Creating a framework for promoting perceptions of ease of use for e-learning

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Supervisor: Date:

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DECLARATION

I, Sharitha Dhebideen declare that this dissertation is a representation of research carried out by myself and is representative of my own work in both conception and implementation. This work was not submitted in any form for another degree at any university or institution of higher learning. All information cited from published or unpublished works has been acknowledged. [redacted] Faculty of Accounting and Informatics, Durban University of Technology Durban, South Africa supervised the research described in this dissertation.

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DEDICATION

I would like to dedicate this research to the following people:

To my father, who gave up his own opportunities to support and educate his loved ones. Thank you daddy for holding your head up high and surging ahead despite every hurdle life threw at you. Thank you for raising soldiers and teaching me the art of survival, the importance of health, and the power of education. I wish I could achieve even half of what you stood for.

To my beautiful mother, words cannot express all that you have been through and still risen above it all. Your endurance, courage and will power, in your struggle to survive, is admirable. Thank you for instilling values that a sound education is the stepping-stone for a better life. Thank you for everything that you have done for our family. I Love You Always and Forever!

To my boys, Shivaan and Akhil, thank you for giving me a chance to experience life's ultimate challenge...to give selflessly and to love unconditionally for the rest of my days. Always remember that God made us all. Mummy loves you more than you will ever know.

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First, I must thank God for this opportunity.

Second, thank you to [redacted] for her continuous guidance and support throughout the years. Thank you for your patience and pleasant disposition with every review, even the half-hearted attempts.

To all the Durban University of Technology staff that took part in the survey and those that allowed me to interview them, thank you.

To the ITSS department for accommodating me during this study.

"Education is the most powerful weapon which you can use to change the world."

Nelson Mandela

ABSTRACT

Information Technology is so widespread and moving at such a rapid speed that it has influenced the education sector at a fast and pressurised pace. This influence has placed focus on the new terminology education technology and blended learning. In order to introduce and implement education technology, Higher Education Institutions (HEIs) worldwide have been introducing Learning Management Systems (LMSs) to support the changes in pedagogy to improve the collaboration between learners themselves and between learners and educators. The implementation of LMSs at South African HEIs are still lagging behind in comparison to first world countries. Nonetheless, changes and advances in education technology have been taking place. These changes have to some degree brought about resistance towards the use of technology (software) to change teaching technique.

Mixed methods research (quantitative and qualitative) was used to conduct a case study analysis at the Durban University of Technology (the case of DUT academic staff using a LMS). The case study allowed the analysis of perceived ease of use (PEOU) of LMSs at this HEI. The perceptions of the academic staff was analysed by executing a survey and by conducting interviews. The study identified additional factors that have a significant influence on PEOU on the Technology Acceptance Model 3 (TAM 3) (Venkatesh and Bala 2008). Literature, information from the interviews, and the themes that emerged from the qualitative results was used to propose a theoretical tiered pedagogical framework that could be adopted by other HEIs planning to adopt a LMS.

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DEFINITION OF KEY TERMS

The purpose of this section is to clarify the definition of key terms used in this study.

Learning Management Systems (LMSs)

Researchers have been defining and redefining the term and use of LMSs for many years. The definition that suites this study is that a “LMS is the framework that handles all aspects of the learning process” (Watson and Watson 2007:28).

E-learning

E-learning is learning via a digitally delivered medium. Electronic resources support teaching.

Blackboard (BB)

BB is the LMS adopted by certain universities in South Africa.

Academic or Lecturer or Educator

An academic is a lecturer or educator of a university. In this study, an academic refers to a permanently employed staff member of the Durban University of Technology situated either at the ML Sultan, Ritson or Steve Biko campuses. For this study, referenced text using the term teacher refers to an educator at a university.

School

The term school is used to define any institution that provides higher education. School in the context of this study refers to a Higher Education Institution or university.

Framework

This study is aimed at building a theoretical framework. A theoretical framework is a guide or a context within which a Higher Education Institution may work with when deciding to adopt a LMS.

Education Technology

Education Technology is using information technology to enhance and support education for both educators and students.

Pedagogy

Pedagogy refers to teaching, education, and training

Blended Learning

Blended learning is a combination of technology assisted learning with traditional face-to-face interaction. Content is presented online and it incorporates distance and classroom education.

Techno-Pedagogy

“Techno-pedagogy refers to weaving the techniques of the craft of teaching into the learning environment itself” (Thakur 2015:183). This includes the use of technology into pedagogy.

Theme

A theme is a category or grouping of related questions. They form a section within the data collection instrument for example a section in the questionnaire.

Variable

Variable refers to a question in the data collection instrument.

ABBREVIATIONS

BB	Blackboard
BI	Behavioural Intention
CLMS	Cloud Learning Management System
CSFs	Critical Success Factors
C-TAM-TPB	Combined Technology Acceptance Model and Theory of Planned Behaviour
DOPU	Drop Off Pick Up
DUT	Durban University of Technology
EDM	Educational Data Mining
e-Learning	Electronic Learning
FOSS	Free and Open Source Software
HEI	Higher Education Institution
ICT	Information and Communications Technology
IDT	Innovation Diffusion Theory
INESI	iKamva National eSkills Institute
ISTE	International Society for Technology in Education
IT	Information Technology
ITE	Initial Teacher Education
ITS	Information Technology Services
ITU	Intention To Use
KMO	Kaiser-Meyer-Olkin
LMS	Learning Management System
MIS	Management Information System
MLE	Managed Learning Environment
MOOCs	Massive Open Online Courses
Moodle	Modular Object-Oriented Dynamic Learning Environment
m-Learning	Mobile Learning
OSS	Open Source Software

PC	Personal Computer
PCA	Principal Component Analysis
PCK	Pedagogical Content Knowledge
PEOU	Perceived Ease of Use
PLEs	Personalised Learning Environments
PU	Perceived Usefulness
SA	South Africa or South Africa's or South African
SaaS	Software as a Service
SAs HEIs	South Africa's Higher Education Institutions
SCT	Social Cognitive Theory
SPSS	Statistical Package for the Social Sciences version 24.0
STEM	Science, Technology, Engineering, and Mathematics
SQL	Structured Query Language
TAM	Technology Acceptance Model
TPACK	Technological Pedagogical Content Knowledge framework
TPB	Theory of Planned Behaviour
TTF	Task-Technology Fit
TRA	Theory of Reasoned Action
UDL	Universal Design Learning
UoT	Universities of Technology
UTAUT	Unified Theory for the Acceptance and Use of Technology
VARIMAX	Variance Maximizing

CHAPTER 1 – INTRODUCTION

1.1 Introduction

This chapter provides a brief background explaining the history and development of Learning Management Systems (LMSs) and the use of LMSs in Higher Education Institutions (HEIs). The research question to be answered in this study with the scope and variables with the research aim and objectives are defined. The rationale behind the study and the contribution of the study towards electronic learning (e-learning) together with a synopsis used in this dissertation are defined.

1.1.1 Terminology

For the purpose of this study, e-learning is defined as access to learning and teaching via a digitally delivered medium. In other words, teaching is supported by electronic resources. This involves software and hardware with the use of an electronic teaching method. Examples of *software* that could support e-learning include Blackboard (BB), Modular Object-Oriented Dynamic Learning Environment (Moodle) and Sakai which allow for the dissemination of course material and the collaboration between students amongst other benefits. These are products that can be acquired off-the-shelf or developed in-house. *Hardware* includes devices, infrastructure development and other physical equipment that may be used to host the software. These could be student or institution owned devices, for example, laptops, smart phones, servers. *Electronic teaching method* is the use of hardware and software to support educators to educate learners. There have been numerous ideas, frameworks and models, surrounding e-learning which indicates support for the e-learning initiative. Kostianinen (2018) explain that in order for educators to be innovative, collaborative and researching professionals they need to teach and learn using technology.

1.1.2 Background

An increase in the implementation of e-learning has been apparent almost since the conception of computer technology and networks. It is important to note what the introducers of the e-learning concept intended it to be in order to understand the basics of the functionality and the benefits, or disadvantages, to this teaching method. Garrison (2011) explains that the term e-learning has been around for many years and "came into use in the mid-1990s along with developments in the World Wide Web". The sheer utility value of information technology (IT) has propelled it into various aspects of civilised activity. The purpose of e-learning has always been to enable the learner to obtain and retain information beyond the limits of pre-electronic learning systems such as the textbook based system. Many years ago, researchers Clark (2008) and Garrison (2011) explained how multi-media and the capitalisation of one's senses can aid the teaching and learning process. Information and "communication technologies, with their multiple media (text, visual, voice) and their capacity to extend interaction over time and distance, are transforming teaching and learning" (Garrison 2011: 5) which creates the advantage of appealing to multiple senses when compared to a textbook based learning system. It has the ability to make use of sight, both written and graphic, the audible sense, and even physical interaction. This capitalisation of senses has the ability to accelerate and enhance learning. It has long been known that learning styles that are "appropriate to e-learning considers preferences in term of the seeing, hearing and doing" (Clarke 2008). Visual learners prefer text that is supported by images, videos and graphics. Auditory learners prefer team discussions or group work with videos and sound effects whilst kinaesthetic learners prefer activities for example group work and note-taking. These learning styles and "some of these preferences translate straightforwardly into the e-learning environment" (Clarke 2008).

E-learning has been implemented in many ways and evolved over time, branching out into many different ways and defined differently in each sector. In earlier years, researcher Nicholson (2007) described e-learning in higher education, business and training sectors as relating "particularly to Internet-based flexible delivery of content and programs that focus on sustaining particular communities of practice" (Nicholson 2007: 2). Some of its implementations have been successful, while some have not, as is usually the case in an evolving system. When looking at the history of e-learning it

is important to take into account the specifics of the frameworks that where being implemented for both the failures and successes. With this information one is able to ascertain some of what works and what is most important when creating a theoretical framework for e-learning. A theoretical framework refers to the “the structure that can hold or support a theory of a research study” (California 2017). It is also important to take a step back for a wholesome understanding of what is needed for South Africa (SA) with regards to e-learning systems at present.

LMSs “weren’t always the flashy cloud-based software they are today. Going as far back as the 1920’s, we have been making steady strides in bringing education and training out of the classroom and to students through technology” (Mindflash 2017).

Table 1.1 History of the LMS (Mindflash 2017), adapted by the author to show some advances that took place to improve LMSs in the earlier years.

Year	Description
1924	Sidney Pressey invents the first teaching machine. The device resembles a typewriter with a window that could administer multiple-choise questions.
1929	M.E. LaZerta invents the “problem cylinder”, a mechanical device that presented a problem to a student and checked whether the solution steps taken by the student were correct.
1956	Gordon Pask and Robin Mckinnon-Wood invent SAKI, an adaptive teaching system that automatically adjusted the difficulty of the questions, based on the learner’s performance.
1960	The University of Illinois at Urbana-Champaign develops PLATO (Programmed Logic for Automated Teaching Operations). This system let different user types interact, including instructors and authors who could create course material, and students who could complete this material online.
1969	The U.S. Department of Defense commissions the creation of ARPANET, a precursor to today’s World Wide Web.
1970	Hewlett-Packard introduces the first-ever desktop personal computer, setting the PC market into motion and making widespread e-learning possible.
1982	TCP/IP was introduced, giving birth of the World Wide Web. This made online learning possible.
1983	MIT annouces “Project Athena, “a five-year initiative to explore innovative uses of computers for teaching. In just two years, 60 such projects were undertaken.
1990	Softarc lauches LMS FirstClass for the Macintosh platform.
1992	GeoMetrix Data Systems releases the LMS TrainingPartner.
1997	CourseInfo develops the Interactive Learning Network. This was the first e-learning system of its kind to leverage a relational MySQL database.
1999	ePath first releases its LMS system ASAP.
2002	Open-source, internal network LMS Moodle is released.
2004	SCORM 2004 is released. This remains the current version that many LMS systems are based on today.

2005	NACON Consulting releases the distance education system, VirtualOnDemand, which can train users in software programs, using only a web browser. The Army later uses this to train IT support personnel.
2006	OLAT 5.0, placing with Ajax support an emphasis on a collaborative environment.
2008	Eucalyptus was released as the first open-source, AW API-compatible platform for deploying private clouds. This sparked an explosion in cloud computing that eventually enabled learning management systems to exist entirely online without needing to be installed on an internal network.
2012	Today, most modern LMS systems are hosted in the cloud, freeing companies from the burden of installing and maintaining in-house systems.

Table 1.1 illustrates the evolution and constant development on LMSs to improve or rework LMSs in the earlier years to better fit the needs and changing demands of the learning environment.

Sharifah Mazlina Syed, Goulding and Rahimian (2015: 98) explain that traditional teaching in specific disciplines like engineering, architecture and construction “need a paradigm shift in order to be able to address the emerging challenges of global practices”. Personalised Learning Environments (PLEs) uses the individuals learning style, capabilities and characteristics to determine a purposive learning system. “The goal of a PLE is to provide digital (and remotely distributable) educational content to suit learners' individual needs and preferences” (Sharifah Mazlina Syed, Goulding and Rahimian 2015: 102). A Managed Learning Environment (MLE) or Course Management System is the bringing together or integration of software that provides an online managed system and learning environment for the learners of an institution. A virtual learning environment commonly known as a LMS is what is needed of the MLE to support online learning. LMSs are defined as,

> *“A virtual environment that aims to simulate face-to-face learning environments with the use of Information Technology. In a LMS, the interaction happens through devices that enable communication either synchronously or asynchronously, allowing the creation of different strategies to encourage a dialogue and active participation of students” (Paulo Cristiano de, Cristiano Jose Castro de Almeida and Nakayama 2016: 160).*

A social LMS can be described as,

> *“A tool which [favours] social interactions and allows scholastic institutions to supervise and guide the learning process. The inclusion of the social feature to a normal LMS leads to the creation of educational social networks (EduSN), where the students interact and learn” (Avogadro, Calegari and Dominoni 2016: 202).*

BB is a proprietary LMS used at certain Universities of Technology (UoT). Other LMSs such as Moodle, an open source software (OSS) LMS, and in-house developed LMSs are also used widely. The use of these systems were increasing over a decade ago where people learnt “together by investigating, analysing, collaborating, sharing, and reflecting. Perhaps this is a key reason why it has had such a rapid uptake among the educational community” (Martinez and Jagannathan 2008: 5). Paulo Cristiano de, Cristiano Jose Castro de Almeida and Nakayama (2016) state that “the growing use of these environments” needs to consider the minimum requirements “in terms of reliability, scalability, security, sustainability and adoption of international standards of quality. Reliability can be obtained through the experience of large universities to use virtual fields for the face-to-face or distance education. Scalability is needed to attend to the large numbers of students, a fundamental characteristic of elearning” (Paulo Cristiano de, Cristiano Jose Castro de Almeida and Nakayama 2016: 161).

> *“Presently, there is a substantial increase of technological utilization for educational purposes. With the potentials that Information and Communications Technology (ICT) offers, educational institutions are now seeking for new paradigms to restructure their educational curricula and classroom facilities to bridge the existing technology gap education” (Ismail Bokhare, Azizan and Azman 2013: 2).*

SA universities are persevering towards aligning the curriculum with the offerings that LMSs bring. Kats (2013) discusses a few LMSs used in the education sector namely Blackboard (including the former WebCT and ANGEL platforms), MOODLE, Desire2Learn, Sakai and Canvas.

1.2 Context of the research

“The growth of information and communication technology is bringing rapid and significant changes to the development of teaching and learning techniques” (Aristovnik, Tomazevic, Kerzic and Umek 2017: 114). e-Learning allows learning to take place at a “very high level available anywhere and at any time” (Górska 2016: 36). The change from the traditional classroom teaching has brought about changes in perceptions. It is important to promote positive perceptions to aid in the successful implementation of e-learning. Examples of current “hot topics” in the field include the use of student owned devices to support learning, mobile blended learning, the cloud

concept, WiFi, and the use of LMSs. It is important to close the education technology gap or risk being left unsustainable, unsupported and out-of-date.

The specific area that will be researched in this study is the perceptions and attitudes of the academic compliment towards e-learning and the use of the Blackboard LMS to support teaching and learning in universities. Referenced text that uses the word school must be interpreted as a university or HEI. The findings will contribute towards expanding the Technology Acceptance Model 3 (TAM 3), developed by Venkatesh and Bala (2008), and will further provide a framework that could assist educational bodies that are adopting a LMS. The research is to identify the factors that influence perceived ease of use (PEOU) of a LMS at a SA HEI. This empirical enquiry used the TAM 3 (Venkatesh and Bala 2008) to evaluate the current perceptions of lecturers at the Durban University of Technolgy (DUT) regarding PEOU of LMSs. This will highlight any additional factors influencing the uptake or perception of education technology from a teaching perspective and the barriers needed to be broken down to reach a stage of lecturers embracing technology as a teaching tool. Assessing the perceptions of academics on using Blackboard with regards to collaboration and general LMS functionality was used to generalize the concept of e-learning using a LMS.

1.2.1 Research aim

The aim of this research is to create positive attitudes towards e-learning and to promote the use of e-learning.

1.2.2 Research objectives

The objectives of this research are:

- To identify and evaluate the perceptions and attitudes of the academic staff with regards to ease of use of LMS technology.
- To expand on the TAM 3 as defined by Venkatesh and Bala (2008).

- To create a framework to promote a positive attitude towards technology in education.

1.2.2.1 Research questions

The research was intended to answer the following questions:

- Do DUT academic staff members think there is sufficient support to ensure a PEOU positively within the LMS?
- Does the demographic profile (age, race, gender, and citizenship) of the individual, at DUT, influence their PEOU of a LMS?
- Do current DUT practices, policies and procedures guide or promote PEOU of e-learning?

The research questions relate to research objective 1 and 2.

1.2.3 Research scope

The study was limited to a UoT situated in KwaZulu-Natal, namely the DUT and the 2017 permanent academic staff at this institution of higher learning. The survey was limited to the educators at the DUT who are the primary users of the LMS within the ML Sultan, Ritson and Steve Biko campuses. The sample did not include students or administrative staff and those permanent academic staff who may not be involved in classroom education (e.g. where the main profile of the individual is the head of department, deputy director, director). A survey and interviews were conducted to understand the case of DUT staff using a LMS. The availability and communication with the academic staff and access to the LMS played a major role in the implementation of the study.

1.3 Rationale of the study

The rationale for this study lies in the contribution it could make towards making the process of adopting or promoting e-learning at a national and international level easier.

1.3.1 Higher Education at a national level

"Education systems in general and the South African system, in particular, are in crisis" (Tarling and Ng'ambi 2016: 555). SA universities have still not embraced education technology as other universities have in first world countries. "One of the challenges facing education systems in general and the South African education system in particular is how to understand ways that teachers change from nonusers of technologies to becoming transformative teachers with technology" (Tarling and Ng'ambi 2016: 554). Education Technology is still a growing concept at SA HEIs. Despite policy directives and an increase of professional training programmes "they tend to fail to create sustainable change in teachers' practice of using emerging technologies" (Tarling and Ng'ambi 2016: 554). Thus far it appears that not all areas within institutions are aligned with the same vision of implementing a culture that promotes education technology.

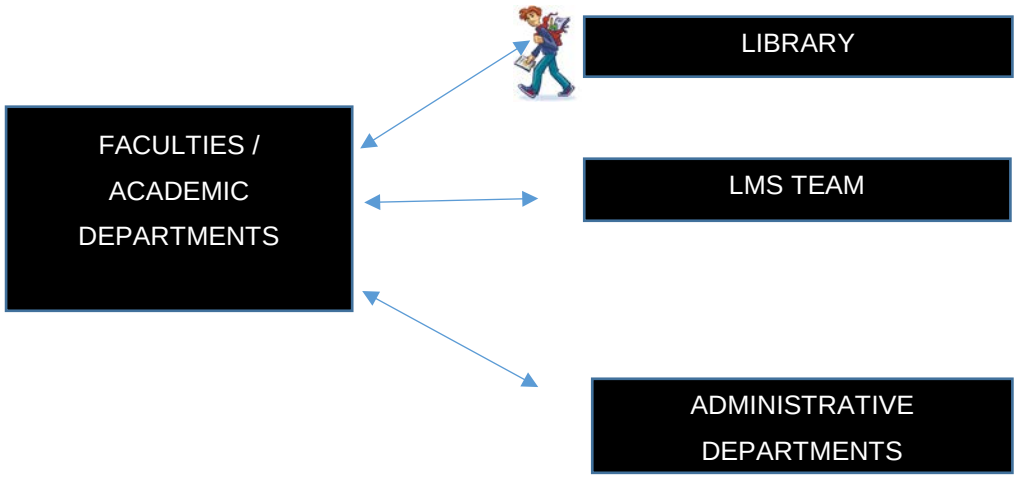

Figure 1.1 Interaction between departments (author's own work)

Faculty offices and academic departments rely on resources provided by the library and the support provided by administrative departments. HEIs have introduced e-learning via a LMS which has added another layer to the support given to faculty offices and academic departments. With the growing use of the LMS and the increasing supply of electronic books, libraries may experience a growing need for computer labs and IT resources (wireless hotspots) and a decreasing need for physical books. It will therefore be useful if the layers that provide support to the faculty

offices and academic departments worked closely together to promote education technology through the use of a LMS. Some SA HEIs have adopted a LMS whilst some are in the process of adopting a LMS.

Figure 1.1 illustrates the communication between departments prior to e-learning at the institution. It is hoped that this research contribution (framework and factors that influence PEOU) is considered by those HEIs that are still in the process of or still considering adopting a LMS. It is hoped that the interaction between the departments will change from what is depicted in Figure 1.1 to a multi-directional type of ongoing collaboration as depicted in Figure 1.2.

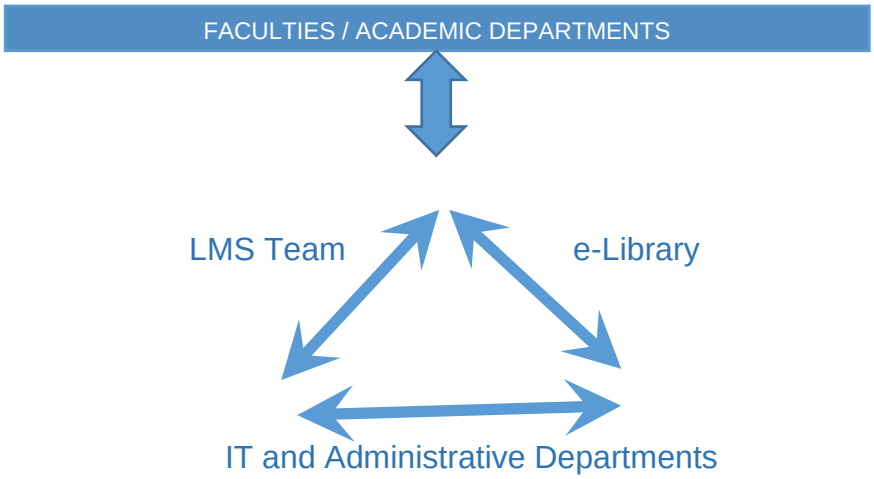

Figure 1.2 A multi-directional type of ongoing collaboration between departments (author's own work)

1.3.2 Significance and contribution at an international level

Research thus far has explored the TAM 3 to explain system use in terms of Perceived Usefulness (PU) and PEOU and its effect on Behavioural Intention (BI) to use. Although much research has been conducted in this area, research on factors influencing the PEOU of a LMS at HEIs, more specifically SA HEIs, is limited. This research attempts to address this gap by investigating the factors that are currently influencing PEOU of a LMS by academics. The research proposes a framework for the implementation of a LMS to promote PEOU for e-learning within an academic context. This study will consider the theory from current theoretical pedagogical

frameworks and contribute towards a new theoretical framework, which if adopted, will have practical implications towards improved educator based interactions with the students (collaboration using the LMS) and indirectly a better working experience and perception of the LMS.

1.4 Research methodology adopted

A mixed-methods (qualitative and quantitative) research approach was used to conduct this study. Multiple methods and instruments were used to gather data on the case of DUT academic staff using a LMS. The research methodology is explained further in Chapter 4.

1.5 Theoretical framework (Technology Acceptance Model)

The TAM 3 (Venkatesh and Bala 2008) in Figure 1.3 summaries the factors that influences an individual's PEOU towards technology applications. Figure 1.3 is explained in Chapter 3.

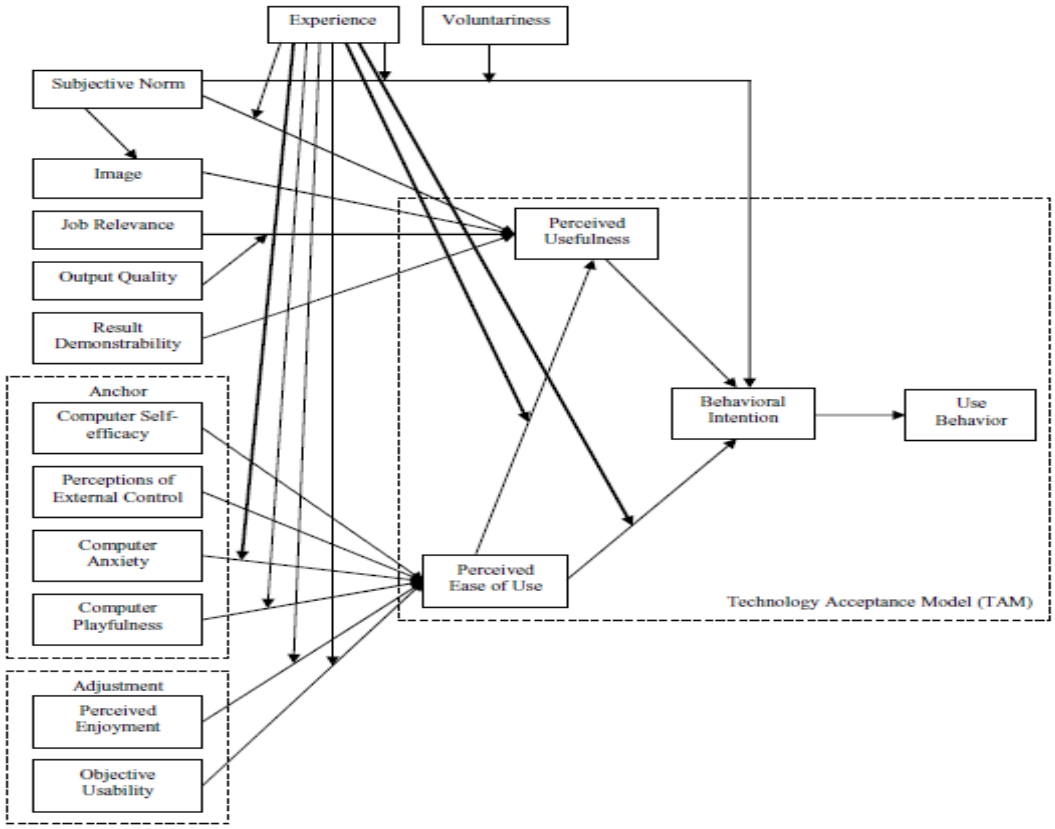

Figure 1.3 TAM Model as defined by Venkatesh and Bala (2008).

This study will reveal other factors that influence PEOU with regards to the utilisation of LMSs at HEIs. As discussed in the aim (1.2.1), any additional factors that will be identified as having an effect on PEOU will be analysed and used to amend the model in Figure 1.3. The changes to the TAM 3 (Venkatesh and Bala 2008) is based on; technology literacy and aptitude, software user friendliness, ease of use (knowledge on how to use a LMS), functionality, Internal support, policies and procedures, time and training and development. A study conducted by Fabito (2017), discussed in Chapter 3, explains that critical success factors relative to an environment could affect the use of software that supports learning. This study assesses which of these factors influence LMS technology acceptance. Computer self-efficacy, as explained in Figure 3.5, is the degree to which a user believes he or she can use technology to perform job related tasks. This study uses technology literacy and aptitude, ease of use (knowledge on how to use a LMS), software user friendliness and functionality as influencing factors on computer self-efficacy. The remaining factors (Internal support, policies and procedures, time and training and development), are new factors tested on TAM 3. The TAM 3 model was changed according to the findings.

1.6 Proposed theoretical framework

The case of DUT academic staff using an LMS will be used as a basis to propose a tiered pedagogical framework. It is hoped that, if this framework is adopted by other HEIs, it could result in promoting a positive attitude towards LMS technology in education.

1.7 Practical implications

The resultant framework from this study will help ease the introduction and use of a LMS which will help end-users improve their working experience on the LMS software. This will reduce the perceived burden of enforcing LMS software usage on an individual without first consulting with every individual. Interested e-learning stakeholders will also be part of a smooth workflow with regards to the use of a LMS.

Furthermore, the additional factors affecting PEOU of a LMS identified in this study, can be further expanded on by other HEIs relative to their environments, infrastructure and software experience. The framework will help create positive attitudes towards e-learning and promote the use of e-learning software.

1.8 Synopsis

The report back from this study is delivered in the following chapters:

Chapter 1: Introduction

This chapter provides a brief introduction summarising the history of LMSs and defines the research question to be answered with the scope of this study. It explains the research aims and objectives, significance of the study, and the contribution that this study will bring to higher education.

Chapter 2: Literature review

This chapter discusses and analyses literature on education technology, LMSs, teaching and learning, bodies that support e-learning and models and methodologies in the field of e-learning and LMSs.

Chapter 3: Theoretical underpinning of research

This chapter discusses a few technology acceptance and usage models. It goes on to describe some of the pedagogical frameworks that authors and researchers have developed to aid teaching in the technological space.

Chapter 4: Research methodology

This chapter explains the research approach used in this study and the reasons for choosing the approach. It further describes the research methods and the reasons for using those methods, data collection methods and instruments used in the study, the sampling method used to collect data and the data analysis methods used. It provides a detailed explanation of the pilot study that was conducted prior to conducting the

main study to test the research instrument. This is followed by a discussion of the main study.

Chapter 5: Results and discussion: Statement of findings and discussion of the primary data

The findings from the data analysis is discussed in this chapter.

Chapter 6: Interpretation, suggestions and conclusion

This chapter uses results from this study to revisit the research aim and objectives. It answers the research questions and explains the contribution this study makes to e-learning. It identifies the additional factors affecting PEOU of a LMS and proposes a framework for the adoption of a LMS.

1.9 Summary

The research questions were answered and the research objectives were met. These are explained in Chapters 5 and 6 in greater detail. This chapter gave a brief introduction to the study and the format in which it is presented.

CHAPTER 2 – LITERATURE REVIEW

2.1 Introduction

The previous chapter introduced the background, scope and purpose of the study. This chapter uses a scoping approach to conduct a literature review. Peterson, Pearce, Ferguson and Langford (2016) describe the main characteristic of the scoping approach as “that it provides an overview of a broad topic” (Peterson et al. 2016: 12). One of the reasons for conducting a scoping literature review is to “provide a quick overview of a field of research, examining the extent of research done on a particular topic or area” (Peterson et al. 2016: 12). The area for this study is LMSs and the use of technology to support learning. Research publications, books, websites, SA government documentation, and empirical studies were scanned for the period 2003 up to 2019 to gather an overview of the use of LMSs and other modern technologies in universities that support e-learning. It also summarizes the acceptance of technology in education. Certain measurement criteria used in some of the mentioned studies have been underlined in this chapter as an indication of which themes were used for this study.

This chapter focuses on literature in the field of education technology to determine how the use of LMSs have influenced the education sector. An overview of SA universities performance in relation to first world countries is given to gain an understanding of where SA universities are placed in terms of the use of technology to aid teaching. It also provides a guide as to where SA universities need to be in order to keep up to technological trends and student-centeredness. The use of a few LMS applications, that support collaboration, is discussed. This implies that there are many LMS software applications for universities to choose from. The empirical studies on the different LMS applications could help universities to choose the appropriate LMS application to support their environment. In addition, the literature review discusses attempts by developing countries to incorporate technology into the learning process. This highlights the gap between universities in developing countries like SA and first world countries. Examples of modern technologies that support e-learning is given to elaborate on the potential that technology has to influence the education sector. These

technologies include mobile blended learning, the cloud concept, educational data mining, massive open online courses and open source software. Furthermore, technology acceptance and resistance to change is discussed to gain an understanding on how individuals' perceptions influence the use of software applications. This resistance could be the key deciding factor on whether the technology is used beneficially or not. Support (institutional and technical), training and user development is reviewed to illustrate the support structure required to ensure the adoption and continued use of technology to support e-learning and the use of LMSs. Lastly, SA's higher education institutions role in a knowledge society is discussed to illustrate the need for technology to improve the method used to deliver education.

Fisher, Exley and Ciobano (2014) define active learning as a "process in which the learner engages with the topics and concepts to be understood actively" by working with information, solving problems or planning tasks. Students can therefore reflect, think of ideas, assess their understanding and take responsibility for their own learning. Student-centeredness "means providing learners with more control and choice in their learning" (Fisher, Exley and Ciobano 2014) which gives them control over what is studied, when, where and how.

E-learning and educational technology has been introduced into educational institutions to aid teaching and learning. The idea and use of Educational Technology, specifically the LMS, "has grown exponentially in the last several years and has come to have a strong effect on the teaching-learning process, particularly in higher education" (Cerezo, Sánchez-Santillán, Paule-Ruiz, and Núñez 2016: 42). LMSs facilitate the incorporation of advances in technology into current teaching methods. "Web based LMS technology is being used to store subject content, share information, and improve collaboration between teachers and students" (Lonn and Teasley 2009: 1). Since then, LMSs have continuously been improved to offer further features. The current LMSs still provide this functionality, but with added capabilities. These systems have "become almost ubiquitous in higher education institutions. It offers a medium for knowledge sharing and acts as a communication tool" (Goh, Hong and Gunawan 2013: 367). "Web based LMSs provide "an effective and responsive way for industry experts and teachers to create, deliver, and manage their content, as well as monitor

participation and assess performance among learners" (Shah 2015). In the process of introducing LMSs at higher education institutions (HEIs), however, a change in the way educators teach and students interact has been introduced.

2.2 South Africa's Higher Education Institutions in relation to the rest of the world

Currently examples of technology that supports communication amongst educators and learner's at SA HEIs take the form of the Information Technology (IT) infrastructure of the institutions' tools to aid teaching (for instance: presentations, graphics, and scanners), communication and collaboration systems (for example LMSs), and technology assisted learning (example, the World Wide Web as a virtual library). A potential meeting point for education technology is the LMS. "The experience of learning is changing due to rapid growth of Learning Management Systems (LMS) usage in campus universities" (Croitoru and Dinu 2016: 5). LMSs "have become an important resource in education, especially in higher education" (Croitoru and Dinu 2016: 5). A study conducted by Croitoru and Dinu (2016) compared several LMSs with the aim to help HEIs in making the right choice for a LMS. The study is described under the evaluations of LMS implementations section. Some South African (SA) HEIs are only now starting to experience the benefits that LMSs offer. It has the potential to provide a platform through which technology can be used in tandem with educators, students, and other communication platforms and collectively monitor and control the collaboration to provide a proper, productive environment for learning, if used properly.

The performance and prominence of the HEIs in SA and the world is linked to the implementation of a multitude of educational technology and technology support systems, beyond and including the use of LMSs in their institutions. An exercise is conducted every year to rate Universities around the world and within specific economic denominations. This exercise was conducted by Times Higher Education for the period of 2016 to 2017 to rate Universities around the world. According to Times Higher Education the ratings were judged across their core operations namely "teaching (the learning environment), research (volume, income, and reputation),

citations (research influence), international outlook (staff, students, and research) and industry income (knowledge transfer)" (Bothwell 2016). The rankings compared 980 universities across 79 countries and used 13 performance indicators and a carefully planned out methodology to rank these HEIs. For this period, the global regions ranking of the top 4 universities in Africa are University of Cape Town (148), University of the Witwatersrand (182) and the University of KwaZulu-Natal (501 - 600). The exercise, repeated for the 2017 to 2018 period, saw a drop in the performance of the top ranked SA Universities relative to their international counterparts. The order of performance remained mostly the same but the University of Cape Town had ranked (171), the University of Witswatersrand (251 - 300), the University of Stellenbosch ranked (351 to 400) and the University of KwaZulu-Natal ranked (401 - 500). The consistently low rankings of SA institutions reflect the need for improvement within SA HEIs. Top universities earned their good ratings due, in part, to their good teaching component. In order to improve the rankings, to stay competitive and to move towards providing world-class education, it would make good sense to improve the teaching component (the learning environment) of these institutions. Improving the teaching, will in turn, improve the ratings. It is for this reason that HEIs need to assess their teaching and learning environments. The current ratings are an indication of how far behind SA is in terms of providing quality education. The integration of LMS technology into the learning environment could help to improve teaching and learning.

The University of Cape Town has been the best faring HEI in SA, and the Continent of Africa in general. University of Cape Town, with substantial output of research, has implemented methods for improving the quality of its educational system. The University of Cape Town implements an internal web-based LMS called VULA in order to monitor and improve the performance of its students and staff (University of Cape Town 2018). Information regarding the Institution and its activities are easily accessible and well structured, and detailed on their website (University of Cape Town 2018). University of Cape Town's performance (University of Cape Town 2016: 7) and sustainability (University of Cape Town 2018) documentation suggests that it keeps track of, and actively implements trending techniques and activities from around the world. University of Witwatersrand was another one of SAs better performing HEIs in the rankings. They have incorporated several technologies and systems such as their own intranet and Virtual referencing aid (WITS 2018), and have been a prominent

participant of SA's research output. No mention was made of which LMS exists in the teaching and learning component even though there are components of technology integration. Therefore using technology and in particular LMSs could contribute towards improving SA university ratings.

Oxford University in the United Kingdom, had been ranked as number one for both periods. Oxford University had ranked highly both overall as well as in terms of the rate of research, citation effectiveness, and their world outlook. It also performed well in terms of their teaching. The Massachusetts Institute of Technology has also been among the top performing institutions of the ranking due to its 100 percent citation effectiveness and high ratings across all evaluation criteria. The institution implements an Open Online course in the form of MITx and edX (Massachusetts Institute of Technology 2018), and a range of informational services to help students, faculty, and the general public understand what's going on in the Institution, their roles in the on-going activities, and the systems and technology in place to help them make use of it.

In contrast to the performance of SA's best ranking institutions, most of the SA HEIs were ranked very far down the list compared to other developing countries. The performance of SA HEIs overall suggests that they have a lot of room for improvement. Among the aspects that can be addressed are the integration of educational technology and technological support in the institutions, and the educational frameworks that implement modern solutions like LMSs. In contrast to the best performing institutions, all SA HEIs still have much room for improvement. The ratings are an indication of how SA is lagging behind and the amount of changes that need to be implemented at SA HEIs for the betterment of quality education and the upliftment of their socio-economic knowledge base.

2.3 Technology and collaboration for students and educators

Fisher, Exley and Ciobano (2014) summarise the use of technology in learning as giving students a voice and "it moves students from being the consumers of information to the producers of it" where the student's consumption and production of

knowledge refers to the knowledge economy. LMSs are student centred because students have access to material on the internet, they can interact, engage in group work and they have more control over what is studied, when and how. Fisher, Exley and Ciobano (2014) explain that technology creates a better learning experience by creating different situations and contexts, which is not limiting with regards to geography, time and learning style. It promotes collaboration despite being physically separated. Material is easily accessible which allows educators to meet the needs of students from different socio-economic backgrounds and those with disabilities. LMS technology allows this type of flexibility. Another advantage is that "technology is immersive and can bring an element of fun to HE" (Fisher, Exley and Ciobano 2014). The increasing popularity of social media and the internet with the SA youth has allowed them to build knowledge on how to use technology to easily collaborate and share information using this element of 'fun'. The students at risk of attaining their qualification have always been a challenge in higher education. It is hoped that the implementation of a LMS will assist with tracking student progress and adequately assist the student before their study period is over.

2.3.1 The use of Learning Management Systems

2.3.1.1 Definition of a LMS

A "LMS is often regarded as the starting point for developing an online course or program by researchers as it provides a means for managing, delivering, and tracking online instruction and student outcomes" (Cavus, Uzunboylu and Ibrahim 2007: 302). This still holds true for the current versions of LMSs that allow sharing and collaboration between educators and students. Upgraded versions have become available over the years.

2.3.1.2 Open Source Software

Open Source Software (OSS) (e.g. Moodle, Segue, Interact, CourseWork, Atutor, KEWL, Sakai) is software that can be used by, or distributed to anyone at no charge. Proprietary software (e.g. Blackboard (BB), WebCT, and Desire2Learn) however, has

a fee structure attached to it. It is because of this fee structure that HEIs sometimes dismiss the use of software owing to the cost attached to the implementation, licensing, and upgrades of the software. It is therefore important to have ***academic executive management support***, with regards to funding and policy from the onset. The proposed pedagogical framework incorporated the executive management support layer as the top most layer of the framework.

Recently "Free and Open Source Software (FOSS) movement has broken the outlook of using the paid software. In the generation of online learning, where Massive Open Online Courses (MOOCs) are being used by educators for transacting the curriculum based material, we need to use the available FOSS also" (Deepty and Surbhi 2018: 53). InfoDev (2018) has listed a number of popular open source LMSs available at present. LMSs like Moodle and Atutor listed in the article represent the potential of Open Sourced Software. They are free, modify-able tools that have the ability to enhance an educational institutions' productivity and facilitate learning and teaching efforts. Open courses and OSS extend beyond the existence of LMSs to include various libraries and indices of educational content and software that automates otherwise tedious scholarly processes.

2.3.1.3 Currently used LMSs

2.3.1.3.1 Blackboard and Moodle

"The most widely used is BB, Moodle, Sakai" (Quinn 2012). "*Blackboard* is a web-based course management software designed to facilitate the management and delivery of educational courses for students…They can even access collaborative tools" (Goh, Hong and Gunawan 2013: 369). BB "mobile learn platform provides access to the resources hosted in its LMS via mobile devices" (Quinn 2012) like iPhones, iPads and android. Students can access pdf and office documents and media files. "Due to the stability and reliability of Blackboard, it is used by more than 70 percent of the U.S. colleges and universities" (Goh, Hong and Gunawan 2013: 369). *Moodle* is the "premier open-source higher-education LMS" (Quinn 2012) that is "provided freely to the public" (Goh, Hong and Gunawan 2013: 369). An empirical

study was conducted by Goh, Hong and Gunawan (2013) to determine if the transition made at a private HEI, from the BB LMS to the Moodle LMS, was conducted successfully. The study took into account the perceptions of students and educators. All questions and responses were placed in a meaningful order according to perceived usefulness (PU) and perceived ease of use (PEOU). The Microsoft Word table feature was used to show patterns for the open-ended questions. The study concluded that "Moodle is considered flexible, cost savings and easy to customize according to specific course requirements. It has a great extensibility potential and is well established" (Goh, Hong and Gunawan 2013: 369). "Moodle is a leading open source LMS, whereas Blackboard is famous of proprietary LMS" (Sahid, Santosa, Ferdiana and Lukito 2016). A critical analysis of LMSs in higher education conducted by Croitoru and Dinu (2016) compared multiple platforms of LMSs based on the features and capabilities offered and the technical aspects of the platform. Croitoru and Dinu (2016: 16) concluded, "that the optimal Learning Management System is Blackboard, followed closely by Moodle". BB provides features under different platforms namely Vista, Learn, Transact, Engage, Collaborate, Mobile, Connect and Analytics umbrella. Moodle, on the other hand, is a prominent LMS in the higher education industry which Sitthisak, Gilbert, and Albert (2013: 53) describe as "a powerful tool in the educational process, as it supports web-based courses and quizzes, along with providing tools for communication and collaboration". Bee (2017: 737) describe Moodle as a LMS that "can be linked to any resources that are uploaded to one's server or that are available on the web" and that Moodle was built according to the "production of knowledge through active and interactive learning".

2.3.1.3.2 Sakai

Research by Wan, Yu, Ding and Liu (2017) provides insight on how the *Sakai* LMS has the ability to track student behavioural patterns. Wan *et al.* (2017) describe Sakai as "an open source learning manage[ment] system developed by four leading U.S. Universities to meet the needs of teaching, learning and research. It is a java-based project and was designed for higher education. More than 350 institutions around the world are now using Sakai" (Wan *et al.* 2017: 250). Sakais's functionality caters for discussion forums, resources, lessons, tests and quizzes, and assignments. The user

has the ability to extract student learning behaviour patterns which can be graphically represented by trace charts. In addition life cycle assessment methodology can be used to evaluate the students' behaviour for the duration of the course.

2.3.1.3.3 Remind and Moodle

Several LMS technologies, such as *Remind* and *Moodle,* have, and are being developed or upgraded. The source code for these OS is available and can be adapted, to enhance the methods of teaching and learning within institutions as well as make access to educational content easier for both the educator and student. *Remind* is a tool designed for student-educator communication and content dissemination. It "interacts with students on both mobile and pc platforms to ensure that content is always received and seen by the students and teachers" (Kopf and Kopf 2018).

2.3.1.4 Evaluations of LMS implementations

2.3.1.4.1 Factors that influence the success of a LMS

Jafari, Salem, Moaddab and Salem (2015) conducted a study to investigate the factors that influence the success of a LMS. The researchers used the DeLone and McLean information systems success model which is considered "one of the most widely refereed IS success models in the literature. It can be used to assess LMS success due to its solid theoretical foundation and the numerous successful empirical studies done based on it" (Jafari *et al.* 2015: 64). The variables used for the study included: (1) system quality, (2) information quality, (3) service quality, (4) use or intension to use, (5) user satisfaction and (6) net benefits. The population was undergraduate university students, who were in semester three or above, that were using the LMS in their educational growth in the Limkokwing University of Creative Technology. The stratified random sampling method was used to select the sample size of 368 participants. A five-point Likert scale questionnaire was used to gauge how strongly students agreed or disagreed with the questionnaire statements. A drop-and-collect survey method was used to distribute 520 questionnaires of which 465 were returned

(response rate of 86 percent after defective responses were removed). It was concluded that “technology characteristics which are system quality and information quality were the major factors affecting the success of the learning management system” (Jafari *et al.* 2015: 68). Readiness for on-line learning had a weak impact which implies that it is not a success factor. System use had a high impact which means that motivating the user or student to use the LMS increases the user satisfaction which leads to the success of the system. Furthermore, user satisfaction and system use directly impact the outcome. The results conclude that “the roles of system quality, information quality, and readiness for online learning are very important and essential predictors of perceived usefulness…the more system use, the higher the value would be on the perceived usefulness” (Jafari *et al.* 2015: 68). Similarly for this study, promoting perceptions of ease of use could result in frequent and sustained LMS use which could result in positive PEOU.

2.3.1.4.2 Usability of LMSs

The Virtual University System of the University of Guadalajara (UDGVirtual) initially used the AVA LMS, designed by a group of engineers lead by Ruben Yanez Reyna, which was redesigned as Metacampus, a homemade system developed in 2001 by de Losada. Metacampus’ purpose was to fulfil the needs of the General Office of the System for Learning Innovation (INNOVA). A user that used both versions felt that “AVA had better interaction facilities, accessibility and a virtual psychosocial approach in comparison with Metacampus….Metacampus’ graphic design was more sober and less motivating” (Medina-Flores and Morales-Gamboa 2015: 197). UDGVirtual also introduced Moodle and Sakai CLE but Metacampus remained the main LMS. The researchers designed a system to evaluate the usability of LMSs by taking into account software user interface features, web application features, and specific LMS features (multiplatform, browser-based, client or server architecture, multimedia, restricted access, graphic interface, information management, interaction and communication). Questionnaire proposals and characteristics of LMSs were considered. “Metacampus has the basic educational tools for the simulation of a virtual classroom: a calendar, emails for tasks, personal pages for participants, documents and links, forums, chat, list of participants, workgroups and portal administration- the

essential tools of a LMS" (Medina-Flores and Morales-Gamboa 2015: 198). It however lacks internal email, announcements, tests, quizzes, blogs, wikis, social networks, and online surveys. It is "suitable to serve an adult population with little experience in the use of ICTs" (Medina-Flores and Morales-Gamboa 2015: 199). Experts, who had to fit a specific profile, were used to determine how usable the software is. The questionnaire used had six sections, with a Likert scale rating system. Email was used to distribute the questionnaire to six experts, who responded via email. The results showed that Metacampus has usability issues in certain key areas like low reliability, lack of flexibility in meeting user demands, and missing search abilities in forums. Overall, the experts suggested that Metacampus needs improvement to provide user satisfaction, and comments. Medina-Flores and Morales-Gamboa (2015: 202) state that it is becoming a complex task to choose the components that will form the educational platform which

> *"Requires assessment tools and better decision-making. The design of such instruments must be based on the state of the art regarding learning management systems, the latest trends in the development and use of information and communication technologies, and new models for education in these new environments."*

This study therefore used functionality ad software user friendliness to determine the effect on PEOU.

Marikar and Jayarathne (2016) distributed a structured multiple choice questionnaire to students at the General Sir John Kotelawela Defence University in Sri Lanka. Thirty one students participated by completing the online questionnaire on Moodle. The outcome showed a positive response on the e-learning platform, however, late submissions were observed and "the results provide cause for concern over the status of e-learning education in Moodle platform in Sri Lanka which is highly satisfactory" (Marikar and Jayarathne 2016: 54). Similarly, Alturki, Aldraiweesh and Kinshuck (2016), conducted a study on the use of BB at the King Saud University, which was in the process of implementing the LMS. It mentions that "faculty members complain about the accessibility and usability of the e-learning software because of the perceptions that the interactive features are not user friendly" (Alturki, Aldraiweesh and Kinshuck 2016: 33). The study however concluded that "the software is easy to access and use" (Alturki, Aldraiweesh and Kinshuck 2016: 43). This shows that even though the LMS may provide the functionality, the way in which the system is used and the

user perceptions will determine its popularity. Developers of LMSs should shift the modelling technique from technology-centered to being more user-centered. Developers should "consider user experience as the primary concern to improve LMS. Therefore, evaluation and measurement of user experience for LMS become crucial" (Sahid *et al.* 2016). This study also shows that software user friendliness and functionality are factors to consider when evaluating user perceptions.

2.3.1.4.3 LMS features that researchers consider important

"Most LMS are open source software because they started as a university project, rather than being a business idea" (Croitoru and Dinu 2016: 5). The researchers further state that "the main focus is still on the *cost point of view, together with financial and technical requirements*" (Croitoru and Dinu 2016: 5). The study by Croitoru and Dinu (2016), mentioned earlier in this chapter, compared the Docebo, Schoology, BB, Moodle and the LMS used at the University of Economic Studies, Bucharest (online.ase.ro). The comparison was based on a number of characteristics that the researchers considered most important to have. Part one compared features and capabilities (functionality), and the second part considered technical requirements. For the first part yes (Y) meant that the feature was available and no (N) meant that the product did not have the feature. The results were that BB and Moodle are the best based on support tools (administrative, course delivery, and content development). In the category technical specification tools, BB took the lead followed by Moodle. The researchers concluded that overall the best product is BB, followed by Moodle. The weakest product was the LMS used at the university (online.ase.ro).

> *"The strengths of Blackboard are the realization of communication tools, the creation and administration of learning objects, the comprehensive didactical concepts and the tracking of data…There is a small difference between Blackboard and Moodle in the paper we conducted, but in the end the choice belongs to the user. Hence we recommend Blackboard as the best choice for higher education generally" (Croitoru and Dinu 2016: 16).*

Open source LMS software provides the use of free software applications to support universities that may have financial constraints whilst proprietary software has cost implications for implementation, licensing, and upgrades of the software. This does not indicate that the functionality is better for one category over the other. It merely provides HEIs with choice over what is implemented. The relevance to this study is

that funding should be considered when adopting a LMS. This was taken into consideration for the development of the pedagogical framework. The *executive management support* layer of the framework should consider funding and policy as the main focus as mentioned by Croitoru and Dinu (2016). Over and above the choice provided over financial barriers, there are many LMSs to choose from. The onus lies on the HEI to select the LMS that is the best fit-for-purpose to support their e-learning requirements within their environments. The evaluations of the LMS implementations discussed provides and understanding of experiences from other HEI that could assist universities that are newly adopting a LMS or are moving over from one LMS to another. The relevance to this study is that the PEOU of the chosen LMS could impact on whether the software is perceived positively or not.

2.3.2 Technology and the curriculum

The International Society for Technology in Education is a educator-based non-profit organisation that allows educators to share ideas about how to enhance learning through technology, but it would appear that the expertise available here is often underutilised. Older studies advised that technology should not be "viewed as a separate curriculum area, but rather, technology tools should be mapped onto the curriculum" (Hart 2007). Figure 2.1 illustrates how teaching and learning should be reorganised using tools. Studies in Norway by Gudmundsdottir and Hatlevik (2017: 214) used a survey with a sample size of 356 of newly qualified educators to determine if new educators are prepared to teach in a digital age. It was found that the educators considered their Initial Teacher Education (ITE) to be of poor quality in the field of information and communication technology (ICT) and stated that "continuous effort is needed to review the quality of ITE and contribute specifically to the development of PDC and developing student teachers' ICT self-efficacy in ITE". These studies suggest that success has not been generally achieved. Even though research is being conducted, the implementation of such findings are still lagging behind.

Figure 2.1 The reorganization of Teaching and Learning with Technology Tools (Hart 2007)

HEIs and learning institutions in general are an environment used to concentrate and facilitate a person's learning experience. These environments have not developed at the pace of technological innovations and "as each generation picks up on these technologies and implements it into their own lives rather than including traditional forms of media and communication the effectiveness of the existing curriculum diminishes" (Parr 2014).

The model shown in Figure 2.1 illustrates that by mapping tools to the curriculum and changing teaching technique to use technology to become more productive will result in teaching and learning with technology. An LMS can be considered an example of the tools or technology that is being used in the teaching and learning process. The model shown in Figure 2.1 is still regarded as valuable, while a more recent article by Parr (2015), identified key trends that accelerate technology adoption in higher education. Technology tools need to be structured to allow for flexibility, and "spur creativity and entrepreneurial thinking" (Parr 2015). He also believes that universities should collaborate regarding their technological activities and combine resources thus allowing them to "work toward common goals concerning technology, research, or shared values" (Parr 2015). The ultimate goal is "to build better pedagogies, empower students to take an active part in their learning, target at-risk student populations, and assess factors affecting completion and student success" (Parr 2015). Parr also advises introducing open educational resources that provide "teaching, learning, and research resources " (Parr 2015) and that institutions should permit their free use and re-use by others. He also advocates the increased use of 'blended learning' and lastly he suggests that learning spaces need to be redesigned involving content being presented online and contact time becoming "discussion and explanation time" rather than just providing an opportunity to disseminate knowledge.

Studies relating to the use of technology in education show that it is possible to incorporate the use of tools into teaching methods. The relevance to this study is to determine how the lecturers perceive the use of a LMS in the institution.

2.3.3 Technological initiatives in developing countries

2.3.3.1 The use of technology in education

A group of researchers in higher education working for the iKamva National eSkills Institute (INESI), South Africa, set up a five-year plan: 'Information and Communication Technology is a mission mode project'. The project was to provide connectivity, content and devices to all HEIs in the country (INESI 2012). A National Knowledge Network was to be introduced to interconnect universities and libraries to share IT resources over a high-speed network with gigabit capabilities. This unfortunately has still not been realised at this stage. "Every teacher should know how to use technology, pedagogy and subject area content effectively in their daily classroom teaching" (Thakur 2015: 182). This belief is important in today's world because skills and knowledge play a vital role in everyday life. Thakur (2015) conducted a study on the implementation of techno-pedagogical skills, its challenges and role at HEI. "Today the techno-pedagogical competency is very much needed for teachers in teaching and learning process, as it facilitates effective teaching and learning" (Thakur 2015: 183). The researcher identified the role of techno-pedagogy in higher education as: Enhance linguistic abilities, develop teaching learning process, improve to develop study materials, design multi-grade instruction, plan specific pedagogy, support in distance education through e-learning, guide and counsel for career choices, stimulate self-learning ability, enhance enrolment and examination process, assist in research activities, reinforce for cognitive learning, development of life skills, develop aesthetic sensibility. The study further lists the challenges of using techno-pedagogy and what needs to be done in preparation for using techno-pedagogical skills to resolve problems related to higher education. The way in which educators integrate technology has the potential to bring change in the education process. For educators to become fluent in the usage of educational technology means going beyond mere competence with the latest tools to developing an understanding of the complex web of relationships among users, technologies, practices, and tools. Educators must understand their role in technologically-oriented classrooms.

Several technology based education initiatives have been set in motion for SA and Africa in general with companies such as Cisco promoting and providing their network technology and strengthening our networking infrastructure. Edubuntu is an initiative that promotes and facilitates the use of the free, and open source linux operating system Ubuntu, allowing the implementation of technology in HEIs and other types of learning institutions to become more cost effective. “FOSS has become popular due to its affordability and the freedom it provides” (Deepty and Surbhi 2018: 53). Initiatives like (Gutenberg, OpenLibre, Open Directory of Open Access Books (DOAB), and Directory of Open Access Journals (DOAJ)) provide a range of content to simplify learning and expand the diversity of information sources available to students and other scholars. The mentioned initiatives are few among many that collectively aim to build an infrastructure and content base, and provide interface and maintenance options for SA HEIs. The onus lies on the institutions, their staff, and their customers, the students, to properly appreciate and fully utilise them and technology in general.

2.3.3.2 Challenges faced by developing countries

Mahenge and Sanga (2016) investigated the implementation of ICT in three Tanzanian HEIs. The investigation asserted that the inclusion of ICT in learning created new, exploitable, opportunities for educational institutes and made use of the results of the current levels of ICT integration of the three HEIs to affirm this position. The study noted the challenges faced in communicating learning content stating that “delivery of learning contents is becoming a challenge for HEIs due to the constraints in resources and network bandwidth” (Mahenge and Sanga 2016: 200). The study also investigated perceptions of e-learning software available for stationary and mobile environments. The results indicated that the majority of students had mobile devices available to them and indicated that as an opportunity that could be taken advantage of and emphasised mobile technology as a primary medium to make use of in developing countries. It is suggested that in order to improve e-learning content delivery and accessibility under limited resource settings, “HEIs in developing countries should make an effective use of emerging mobile computing technologies which are relevant to their respective environments” (Mahenge and Sanga 2016: 200).

The same study by Mahenge and Sanga (2016) looked at mobile device penetration in a broader sense, by tallying the usage of four countries: Tanzania, Kenya, Nigeria, and SA. The results placed Tanzania at the lowest level, at over 20% and SA the highest, at approximately 52% as at 2017, with the graph also tracking the rate of increase over a period of five years. With regards to Tanzania's HEIs the gender dispersion amongst mobile users in the sample of students was also identified, with average of male students at 73, 2% and female students at 26.8%. The study made use of a questionnaire, made up of closed ended questions with multiple responses to choose from in order to generate new statistical data. The questionnaire helped generate statistical usage data of social media and other e-learning platforms used in HEI. The three Tanzanian HEIs e-learning platforms were dominated by YouTube, Facebook, and Twitter respectively. The study asserted that "most of the mobile Web 2.0 applications can in one way or another be adopted in the teaching and learning process" (Mahenge and Sanga 2016: 205). This suggests that social media and mobile technology may play an important role in the implementation of e-learning and the use of LMSs in developing countries.

The questionnaire from the Mahenge and Sanga (2016) study also took note of the perceptions of the students, relating to the performance of existing e-learning tools at their disposal and the specific types of devices used. It found laptops, smart-phones and cellular phones respectively to be the most used physical mediums for e-learning activities. The study analysed the forms of educational information transferred through ICT, logging the frequency of this usage across the three HEIs. The results of the study mentioned a low adoption of mobile-based learning with major obstacles to its propagation being the limited bandwidth access and resource availability and inadequate ICT infrastructure in the HEIs, even in a scenario where most students have mobile learning (m-learning) capable devices. The article recommends an integrated approach. "An integrated approach that combines face to face learning, e-learning and m-learning in a blended manner is recommended by this study" (Mahenge and Sanga 2016: 210). The study heavily emphasises m-learning implementation as a means to improve education in developing countries. The information collection method that it employed to reach this conclusion took into account many possible variables that could affect the success of ICT implementation, although further data is needed to identify the nature of the effect that the variables

would have. The collection method's use of close-ended questions allowed for a conversion to precise statistical data with accuracy suitable for its purpose. The study did not indicate the performance change in the students, but it did indicate the most popular mediums and types of information that the Tanzanian HEIs made use of. The successes and hardships of this instance of implementation acts as a point of reference for other institutions to help improve their own implementation of ICT in learning.

2.3.3.3 Adoption, usage and integration of a LMS

A study was conducted by Emelyanova and Voronica (2014), to understand the perceptions of stakeholders (educators and students), by examining the adoption, usage and integration of a LMS at the Russian University (National Research University Higher School of Economics – Nizhny Novgorod campus). The study looked at the qualifications and readiness of the stakeholders and their perceptions in terms of convenience, effectiveness and usefulness to help identify potential problems and to build a productive learning environment. Similarly, this study could help build a productive environment by promoting PEOU of LMS technology. An anonymous survey was administered, using a paper format questionnaire, at random students that attended class at the end of the lecture which was collected by a coordinator. Educators were approached and completed the questionnaire in their staff rooms. MS Excel and MS Word was used to process the data. Two different questionnaires, with closed and open ended questions on a 3 point Likert scale, were drawn up for 109 bachelor and master students (25% men and 75% women), aged between 18 and 21, and 23 educators from different faculties (21.7% men and 78.3% women), aged between 30 and 60. The student questionnaire had two parts. The first part was irrespective of LMS exposure to determine if they were aware of or used a LMS at least once. If the student had LMS exposure, part two gained feedback of the LMS application. The educator's questionnaire was used to gain perceptions and attitudes with regards to their willingness to incorporate the LMS application into teaching and learning. The results from the study showed that students from this university were confident personal computer (PC) and internet users and an assumption was made that introducing a LMS will not present difficulties to them. With regards to perceived

ease, students and educators have the computer skills to embrace the LMS application which was perceived by the majority as easy-to-use. However not all educators use the LMS and students do not have the opportunity to benefit from the use of a LMS application in the learning process meaning that the problem is not in the perceived complexity of the LMS application but somewhere else in the system. With regards to perceived convenience, more educators perceived the convenience of the LMS application as average. With regards to PU, results show unanimous notions for LMS importance for uploading and storing materials. A gap was noted between using the LMS as a tool (in the learning process), with a ratio of 2:1 (two being the educators) and making the learning process easier (higher number of students compared to educators). With regards to perceived effectiveness (time), educators perceived the LMS as time consuming and not time saving whereas students perceptions varied (25% responded time saving and 19% responded time consuming). All stakeholders were in favour of having subjects on the LMS but they were not satisfied with the convenience (ease) of the LMS application. Students supported the use of the LMS as a storage facility but not all students were keen to use the LMS. It was too early to determine if the teaching and learning process was being transformed using a LMS. “Educators should be a driving force of innovation and bring university education to the next level. How teachers use the system depends on their involvement and belief in the effectiveness” (Emelyanova and Voronica 2014: 286).

The study by Thakur (2015) is relevant to this study in trying to identify if the level of computer literacy plays a role in the way the lecturers perceive the LMS software. It further highlights barriers experienced when adopting technology. The relevance to this study is to determine what factors affect PEOU of LMS technology within the DUT environment and to build a framework that could assist when adopting LMS technology. The challenges faced by developing countries illustrate that it is more difficult to implement technology without the necessary support. Students are encouraged to use their own devices to support their learning. The relevance to this study is to identify what challenges exist in the DUT environment and to determine if there is adequate support (training and development, policies and procedures, internal support) to promote positive perceptions towards the ease of use of LMS software. The study by Mahenge and Sanga (2016) addresses how an integrated approach

used in a blended manner could aid education. The relevance to this study is that an LMS can provide a blended approach if perceived positively and used on a continuous basis. The study by Emelyanova and Voronica (2014) examined the adoption, usage and integration of a LMS in a university. This study examines the perceptions of the lecturers on the adoption of the BB LMS and the integration of the LMS software with other software applications used at the institution. The study by Emelyanova and Voronica (2014) looked at the role that qualifications and readiness of the stakeholders played on perceptions whilst this study looks at factors like years of lecturing experience and the level of experience using a LMS on perceptions.

2.3.4 Examples of modern technologies that support e-Learning

2.3.4.1 Mobile blended learning

2.3.4.1.1 Definition of mobile learning

"As the role of technology in society and education dynamically emerges, the adequate preparation of teachers in educational technology is integral to using such a tool effectively in the teaching and learning of our children" (Vannattaa and Nancya 2004: 263). This has clearly been a recognised challenge for a long time. M-learning is the ability to combine mobile phone technology with computer resources to gain the functionality of both. Educators have been incorporating the potential of these devices into their teaching to send text messages, allow students to collaborate, send emails, and more.

2.3.4.1.2 M-learning and LMSs

The World Wide Web has presented many opportunities in the field of education and with "the ability to pair almost any piece of hardware with a mobile device, the opportunities become quite heady" (Quinn 2012). Technology has evolved so quickly over the years that there are many more devices that can be 'linked up' to your mobile devices as compared to 6 years ago, which makes the opportunities today much more attractive. Moving towards mobile blended learning is allowing educators to train their

students to think critically “nonetheless, flipping the lecture isn’t universally embraced. Some professors really like being the ‘sage on stage’ and some students really like that” (Loftus 2013). Students and institutions of today have much more resources at their disposal to make a transition from the traditional classroom teaching method to a method that gives the students the control over what is studied, when, and how thus shifting the onus of learning in the students hands. LMSs have made course material more accessible and portable. Students of today can, for instance with their mobile devices, view and, download material, and engage in group discussions at their leisure as opposed to students from the previous decade. M-learning “relies on wireless communication that can be accessed every time and everywhere” (Fabito 2017: 220).

A study by Hung, Lam, Wong and Chan (2015), conducted in April 2015, aimed to assess the usage experience of a LMS before and after the use of a mobile application. The purpose of the study was to provide an example for future development and design of m-learning for HEIs. The LMS components that were examined included the server architecture and functionality of the mobile application (the main page, course content browser, forum, chat room, quizzes, event reminder and messaging). The mobile application (HKU SPACE SOUL) was launched in September 2014 and available on the Google Play Store and Apple App Store. All students, educators and administrative staff that belonged to the HKUSPACE could install the application and access the LMS. There was no need to gather information from the users because the access and functions used by the user was recorded on the server. This data was then used to gather statistics on the use of the LMS. The outcome was that “the total number of access to the LMS increased while the number of access from traditional web browser decreased. It indicates users are shifting to use the mobile application instead of using mobile web browser” (Hung *et al.* 2015: 172). It was further highlighted that “in-depth qualitative analysis of users’ experiences are required for understanding how new educational technologies impact teaching and learning” (Hung *et al.* 2015: 172). This study included qualitative questions to understand the impact of LMS adoption on teaching and learning.

2.3.4.1.3 Challenges with m-learning

Yousafzai, Chang, Gani, and Noor (2016) examined the properties and developments in m-learning and the resulted strengths and weaknesses of the medium. “The intensive penetration of smart mobile devices and mobile applications has fuelled a new wave of demand for mobile services, such as mobile learning, which introduces the wireless and ubiquitous system of learning. With the assistance of such systems, smartphone users can use the educational material on their device to learn” (Yousafzai *et al*. 2016). Yousafzai *et al.* (2016) discusses the popularity that new communication medium opens up new avenues for the propagation of educational information and mobile devices have the advantage of facilitating on-the-go learning. They explain that the introduction of any learning platform comes with its own challenges during its integration and development. Multiple facets of reality feed into the complexities of education via the medium and questions arise concerning the trade-off between face to face interactions and physical contents, and versatility. The issue of fully developed versus in development also arises. When the education system is prepared to implement a system versus the rush to implement a system of untapped potential.

> *“This overwhelming thriving of mobile media gives rise to multifold technical challenges. These problems include (i) the difficulty in sustaining the satisfactory quality of experience (QoE) or QoL over inherently unreliable wireless links and (ii) the tendency of large simultaneous delivery of media contents tends to swamp existing mobile network infrastructure” (Yousafzai et al. 2016).*

2.3.4.2 Cloud Concept

2.3.4.2.1 Concerns over the Cloud concept

The “main benefits as an e-learner are that you have considerable freedom of: place; pace; time” (Clarke 2008). Unfortunately SA students have only now started to experience these benefits. The learner is free to study anywhere, anytime and at his or her own pace. Another “new development is storing information not locally on the device or syncing it to a personal computer but instead to servers hosted on the Internet, also known as the cloud” (Quinn 2012). Certain SA institutions have recently started to use the cloud concept to store information. Cloud allows access to the same information from any device, any place and at any time without concerns over storage

space. There are however, concerns over “security of information and data loss” (Quinn 2012). There will unfortunately always be the possibility of hacking and data loss no matter how stringent controls are implemented. People have become smarter and more knowledgeable on how to breach security. Despite these concerns individuals still choose the use of the cloud. Poorer communities, although they generally have access to mobile devices, are faced with other challenges. The cloud concept has addressed some of these challenges to mitigate rural e-learning sustainability. It was found that the “promise of cloud computing are huge, fascinating and cost effective that ensures the delivery of stable, high performance, Return On Investment (ROI), less commercial and operational risk computing application and implementation as against on-site alternative” (Odunaike, Olugbara and Ojo 2012). These benefits are still to be seen at SA HEIs. The possibility of using Cloud technology to host the LMS exists for HEI that may have hardware and other restrictions.

2.3.4.2.2 Cloud standards, policies and procedures

A number of initiatives have come into being to help take advantage of the cloud. Although standards for cloud computing exist there is a lot of diversity between them and many of those are built as a complex structure of policies, procedures, and parameters. Sandhu and Chana (2013) conducted a survey of cloud standardisation initiatives with aims to simplify and homogenise the standards for cloud computing, and reviews the existing standards across multiple major governments and businesses. “A systematic and comprehensive survey is conducted for finding current standard initiatives by different Standard Development Organizations (SDO), Technical Forums and Government Organizations” (Sandhu and Chana 2013: 351). The survey reviewed 31 cloud standards and provided recommendations based on identified shortcomings. The study attempted to provide guidance to the unification of cloud standards on a global level and determined that “Proper coordination is required among different organizations and bodies so that work already done does not duplicate and organization focuses on standardization gaps” (Sandhu and Chana 2013: 361).

Disaster recovery policies and procedures in the IT field is a necessity. Togawa and Kanenishi (2013) built a framework for recovery after a disaster for private cloud technology (earthquake and tsunami disaster) in an e-learning environment to protect their education assistance programs, namely the LMS systems and learning data, to prevent “lost sustainability for educational activity” (Togawa and Kanenishi 2013: 4104). Eastern Japan experienced an earthquake on 11th March 2011. The east coast of Japan, was as a result of the earthquake, hit by a tsunami causing severe damage. It is predicted that the Nankai earthquake reoccurs and will occur again in 30 years with a probability rate of 70-80 percent. In order to protect the universities in the western Japan the researchers “built a framework of disaster recovery such as against earthquake and tsunami disaster for e-learning environment[s]” (Togawa and Kanenishi 2013: 4104). Course material is sometimes shared over a consortium of universities. The researchers built this framework that will allow one organisations e-learning environment to run on another organisations environment in the event of a disaster, which prevents loss of e-learning systems and learning history. The policies and procedures theme for this study was included to determine if these documents exist.

2.3.4.2.3 Cloud Learning Management System

Yahfizham, Purwani, Rukun and Krismadinata (2017: 205) state that “there are many Cloud Learning Management System (CLMS) based on Software as a Service (SaaS) available and offered for free in the market. However selecting the one that fit to purpose for educational institution or educators are still challenging”. A qualitative analysis mapping out criteria for use was carried out in a study to review and analytically compare six CLMS based on SaaS. The six were Collaborize Classroom, CourseSites, Ecto, Edmodo, GoConqr and Google Classroom. The results mapped out the popularities, features and advantages or disadvantages per CLMS. The criteria was as follows: the LMS should be free, online access via the Internet, SaaS with cloud computing technology, single user and single sign on technology that allowed network users one account only, cloud hosted server with data storage and installation processes, a platform-free operating system for live use anywhere and anytime, vendor responsibility over care and security of the system. “CLMS based on SaaS, in

the future will grow very rapidly. Enthusiastic educational institutions to use and utilize CLMS based on SaaS will also increase. In particular for educators, it will further increase the ability literacy of information and communication technology of 21st century" (Yahfizham *et al.* 2017: 208). Yahfizham *et al.* (2017: 208) conclude that "to determine the best among …depends on what you need". (Yahfizham *et al.* 2017: 208) explain that "CLMS based on SaaS has to be tailored to the needs of individual or personal learners, educators or educational institution pending on the curriculum, content and course characteristics".

2.3.4.2.4 Cloud services in developing countries

Almazroi, Shen, Teoh and Babar (2013) looked at the factors that influence students' intention to use cloud services in a developing country (Saudi Arabia). TAM 3 is a

> *"Recent and comprehensive model that describes individual behaviours regarding the adoption and use of information technologies. Although several prior studies used the original TAM and its extensions to study the issue from other perspectives TAM 3 has never been adopted by any existing empirical study to investigate the factors influencing the adoption of cloud services by university students in developing countries" (Almazroi et al. 2013: 71).*

A case study "was conducted across two universities and a survey questionnaire modified from Technology Acceptance Model 3 (TAM 3) was administered to 527 students" (Almazroi *et al.* 2013: 71). Almazroi *et al.* (2013: 71) explain that "the users of cloud services can access computing resources anywhere, anytime and using any device. Currently, interest in cloud computing is rapidly increasing as a result of its applications in fields of information systems and computer science". They go on to state that it has "tremendous benefits including cost savings with increased efficiency, portability, and security" (Almazroi *et al.* 2013: 71). Almazroi *et al.* (2013: 71) advocate that "cloud computing services have been widely adopted by higher education institutions across developed countries to make teaching, learning, and research easier without the need to acquire and maintain hardware and software". "The adoption of cloud services by higher education institutions in developing countries is very low, and there is a lack of empirical studies that examine the factor influencing the adoption of cloud services by university students in developing countries" (Almazroi *et al.* 2013: 71). The results from this study showed that the PU and PEOU are the driving factors of students behavioural intention to use cloud computing

services. This implies that TAM can successfully be used in many technology based environments.

A study by Gangwar, Date and Ramaswamy (2015) used and integrated TAM-TOE framework to identify the external factors (relative advantage, compatibility, complexity, organizational readiness, training and education, and top management commitment) affecting Cloud computing adoption in organisations. A survey was conducted using a questionnaire to gather empirical data from a list of 1000 random organisations, obtained from the Bombay Chamber of Commerce and the Industry of India that implemented Cloud technology. Screening questions were used to identify 433 eligible organisations. The variables identified were used from literature. The two sections of the questionnaire obtained information about the company's profile and the adoption variables. A 5-point Likert scale was adopted. Two rounds of pre-testing of the questionnaire was done, first by academic researchers and then by known IT experts, to ensure that the items were understood. Other responses were gained from top and middle level IT professionals. Purposeful sampling was used. Email and telephone was used to contact individuals to find out if they knew of Cloud computing. If yes, then the next step was to find out if they are willing to adopt Cloud technology or if they are in the process of adopting Cloud technology. Once this was determined, an appointment was made to collect data via personal visits and completion of the questionnaire. Other responses were gained via email. Three hundred and thirty responses were received of which 280 were valid for the study. Sample characteristics, and reliability and confirmatory factor analysis was used. The result of the study was an extension of the TAM models constructs PEOU and PU as per the external variables that were significant. Empirical tests "show that perceived usefulness, perceived ease of use, relative advantage, compatibility, complexity, organizational readiness, training and education, top management commitment, competitive pressure and trading partner support are important determinants for cloud computing adoption in organizations" (Gangwar, Date and Ramaswamy 2015: 123). This study tested if training and development in a LMS environment affects PEOU.

In another study by Gangwar and Date (2016) security, availability and compliance-related challenges in cloud computing was assessed to mitigate risks in cloud computing. PEOU and PU mediated the intention of adoption of cloud technology, in

organisations. Information from 280 organisations in information technology, manufacturing and finance sectors in India, was gathered using a questionnaire. Literature and adoption theories and models were used to design the questionnaire. A five-point multi-item Likert-type scale was used for each item. Company profile data was obtained from the first part of the questionnaire and the second part gathered information on Cloud computing. Exploratory and confirmatory factor analysis was used. A model was proposed and structural equation modelling (SEM), using AMOS 20.0 was used to test the model. “Risk as well as availability and support are found to be significant on PEOU. In addition, threat, risk, vulnerability and compliance are found to be significant on PU. The model can be used as a guideline to ensure a positive outcome of the cloud computing adoption in organizations” (Gangwar and Date 2016: 886). The pre-test of this study was similar to the previous study mentioned, to ensure that respondents understood the items. A total of 301 organisations, provided by Bombay Chamber of Commerce and Industry of India, participated in the study and 281 responses were valid and used in the analysis. Purposive sampling method (a non-probability sampling technique) was used based on respondents knowledge. From the 1000 organisations, 433 were eligible, 300 responses gathered, and 280 valid. Individuals working in the IT enabled service (ITeS), manufacturing, and finance were chosen because the probability of adoption was higher with these sectors. The outcome of the study was that,

> *“PU, PEOU, threat, risk, vulnerability, availability and support and compliance are important determinants for cloud computing adoption in organizations. Though cloud computing makes organization economically effective, the results of the study show the importance of addressing security standards and cloud computing service provider-related issues before sensitive and regulated data move into the public cloud” (Gangwar and Date 2016: 901).*

The conclusion is that important issues in cloud computing adoption is to have a secure identity, information and infrastructure model e.g. strong authentication, delegated authorisation, key management for encrypted data, data loss protection, service-level assurances and regulatory reporting. The study allows organisations to consider “effect concerned areas so that they can take effective course of actions during cloud computing adoption” (Gangwar and Date 2016: 902).

2.3.4.3 Educational Data Mining

2.3.4.3.1 Educational data mining and Moodle data

Bee (2017) emphases that Moodle has the ability to record user experiences, which can be later, analysed to provide solutions to meet pedagogical requirements.

> *"Educational Data Mining (EDM) is an emerging discipline to discover hidden knowledge and improve the quality of the whole educational system. EDM can be applied to discover important information from the huge datasets to automate the decision making process of students, learners, academicians, and institutors" (Bee 2017: 735).*

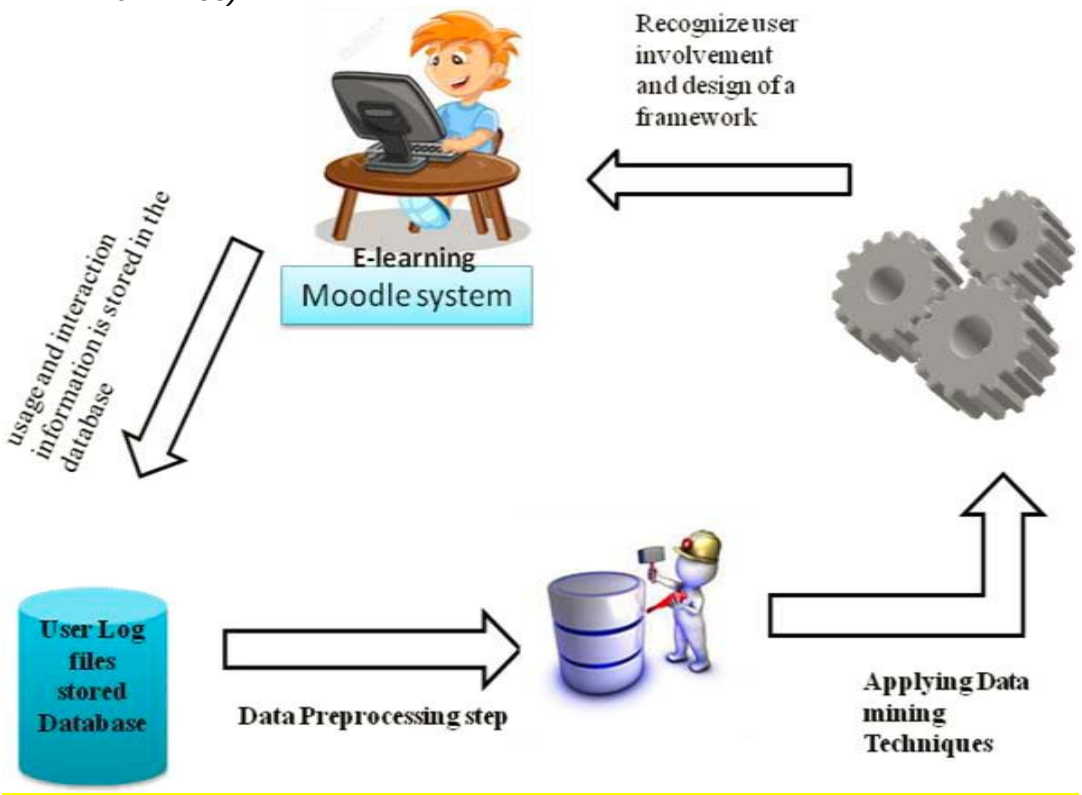

Figure 2.2 Mining Moodle Data for predicting interesting knowledge (Bee 2017: 736)

This is a new technique with not much research in the field. Data mining is a technique used to extract and analyse data from educational systems like LMSs, which can be used to improve e-learning systems. Bee (2017) looked at how the Moodle LMS supports EDM. Figure 2.2 shows the process to follow when mining Moodle data. Log files keep a record of the student's interaction with the Moodle system and mining techniques are used to identify patterns in the interaction. Moodle log files store information on every click the student makes for learning purposes. It also provides a

built-in log viewing system. The instructors can use this information to determine which students where active and inactive in the course, what was done, when it was done, duration on each activity and so on. Data pre-processing is the method used to clean, reduce or summarise and transform data into a format appropriate for EDM. Data mining techniques is the main component and integral part to building summarised models that supports areas of interest to the students. Techniques like classification, clustering, regression and association rule mining can be used to identify patterns in data. The user experience on the Moodle system could be used to design a framework to develop the learning environment. Converting log data into information or knowledge consists of data cleaning (detecting data inconsistencies), integration (combining data from multiple sources to form a single data view), selection (analysing relevant data), and transformation (consolidation for mining). OSS tools, like the Rapid Miner tool, provide data mining algorithms to analyse and evaluate the students' performance. The Rapid Miner toolset "is a powerful data mining tool for rapidly building predictive models. This all-in-one tool features hundreds of data preparation and machine learning algorithms to support all your data mining projects" (Rapidminer 2019). It is hoped that this study promotes PEOU of the LMS which could increase the use of the software and open avenues for EDM at this HEI.

A 2012-2013 case study by Cerezo *et al.* (2016) at a state university in Northern Spain, used EDM to extract Moodle 2.0 logs of different groups of students with similar behaviour and to match them to levels of achievement. Logs from an eleven week course, of a third year mandatory subject, eTraining for Autonomus Learning, of a psychology degree qualification were used from 140 enrolled undergraduate university students. Students had to participate in a program, consisting of 11 different units delivered to them on a weekly basis, outside of teaching hours. The assignment was to comprehend the theory, put the theory into practise, and to use a forum to share information on the topic for the week. Every unit required approximately 2 - 2.5 hours of students' effort per week. The LMS logs were analysed from 76 automatically stored variables on the LMS application. Twelve log actions were used to calculate 6 variables to represent student's performance. A cluster analysis was run using the expectation-maximisation algorithm and then a k-means algorithm was used as a confirmatory method. Thereafter ANOVAs were run to identify differences between inter-clusters and validity of the clusters. The results from this study revealed that

variable time tasks are related to achievement and for variable days hand in could determine which group of students are procrastinators which in turn impact achievement results. For the variable forums, the analysis identified which groups of students where socially focused, and in favour of collaborative learning, and which group of students where individually focused. “LMS are efficient tools to track a large amount of student behavioural data through log files” (Cerezo *et al.* 2016: 52). The adoption and acceptance of this new-found teaching aid is dependent on the educator’s perceptions and their “attitude is one of the most critical factors that can entice students to interact actively on an e-learning system” (Cerezo *et al.* 2016). It is not just the students that need to be enticed but the educators as well. These perceptions encapsulate areas of awareness, institutional support, cost, training and development, time, technology skill level, the nature of subject content, ease of use and software user friendliness. This study used most of these factors to determine the effect on PEOU.

2.3.4.4 Massive Open Online Courses and Open Source Software

Massive Open Online Courses (MOOCs) have introduced another tsunami in education. “MOOCs would be helpful to people from the ages of 22 to 102, international students and smart retired people. Students may be able to enrol in a set of MOOCs and emerge with something that would serve almost the same function as a traditional diploma” (Lewin 2012). However others are less enthusiastic about their accessibility: “Although self-directed learning and peer mentoring have instructional benefits when part of a well-designed curriculum, most MOOCs (especially in STEM areas) are designed in a way that skews toward autodidacts and more advanced learners” (Mazoue 2013: 2). MOOCs has covered the science, technology, engineering, and mathematics (STEM) disciplines and “emerged as a powerful contender for the next new education technology” (Daniel, Scott, Armando, Celine, Mitchell and Elizabeth 2013: 2395).

“Without exception, MOOC has developed quickly and attracted millions of learners since it came to China in 2011. Nowadays, the number of China’s MOOC learners have ranked at 4th place in the world, after the U.S. Brazil and India” (Shi and Yu 2016). Shi and Yu (2016) looked at the nature of China’s MOOC in order to understand

its particular successes and innovations that facilitated such good results. The success of the MOOC in China has been attributed to three methods of implementation namely the integration of prominent external courses, the development of their own MOOC platforms, and the establishment of MOOC alliances as identified by Shi and Yu (2016). China has become a participant of a number of prominent MOOCs such as edX and coursera which have allowed it to expand the international content offered to its citizens and the national content offered to the rest of the world. The success of course participation has spurred the efforts of China in the creation of its own MOOC platforms by local institutions. There are about 10 MOOC platforms created by China that vary in purpose and scope. Shi and Yu (2016) identifies these platform types as "Institution-based platforms, a platform affiliated to the Open University of China (OUC), the joint platforms by University and enterprise, and Enterprise independent or cooperative platforms". These platforms are specialised to cater for the various needs and requirements of both the institutions and individuals. Chinas next step in the inclusion of MOOCs to their educational infrastructure was the creation of their MOOC alliances. These alliances help overcome the technology infrastructure challenges that alone institutions might otherwise not be able to overcome and consolidate information resources to open up possibilities for their clients. "They collect domestic and foreign open course resources from world-class universities" (Shi and Yu 2016). China has not only developed its MOOC systems but also the policies that support them. The institutions affiliated with the China's Central Government has implemented policies to ensure further success for the initiatives. "The MOE has issued relevant favourable policies to assure the development of MOOC" (Shi and Yu 2016). The first layer of the proposed pedagogical framework of this study suggests that policies need to be in place when adopting an LMS.

"These policies aid MOOCs by facilitating student credit transfers, mutual recognition of educational information and systems between HEIs, the improvement of MOOC application and management, and the encouragement of HEIs to actively improve the state of MOOCs" (Shi and Yu 2016). China faced some difficulty and foresees other challenges for the success of MOOCs and the longevity of HEIs. The inclusion of these courses into the educational system reduces the need for physical educational institutions which may result in the loss of these institutions both nationally and internationally. There are also issues apparent in the transition from a traditional

educational environment to one based around MOOCs. The MOOC breaks the restrictions of a physically based HEI as it allows for self-study, larger student numbers and the quick transmission of information but comes with its own problems. “There are still lots of unsolvable problems in institution, technology, fund and ideology and so on” (Shi and Yu 2016). Another major issue lies in the validity of the qualifications. Companies within China and internationally need to acknowledge the weight of an MOOC attained qualification. China also faces challenges in standardising and improving the quality of courses in a MOOC as well as decreasing the drop-out rate for these courses. The techniques used by China to make MOOCs a success could be of use to other countries and their own institutions and their difficulties serve as paths for preparation.

This section explains how institutions can use technology to support educational requirements. The relevance to this study is that an LMS is the starting point of such technologies. By getting lecturers to embrace technology and perceive the use of software like the LMS in education positively is a starting point for incorporating other technologies and exploring benefits that other technologies may have to take the delivery of education to a higher level. The proposed framework may result in the adoption of LMS technology to be smooth flowing without having negative beliefs or resistance about technology integration. This section also explains the importance of standards, policies and procedures to ensure a controlled implementation. Similarly, for this study the questionnaire incorporated questions on policies and procedures to determine if LMS documentation existed in this HEI. EDM illustrated how the data from LMS technology integration can be used to analyse statistics on system usage. The relevance to this study is that if the adoption of LMS technology is perceived positively then it opens up the potential to analyse hidden knowledge in the data to help improve education and support decision making.

2.4 Technology Acceptance

“The effect of perceived ease of use has been found to impact intention to use through attitude” (Ajjan and Hartshorne 2008: 74). Changing people’s attitudes towards the use of technology has always been a challenge. Even where technology courses are

offered at institutions which have adopted LMSs, in some cases the educators themselves are learning along with the students. The resistance could to some degree contribute to the underutilisation of the LMS software by lecturers. Each institution has adopted different teaching methods and it is therefore important to educate educators and to "prepare tomorrow's teachers to teach with technology" (Polly *et al.* 2010: 863). Information systems may be valuable to an institution but ensuring computer literacy needs of educators to come first in order to enable the desired attitude to emerge is not easy. "Technology acceptance in education plays a direct role in the successful use of new teaching technologies" (Aypay, Çelik, Aypay, and Sever 2012: 1). When an individual uses an information system voluntarily, the chances are greater that their attitude and perceptions will be positive. Therefore, a factor to consider towards PEOU is the voluntary use of an information system. Apart from perceptions, the acceptance of technology in HEIs has often failed due to a number of challenges. "These challenges range from technological, organisational and pedagogical challenges" (Tarus, Gichoya and Muumbo 2015: 121). Despite institutions attempts to simplify the collaboration between educators and learners within a user-friendly system there still appears to be some way to go before general acceptance are achieved and the challenges are overcome.

Elsaadani (2013) initiated a study that analysed the relationship between age and the attitude of lecturing staff toward ICT. The study was performed via the dispersion of a questionnaire amongst 500 full-time faculty from various Egyptian HEIs, of which 412 were returned and used as the sample size. "Each item in the questionnaire has an accompanying 6-point Likert-type scale ranging from no (never) to yes (always)" (Elsaadani 2013: 218). The study was followed by a smaller pilot study to validate the results of the initial one. The study aimed to provide its audience with valuable information to facilitate the planning, development and implementation of ICT's in a HEI. The study began with the position that ICT is a fundamental requirement for the provision of "High Quality Education" Oustz and Palombo (2004) via Elsaadani (2013) and corroborated its findings with the naming of previous studies of the same nature that arrived at similar conclusions. The findings of the study showed that faculty between the age of 18 – 24, as well as younger faculty with less than 10 years of work experience, had a higher rate of ICT integration than their more senior peers. The study also discovered that "approximately 25% of the respondent faculty population is

not actively participating in the innovation" (Elsaadani 2013: 217). The study mentioned the results of other studies that found the inverse to be true between two close age brackets

> *"Some developed nations revealed narrow gaps across age groups in their attitude towards ICT. For example Luchetta (2000) found that elder teaching staff members are exhibiting better attitude towards ICT than in the former year's staff members, but this narrow gap across age groups in attitude towards ICT is not a global trend" (Elsaadani 2013: 2017).*

The questionnaire tested the participant in 6 parts: the attitude toward ICT, measuring the use of ICT in teaching, Judgement about ICT, Professional development of faculty staff, questions on the support services for ICT, and the barriers to adopting and using ICT. The literature reviewed in the study re-affirmed that ICT in HEIs drastically changed the manner in which knowledge was transmitted. It has a positive effect on the outcome of teaching using it as the medium, additionally, "it was found that the performance of the students in rich technological environments experienced highly positive effects in all subject areas consistently" (Elsaadani 2013: 221). The questionnaire results concluded that age is indeed an important factor in the acceptance of ICT and that an increase in the age generally exhibits an inversely proportional relationship to the acceptance of technology. This study reinforced popular notions and provided a guideline as to where HEIs should focus their efforts when it comes to promoting the positive aspects and potential value of the various forms of ICT.

While a lot of research has been conducted into technology-based education, research into the success or challenges of its implementation is still far behind in third world and developing countries, including SA. "As technology becomes a critical part of the 21st century classroom, a teacher's decision to integrate technology into the learning process is no longer a personal choice" (Jared 2015). Jared (2015) goes on to state that "technology changes the roles of teacher and students: The traditional role of teacher as dispenser or information is challenged, and the teacher's new role is that of a guide: to challenge students' thinking and encourage reflection in the learning process" (Jared 2015). According to an e-learning Africa Report published in 2013, "respondents were asked what technologies they make use of every day to support learning in their organisational contexts. 83% of respondents said they use laptops to

support learning, followed by mobile phones (71%) and stand-alone PCs (67%). “ (Isaacs 2013: 13).

“Teachers in technology-rich schools continue to use technology in ways that support their already existing teacher-centered instructional practices” (Palaka and Wallsb 2009: 417) by means of tools to aid teaching, LMSs, the use of the internet and so on. Overall it is significant that research has found that educators still use technology most frequently for management and administrative purposes and that its use to support student-centeredness in teaching and learning is still erratic - even amongst those that work at institutions which are technology-rich and which hold student-centred beliefs. Technology is seen as a major component of educational reform and considerable sums of money are spent on it in nearly every institution world-wide. Numerous studies have also been conducted to better understand why some educators use technology and others do not. Apart from the educators’ beliefs and dispositions, educators particularly in the STEM disciplines are experiencing challenges in incorporating technology into their curriculum.

“Personalising learning is about educational equity, just like ‘bring your own device’ (BYOD) is about equipping all students with a device to support learning” (Ng. 2015). Students understand how technology can transform their learning and are looking to personalise their learning by using mobile devices. These technologies are being used to collaborate, remind, take photographs (for instance of science labs) organise coursework and university assignments, etc. for later review. Mobile devices, such as tablets and smartphones with internet accessibility, are significant in the drive towards personalised blended learning. New ways are also being explored to leverage technology as a means to decrease costs or increase revenue. Now that educators have become “mobilists”, they appreciate how these devices, together with internet accessibility, can change learning. However, changing educator practice is still a critical challenge. “Educators are able to set up discussion forums on learning management systems or on blog sites, where learning becomes more transparent and can occur on a continuous basis” (Ng 2015). These forums help educators understand and come to accept the usefulness of LMSs, and ultimately improve their use of it.

2.4.1 Resistance to change

Resistance is human behaviour that has been experienced for a long while when change is introduced. Broadbent (2002) states that by introducing e-learning “you will probably be fostering substantive change. Re-jigging an organization for e-learning changes the way learners learn, instructors teach, designers develop and managers manage. It is no wonder you may experience considerable resistance” (Broadbent 2002). Thakur (2015: 182) states “that merely introducing technology to the educational process is not enough. One must ensure technological integration since technology by itself will not lead to change.” It is the way that educators integrate technology in their teaching that will bring about change. “Techno-pedagogical competency is nothing but the ability of the teachers to make use of technology effectively in teaching” (Thakur 2015: 183). As is customary with any change, some resistance to a new medium will be encountered. This resistance could be explained in terms of both lecturers’ and students’ level of readiness and willingness to accept change; their levels of computer literacy and the extent and quality of the training and support that has been provided. Issues involving software user-friendliness, financial limitations, demographics and cultural issues, may also have been partly responsible for the resistance experienced. Another reason for the resistance could be that alternative software is preferred by the educators over the LMS software that has been implemented. Much of this resistance is due to perceptual problems caused by a lack of information communication and ineffective techniques used in the promotion and instruction of e-learning materials. Bullen and Janes (2007) and Croitoru and Dinu (2016) declare that infrastructure and funding is in some cases are a concern. Because of this, the requirements for a change in public perceptions is much greater. There are various frameworks that exist for the successful promotion and execution of e-learning and aim to address the problems in e-learning from a certain angle.

A study performed by Karaseva, Siibak and Pruulmann-Vengerfeldt (2015) detailing the teaching and technology experiences and perceptions of 26 educators in the countries of Latvia and Estonia noted a number of factors that affect an educators ability and willingness to implement technology in their classrooms. The study talks about the development of educators’ perceptions of technology stating that “these beliefs are established during early teaching experiences and they are deeply personal

and hard to affect by persuasion" Karaseva *et al*. (2015). The existence of negative beliefs or perceptions of technology and beliefs promoting the non-inclusion of technology are a major source of resistance to the implementation of technology in the classroom. "A popular perception of technology identified by the study was teachers thinking of technology as a form of reward or entertainment for students" (Karaseva *et al*. 2015: 3). Educators that perceive technology in this way tend not to implement it amongst students in HEIs. Some teaching staff perceive technology to be a tool for procrastination and unproductive behaviour (Karaseva *et al*. 2015: 3) such perceptions may lead to a more hard-line stance favouring traditional techniques. Educators with a lack of experience and familiarity with technology also tend to steer away from their use. Karaseva *et al*. (2015: 10) has mentioned a method by which some educators have overcome that. This method is called "reverse-mentoring" which involves the reliance on students as facilitators of a lecturer's use of technology. Educators making use of reverse-mentoring may be able to improve their technological knowledge and skill-set.

A study on the status of ICT in Zimbabwe was conducted by Sakala and Chigona (2017) and aimed to reveal many points of resistance on the part of lecturers. "Many HEIs have implemented ICTs but the uptake, is low. Gaining insights on user resistance could inform implementation strategies, aimed to improve uptake of ICTs" (Sakala and Chigona 2017). The study sought to provide some insight into the nature of such resistance and offer some advice on how to mitigate it. The study uses two questions as its foundation for enquiry: "What are the forms of resistance behaviours that manifest from lecturers during ICTs implementation in HEIs in Zimbabwe?" and "What are the triggers, underlying these resistance behaviours?" (Sakala and Chigona 2017) They used a diagrammatic model of resistance to aid the study and a 20 senior staff sample, between the ages of 30 and 65 , that was host to 31 interviews.

The format for the interviews followed the employed model but was partially free forming. The use of ICT has been consistently and constantly promoted by the institutions' higher management and as a result has seen an introduction in Zimbabwe's HEIs but the use of the ICT infrastructure by lecturers has been minimal. "The study revealed that power and politics played a role in manifestation of user resistance. It also highlighted that users can resist an IT system if they perceive loss

of power within their settings" (Sakala and Chigona 2017). The study cites several causes of resistance to be "uncertainty, territory invasion, work overload and complexity" (Sakala and Chigona 2017). It also mentions a number of forms of resistance that manifest themselves as a result of environmental conditions and the manner in which ICT is implemented, managed and supported. These forms of resistance were listed as "resentment, undermining, misuse, user grumbling and cynicism" (Sakala and Chigona 2017).

The study highlighted several initial factors that helped produce the less than optimal uptake conditions that exist in Zimbabwe's HEIs at present. The first mentioned was "the inadequacy of resources and proper planning" (Sakala and Chigona 2017) that went into the implementation of ICT. The eagerness of Zimbabwean HEI management to introduce new technologies and systems to its institutions has caused a lack of attention to logistical aspects of their inclusion and brought about issues early on in the system which left a lasting impression amongst the lecturing staff. While the importance of global competency and competitiveness cannot be overstated, the comprehensive planning and preparation that would be required to attain those two states should be just as heavily emphasised.

Sakala and Chigona (2017) went on to discuss another initial factor which was the actual implementation. The way in which it was executed may not have been properly thought out, tying into the planning in the first factor. "No sooner had it been introduced to distance learning mode than it quickly transitioned into the full-time learning mode" (Sakala and Chigona 2017). The premature implementation of the system meant that the issues, potential improvements and customisations, and general effect of the Moodle system being implemented where not properly identified and addressed. The amount of technical support both internal and extended was little which led to many problems in the execution of the implementation with regards to adhering to managements standards and being on time for the completion curfew. The consequence of this was that any issues identified post-implementation would reverberate throughout the entire system as opposed to a small portion of it and the probability, quantity, and severity of resistance would increase which was the case for the Zimbabwean HEIs.

The resulting resistance came in the form of “disinterest, minimal use, refusal to use, pessimism, delegation, withdrawal, avoidance and prioritization” (Sakala and Chigona 2017). The disinterest was expressed as a lack of initiative to learn the new system due to a large existing workload and a lack of interest in current technology in general. Minimal use of the Moodle system was attributed to the perspective of lecturers that they only needed to use what they thought was mandatory for the fulfilment of their duties and neglected to learn or explore beyond those features. Once again, this was attributed to a lack of time on the part of the lecturers due to the state of their lives and workloads. The delegation of tasks associated with Moodle was also identified as a form of resistance and was most common in senior staff. It was attributed to slow learning of the system coupled with the availability of other more capable individuals that they could rely on. It was also expressed that they lacked training in key aspects of Moodle that they were required to make use of. “They posited that no one offered them the Moodle training which they were expected to use in their teaching. In the end, they would delegate their roles to fellow lecturers in the department” (Sakala and Chigona 2017). The delegation of work or offering of assistance, rather than being an aid to the learning system, became a thing of habit for the senior staff. A portion of the lecturers expressed pessimistic perspectives on the Moodle system identified “incidents of doubt, sarcasm, distrust and storytelling by lecturers towards Moodle and its advocates” (Sakala and Chigona 2017).

Lecturers that displayed pessimism were also adamant about the suitability of their current routine and practices and expressed dissatisfaction with the segmentation of communication as opposed to a smaller, more homogeneous range of communication mediums that they’d become accustomed to. The study revealed that most Lecturers refused to make use of the Moodle system favouring other LMSs or using their more familiar current utilities exclusively.

> *“Most lecturers from FacultyD refused to use Moodle entirely with some opting to use it with alternative LMS, e.g., Eliademy or social media platforms. They argued that what mattered most was using technology in teaching and learning and not necessarily Moodle. They also posited that since there were no consequences for non-use, they did not worry about not using Moodle” (Sakala and Chigona 2017).*

One argument posed against Moodle and other forms of ICT was that “uploading notes in advance, resulted in students boycotting lectures because they would all have the

notes” (Sakala and Chigona 2017). Some lecturers opted out of the use of Moodle after using it for some time. Many of these lecturers displayed some will to make use of the system but stopped due to poor implementation and a lack of support systems and personnel. They cited the training afforded to them as non-informative and irregular and that by the end of it the system did not seem suitable for carrying out the activities required of their positions. The study identified avoidance, the use of excuses, as a form of resistance present amongst the Zimbabwean HEI lecturers. Many of the excuses revolved around the request of additional hardware technology such as laptops and desktops, stating that their personal equipment “Lecturers argued that the university should provide desktops and or laptops for use with Moodle, not rely on their personal gadgets” (Sakala and Chigona 2017).

The study mentioned the difference in the treatment of Management and Lecturing staff in terms of the equipment that the HEIs afforded them as another point of contention and avoidance. These excuses have been a point of contention between the staff implementing the LMS and the staff required to make use of it. The prioritisation of work was yet another form of resistance. This type of resistance was related to the workloads and activities that the lecturers faced in comparison to their perceived value of the LMS and other ICT utilities. “Most lecturers prioritized other work activities but not Moodle. Almost all the lecturers complained of heavy teaching workloads and tight deadlines and these took precedence to use of Moodle” (Sakala and Chigona 2017). A lot of the lecturers considered Moodle to be a “Liability”, “Waste of time”, or a hindrance to their academic career in the presence of what they considered more productive and important activities and endeavours. The grouping of behaviours by the study seemed to have a lot of overlap in terms of the themes and reasons behind them. This is understandable because of the less concise methods of data gathering. The study identified a number of triggers of resistance within the organisation such as “management top-down strategies, use of *threats by management, poor communication, national electricity outages, internet and connectivity issues, technophobia, age and attitude*” (Sakala and Chigona 2017). These triggers were segmented into management, infrastructure and personal trigger types in the original study. The implementation of top-down management was expressed to have promoted resistance among the lecturers due to a lack of input or ownership over the utilities that they were expected to use. “It seemed lecturers’ views

were not upheld and there were no wide consultations during Moodle implementation" (Sakala and Chigona 2017).

Some of the consulted faculty also mentioned the use of threats by management with the aim of forcing them to use a system that they were not keen on making use of. The lecturers preferred to have the freedom to choose the systems and tools that they felt worked best for them and did not appreciate what they perceived as an aggressive implementation. The study also cited poor communication through the chain of command as a trigger for resistance as it complicated and did not properly convey their needs, worries and opinions to upper management. "Resistance behaviours manifested when lecturers felt that no one at the top was paying attention to their grievances, whilst they were expected to adopt directives from the top" (Sakala and Chigona 2017).

The study mentioned the existence of environmental or infrastructural triggers such as power outages and internet connectivity, which decreased the reliability and appeal of the technology that they expected to make use of and promoted the use of more basic forms of teaching aids such as textbooks. The awareness of an alternative power supply, reserved for higher levels of management, was mentioned as a possible promoter of resistance. Personal triggers such as technophobia, a condition largely found among the older staff, was noted to be present. The technophobia aspect was due to an inability to adjust to new practices and for fear of failure in making use of it. "It's just technophobia. It's one critical area where people just resist technology. There isn't much we can do though" (Sakala and Chigona 2017).

The natural attitudes of lecturers was another personal trigger for resistance. Both the lecturers and implementers conveyed dissatisfaction with each other's attitudes toward the new systems and each other. An increase in sample size may have improved accuracy and expanded the scope of information attained. The study provided valuable insight into the opinions of lecturers in light of the actions of their management and fellow staff members. The information will prove useful for the future implementations of ICT attempting to use Moodle or any other system. The study makes apparent the need for comprehensive, considerate planning both for the systems to be implemented, and the way in which the HEIs function. The procedures

and policies put into place need to emphasise and incentivise pro-active self-improvement among staff and the organisational culture that is instilled into the workforce should promote the building of a HEIs infrastructure and reputation as opposed to working off of its existing state. If the nature of the individuals prove difficult to change in the organisations current state then the organisation should change in structure until it creates an environment that motivates change in the individual staff. This can only be done by understanding the underlying causes and behaviours of the employees and designing ways to handle and overcome them.

As per the literature above, resistance to change could result in the underutilisation of software. It would therefore make sense for lecturers to be prepared for technological change affecting their environments. Resistance to change could impact a person's perception of the software. This study uses the demographic characteristics of the respondents to determine which categories of respondents are resistant towards the adoption of the LMS software at the DUT.

2.4.2 Institutional and technical support

"Many institutions have coherent, well-developed e-learning strategies, robust and well-funded organizational structures, and high quality e-learning products ranging from individual modules to fully online e-learning programs. But this is not the norm" (Bullen and Janes 2007). Education Technology is a fairly new concept for SA HEIs. This means that many SA HEIs are in most likelihood using e-learning software without understanding how to plan, prepare and support the institution to fully embrace the technology. In the absence of formal or adequate institutional or technical support, educators and students will need to take the initiative to consult with external sources. This can be through their peers or through physical and virtual information. There are a number of sites across the internet that provide assistance when it comes to implementing technology into the classroom and providing technical support for existing international software like BB. Continuous efforts of interaction and communication is key to building a library of support information. Even in the absence of formal institutional support educators are able to interact with each other and come up with solutions and techniques for using the technology available to them.

As discussed above, HEI's could be implementing e-learning software, like a LMS, without planning and preparing the institution to embrace the technology. The relevance to this study is that, poor planning could result in negative PEOU of the LMS. This study therefore proposes a theoretical framework to support HEI to consider the aspects that contribute towards a successful implementation of a LMS, based on the case of DUT academic staff using a LMS.

2.4.3 Training and user development

The study by the Partnership for Higher Education in Africa revealed that "some senior education officials (often the decision-makers) are technologically shy (or technophobic), making it difficult to implement e-learning" (Ngugi, Irungu, Muwonge, Langa, Pederson, Butcher, Hoosen, Moll, Adam, Backhouse, Mhlanga, Kouame, Tolba, Mutti and Eden 2007). Over the years technology and education have become fast moving with IT becoming more prevalent in our homes, and in society, "however, it should not be assumed that all users will automatically possess IT literacy or familiarity with the Internet" (Catherall 2005). This holds true for third world countries like SA where some students come from disadvantaged socio-economic circumstances. In order to take advantage of e-learning requires information and computer literacy "but the ability to take advantage of it requires significant skills" (Clarke 2008). This suggests that all individuals with access to the HEIs LMS will need training. This includes the staff implementing the LMS, support staff, academic staff, academic support staff, and the students. The training provided should be appropriate to the associated responsibility of the individual on the LMS. A study done by Esterhausen *et al*. (2013) from the North-West University, SA, suggested that

> *"The final successes of implementing TEL at higher education institutions (HEIs) are to a great extent in the hands of faculty members. However, in many cases, faculty members require intensive pedagogical, knowledge, and skills training to make a real difference in the deposition of their learners" (Esterhausen et al. 2013: 60).*

Quality and relevant training and user support must be provided to ensure that the educators use the LMS.

The students are the majority of the users on any LMS. Students may be trained using a manual “made available to students during an induction process” (Catherall 2005). Guidelines to students could include downloading, printing and teamwork or discussion forums. Even though guidelines are provided support needs to be provided to resolve any incidents e.g. forgotten passwords, access to new material, training requests, and technical issues for system faults. Support may be provided via a help-desk (telephonic or via email). Apart from technical support, the learner requires support from other learners, family and tutors. “A supportive family can make the difference between success and failure” (Clarke 2008). The support in the traditional face-to-face text book based system is that the educator provides the formal support whilst the family and friends provides the informal support. In the e-learning environment the formal support by the educators are less visible and is more facilitation than delivery of module content. E-learning promotes peer collaboration and modules may be designed to enforce interaction or group-work. “All forms of distance learning, including e-learning suffer from higher levels of drop-out than conventional face-to-face courses” (Clarke 2008). This was possibly because of more responsibility being placed on the learner. “An important aspect that needs to be considered in distance learning is the high percentage of students who drop out after starting their Studies” (Gregori *et al*. 2018) due to the lack of support.

In 2006, an ‘Educational Technology Think Tank for Africa’ was conducted by the Centre for Educational Technology at the University of Cape Town. This was steered by the Partnership for Higher Education in Africa. The mandate was to provide strategies in teaching and learning in nine African countries. This study revealed that “the need for specialised skills is apparent, and the adoption of educational technology could be significantly enhanced by improving the capacity of teachers in adapting learning materials to the electronic media, and by properly acknowledging their new roles of teacher, facilitator and mentor” (Ngugi *et al.* 2007). Ngugi *et al.* (2007) study shows that even though some African HEI have an online module content presence some HEI have fully online qualifications e.g. UNISA. Ngugi *et al.* (2007) suggests that “radical changes are required to the entire tertiary education system in Africa”. Over a decade has passed and only now have some HEI started to explore the use of a LMS.

As suggested above, training provided should be appropriate to the associated responsibility of the individual on the LMS. The relevance to this study is that training and support are critical in sustaining the continued use of the LMS software. The lack of training and support could result in negative PEOU of the LMS software which could result in the lecturers not using the software. It would therefore make sense to plan and incorporate these aspects into the implementation plan of the LMS software. The survey was used to determine if there was awareness of the support provided, in terms of documents and internal support. The case of DUT academics using a LMS highlighted that community of practice interest groups is another way to train and support the use of the LMS. This was considered for the development of the pedagogical framework.

2.5 SA's Higher Education Institutions role in a knowledge society

HEIs are responsible for the education, training and development of skilled individuals thus playing a major role in the growth of both the SA economy and the SA knowledge society. A "knowledge society is a dynamically developing socio-economic system within the modern society" (Karpov 2017: 201). The development of this system, being higher education, depends on education models, technology, science, research and innovation. The SA education department is continuously developing and reworking education teaching models for both schooling and tertiary education. This is done to support "claims that more citizens can be heard in more (effective) ways, ultimately bringing society closer to participatory and democratized knowledge production" (Adams 2014: 657).

Pillai (2017) explains how the SA Department of Science and Technology's National Development Plan and the 10 year innovation plan aims to combat the challenges of poverty, underdevelopment and inequality by pursuing a path geared towards growth, development and prosperity. Pillai (2017) goes on to state that this developmental mandate can be achieved by SA becoming a knowledge-based economy.

> *"This knowledge-based economy rests on four interconnected, interdependent pillars: innovation, economic and institutional infrastructure, information infrastructure and education. This final pillar is crucial to our developmental journey… Delivering quality education is within our power. It will move millions of people out of poverty which will improve families, communities and ultimately our nation" (Pillai 2017).*

Currently technology at HEIs takes the form of the IT infrastructure of the institutions; tools to aid teaching (for instance, presentations, graphics, and scanners); communication and collaboration systems (for example, BB); technology assisted learning (for example, the World Wide Web as a virtual library) and specific technology courses. The successful integration of these technologies at HEIs can only be achieved as the result of many factors working together. One of the most important is the readiness and willingness to accept technology into their everyday classroom practice and to use technology as a tool to improve teaching.

The BRICS rankings are university rankings that rate universities of emerging economies and uses the same performance criteria as the world rankings conducted by Times Higher Education but considers the developing priorities of the universities within Brazil, Russia, India, China and SA. For the 2016 rankings there were 200 universities and for the 2017 rankings 300 universities. SA HEIs were placed in the advanced emerging category. These same universities ranked as follows; University of Cape Town (4), University of the Witwatersrand (8), Stellenbosch University (42) and the University of KwaZulu-Natal (58). Other qualifying SA HEIs included University of Pretoria (74), University of Western Cape (102), University of Johannesburg (141), and University of South Africa (251-300). These rankings show that SAs seven out of eight universities fall within the top half of other similarly challenged economies. This shows potential for SA to progress if their 10 year developmental and innovation plan, that Pillai (2017) discusses, is to succeed.

It would make good sense to keep up with world-wide trends on how to improve the delivery of education. The adoption of a LMS to support e-learning is a step in that direction. It is therefore important to manage the expectations and perceptions of the lecturers with regards to the use of such technologies. This study looks at the factors that influence PEOU of the LMS at DUT.

2.6 Some acknowledged pedagogic benefits and disadvantages

With a lot of current technology in education, the disadvantages are often not a matter of obtaining technology that can perform well, rather it is the implementation of it that is the source of issues. Livingstone (2012) describes the general perception of ICT in Education as a tool for “enhancing learning” and that the addition of ICT facilitating technology is quick, but the changing of curriculum is not. “They are not yet so embedded in the social practices of everyday life as to be taken for granted, with schools proving slower to change their lesson plans than they were to fit computers in the classroom.” (Livingstone 2012: 1). Livingstone (2012: 11) noted that the statistical data supporting or debunking the belief that ICT and educational software was beneficial, was sparse at the time and that the benefits of ICT was dependent on the popularity and agree-ability of the students.

Razika *et al.* (2014) conducted a formal experiment to determine many of the advantages and disadvantages of e-learning. The experiment identified some of the strengths of e-learning technology. It is a “tutorial system, courses structuring and presenting, activities, adequacy between the training content and its objective” (Razika *et al.* 2014). Some of its major educational weak points is a “lack of learning autonomy for learners and bad time management, bureaucratic and technical problems”(Razika *et al.* 2014) and concluded that “training teachers, especially for the collaborative work” (Razika *et al.* 2014) is the primary issue to be addressed. Razika *et al.* (2014) re-iterates on some of the strengths and weakness identified by the studies and experiments preceding their study, which provides more merit to those conclusions.

Hulme and Winstone (2017) notes that while innovation and change within education is vital to maintaining a healthy and productive learning environment, the effect of its implementation is “largely unpredictable” (Hulme and Winstone 2017: 262). “With an educational innovation comes the risk that it might have a negative impact on student progression, attainment, and other important factors such as a students’ confidence or motivation” (Hulme and Winstone 2017: 262). E-learning has been an innovation that has taken us from a largely physical medium of education to a more virtual and mobile method of teaching. This innovation in the educational industry has created series of benefits to take advantage of and problems to overcome.

LMSs provide many benefits in delivering education. A poorly implemented system could result in negative perceptions which could be expressed as disadvantages of the system by the system users. As Livingstone (2012) declares, the general perception of ICT in education is seen as a tool to support learning. The LMS software is an example of such a tool. Razika *et al.* (2014) focuses on collaboration. The relevance to this study is that if the adoption of a LMS is conducted with minimal concerns, the chances of experiencing the benefits that the LMS has to offer is much greater. This could result in more positive perception of the LMS software. The proposed pedagogical framework could guide HEIs to implement a LMS with fewer issues if the items that make up the proposed pedagogical framework is considered prior to implementation.

2.7 Summary

It would be ideal if adopting a LMS in institutions became a calculated policy rather than a choice for academics to adopt at their discretion. On-campus face-to-face learning as opposed to distance learning requires a different strategy. The idea of studying remotely was identified a decade ago using technology to "enable us to study at any university in the world, from home" (Keogh and Fox 2008: 147). Using a LMS to create a managed learning environment is fundamental to start this transformation. "We have allowed our schools to remain in the past, while our children have been born into the future. The result is a mismatch of learner and educator. But it is not the children who are mismatched to the schools; the schools are mismatched to the children" (Strommen and Lincoln 1992: 474). SA HEIs, in comparison with HEIs of third world countries, are not technology rich. They are not effectively preparing the students for the current work-related environments (where tasks involve technology e.g. correspondence via emails, training via the CBT route). This illustrates the need for current transformation into technology-based education. By "capitalizing on the strengths of online learning, we will make education more accessible, more effective and more affordable for more human beings than ever before" (Reif 2013). Future technology development efforts need to focus on integration of technology into the curriculum via student-centered education whereby technology encourages active

participation in the learning process. Future technology research should consider educators' beliefs if change in practice is desired.

A scoping approach was used to provide a broad overview on LMSs and the use of technology to support learning. Empirical studies highlighted topics like the adoption of LMSs in HEIs, benefits and challenges offered by LMSs, and perceptions of LMS users. The studies further highlights how the use of LMSs have influenced the education sector. An overview on SA HEIs rankings relative to first world countries provides a guide as to where SA HEIs need to be in order to keep up with technological trends. A few LMS applications was discussed. The discussions on developing countries adoption of LMSs highlights the gap between developing countries and first world countries with regards to technology integration into pedagogy. This chapter also highlighted how resistance to change and resistance to technology could affect perceptions. The support structure required to ensure successful adoption and continued use of LMS software was discussed. Lastly, SA’s HEIs role in a knowledge society is discussed. From this review it can be seen that it is necessary to implement a tool like a LMS to support e-learning in order to realise the benefits that LMSs offer and to improve the method used to deliver education.

CHAPTER 3 - THEORETICAL UNDERPINNING of RESEARCH

3.1 Introduction

The previous chapter highlighted relevant literature relating to South Africa's Higher Education Institutions (SAs HEIs) in relation to the rest of the world, technology and collaboration for students and educators, technology acceptance in education, and SAs HEIs role in a knowledge society. It further highlighted pedagogical benefits and disadvantages of learning management systems (LMSs) to support education. This chapter discusses technology acceptance models (TAM), frameworks and theories that contributes towards developing a framework to promote a positive attitude towards technology acceptance in education.

The information age requires keeping up with technology and technical methods in order to put institutions at the forefront. Researchers in education technology analyse, criticise, extend and rework models (an example for others to follow) and frameworks (a structure of ideas) so that their revisions can have a positive impact on education technology. "Many models of technology acceptance have been developed over the years, including: the Theory of Reasoned Action (TRA), Technology Acceptance Model (TAM), Motivational Model (MM), Theory of Planned Behavior (TPB), Combined Theory of Planned Behavior/Technology Acceptance Model (CTPB-TAM), Model of PC Utilization (MPCU), Innovation Diffusion Theory (IDT), and the Social Cognitive Theory (SCT). The key dependent variable in all of these models is intention and/or usage" (Oye, Iahad and Rahim 2014: 253).

Any Information Technology (IT) system or application has to align with the requirements of both students and staff but most importantly, it has to appeal to human tendencies. The performance and efficiency of the educational tool must be communicated attractively. Naturally, the intention and attitude towards the use of an attractive product will be more than one that is not attractive. "The TRA and TPB rest on an underlying assumption that the best predictor of a behaviour is intention, which

is determined by attitudes and social normative perceptions regarding the behaviour" (Montano and Kasprzyk 2015). To this end, TAM includes Intention as one of its constructs. "The technology acceptance model is one of the most influential extensions of Ajzen and Fishbein theory of reasoned action (TRA)… TAM replaces many of TRA attitude measures with the two technology acceptance measures ease of use, and usefulness" (Oye, Iahad and Rahim 2012: 252). If an application is perceived as easy to use and useful to day-to-day needs, then the intention to use the application is greater.

TAM and TPB were combined to form Combined Technology Acceptance Model and Theory of Planned Behavior (C-TAM-TPB), which,

> *"Includes perceived usefulness, ease of use, and compatibility as determinants of attitude. Besides perceived usefulness and ease of use, compatibility is also an important factor affecting attitude. Compatibility is defined as the degree to which a new technology fits with the user's existing values, previous experiences, and current needs" (Ho, Hung and Chen 2013: 107).*

Like all products, an IT application needs to appeal to its market and be compatible to the purpose. Empirical support was found for the link between task and technology characteristics and user perceived task-technology fit (TTF). Results showed "TTF and usage together better explained the impact of information technology on individual performance (i.e., user-perceived accomplishment of individual tasks) than usage alone" (Gebauer, Shaw and Gribbins 2006: 260). In this case, the market is the students and staff that are to make use of it (keep in mind that the technological fluency of users vary). The electronic learning (e-learning) application (LMS) implemented has to be created with this in mind. An application for e-learning that is two-fold: one, that focuses on promoting the investment of the user's time and effort and one that provides instructional guidance for its users to familiarise themselves with the technology. Firstly, the application should embody simplicity, visual appeal, speed and non-redundancy and marketability which deals with the promotion or motivation of these properties with the user's needs and wants in mind. "The Motivational Model distinguishes effects of extrinsic and intrinsic motivation in influencing the level of technology acceptance" (Yoo, Han and Huang 2012: 943). Secondly, it should aim to teach and empower users to easily use general and specific functions to achieve tasks using technology. It should also provide them with guidance on how to use these

technologies parallel to each other. This should be a multi-faceted approach to tackling the issues faced by people of all abilities when it comes to integrated systems and e-learning systems. Potential users of a system decide on whether to use or reject a system based on their beliefs about the system. The IDT theory supports this and "includes five significant innovation characteristics: relative advantage, compatibility, complexity, and trialability and observability" (Lee, Hsieh and Hsu 2011: 126). The IDT theory and TAM has some similarities in that the IDT theory's relative advantage construct is similar to the Perceived Usefulness (PU) construct of the TAM and the complexity construct to the Perceived Ease Of Use (PEOU) of the TAM, "although the sign is the opposite" (Lee, Hsieh and Hsu 2011: 126).

SCT is

> *"A theoretical framework, representing bidirectional relationships among an individual's behavior, personal factors, and the environment… In SCT, coping self-efficacy is a key self-regulatory cognition driving the perception or belief in one's capability to manage environmental demands and effectively enact coping behaviors" (Schiavoa, Prinarib, Saitoc, Shojid and CC 2018: 19).*

The environment that the user is in has an effect on the user's behaviour. A pressurised environment could cause a user not to cope with the demands of the environment. The adoption of a LMS in a pressurised environment could relieve some of the pressure by providing structure. Providing structure to the working methods could result in a reduction of pressure and ultimately positive behaviour or attitude towards the use of a LMS. The factors, revealed by this study, that affect PEOU and the proposed theoretical pedagogical framework could assist in promoting an environment with reduced pressure.

The models listed above were combined to explain the relationship between employee's level of technology acceptance and their actual intention to use information technology.

> *"Venkatesh et al. (2003) proposed the Unified Theory for the Acceptance and Use of Technology (UTAUT) by synthesizing the Theory of Reasoned Actions (TRA) (Fishbein & Ajzen, 1975), the Technology Acceptance Model (TAM) (Davis, 1989), TAM 2 (Venkatesh & Davis, 2000), the Motivational Model (MM) (Davis et al., 1992), the Theory of Planned Behavior (TPB) (Ajzen, 1991), the Combined Model of TAM and TBP (C-TAM-TPB), the Model of PC Utilization (MPCU) (Thompson, Higgins, & Howell, 1991), the Social Cognitive Theory (SCT) (Compeau & Higgins, 1995), and*

finally the Innovation Diffusion Theory (IDT) (Moore & Benbasat, 1991)" (Yoo, Han and Huang 2012: 943).

All of these models can measure (1) system quality, (2) service quality, (3) content quality, (4) learner perspective, (5) instructor attitudes, and (6) supportive issues. For the purposes of this study focus is placed on PEOU of the TAM. Although there are many usage models, theories and frameworks, the adoption of these theories and frameworks appears to be underutilised because even though educational institutions have been adopting LMSs "the utilization of such systems is still not within the acceptable levels" (Binyamin and Smith 2014). "TAM has evolved to become a key model in understanding predictors of human behaviour toward potential acceptance or rejection of the technology" (Marangunic and Granic 2015: 81). The means is available, however, the adoption of generally accepted practices requires attention. Although some of these frameworks date back some time, they still appear valid to SA HEIs, because they are endeavoring to move to a fully on-line teaching and learning platform as indicated in Appendix F (e-learning policy at the Durban University of Technology (DUT), Appendix G (e-learning Procedures and Guidelines), Appendix H (Government Gazette ODL Policy) and Appendix I (DHET Distance Education Policy).

3.2 Technology Acceptance Models

The TAM is a model that has evolved from the original TAM (Davis 1989) (Figure 3.1) to the TAM 3 (Venkatesh and Bala 2008) model. There are many extensions and developments to the TAM (Figure 3.6) that extend beyond the TAM 3. "Derived from the psychology-based theory of reasonable action (TRA) and theory of planned behaviour (TPB), TAM has taken a leading role in explaining users' behavior toward technology" (Marangunic and Granic 2015: 81). TAM introduced the PEOU and PU constructs, by replacing certain measures from the TRA model. As shown in Figure 3.1, TAM illustrates measures of PU, PEOU, Attitude, Behavioural Intention (BI) and Actual system use. From the studies below it can be seen that PEOU is determined by the environment and the individuals.

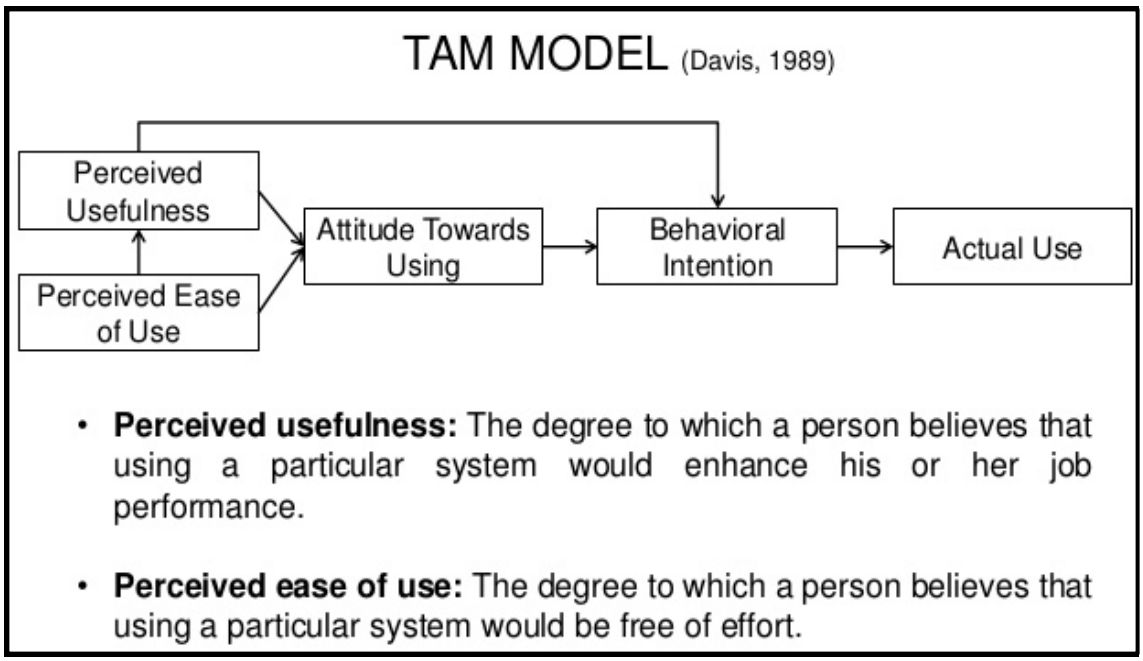

Figure 3.1 Technology Acceptance Model (Davis 1989)

The TAM model (Figure 3.1) progressed through many iterations (developments and extensions). The original TAM model "does not provide an in-depth explanation of how the factor PU is formed or how it can be managed to improve user behaviour towards system usage" (Yousafzai, Foxall and Pallister 2007). Venkatesh and Davis (2000) developed an extension of the Technology Acceptance Model (TAM2) (Figure 3.2) to overcome this drawback.

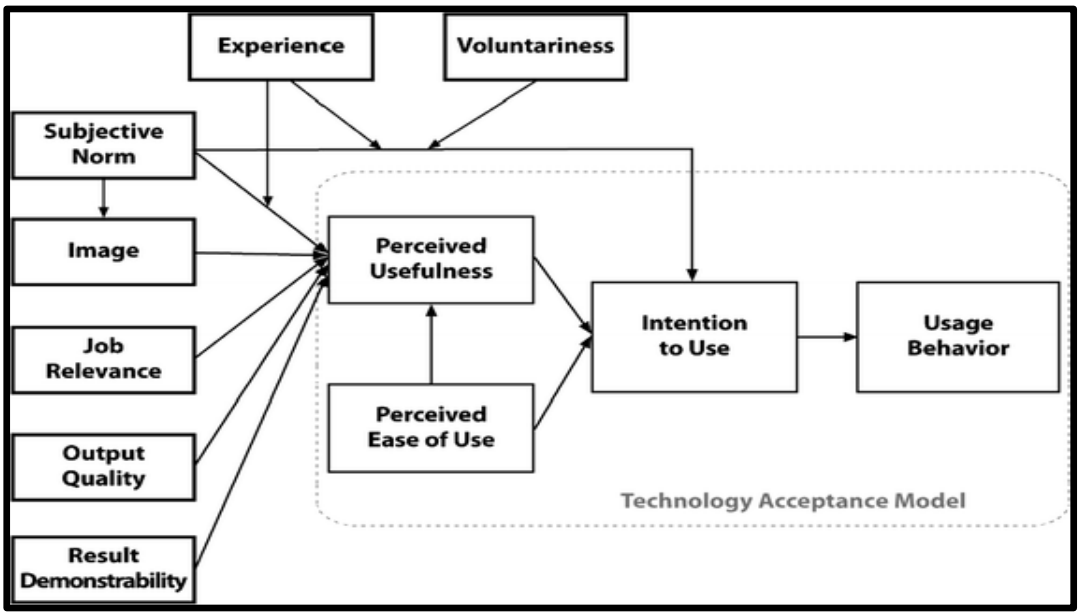

Figure 3.2 Technology Acceptance Model 2, Venkatesh and Davis (2000)

The extension of TAM by Venkatesh and Davis (2000) included additional social or external factors that contribute to perceived usefulness and system usage. The three constructs (PU, PEOU, and BI) of the original TAM model remained. TAM 2 incorporated factors that influence the three constructs (experience, voluntariness, subjective norm, image, job relevance, output quality, and result demonstrability). Figure 3.3 defines the determinants.

Determinants	Definitions
Perceived Ease of Use	The degree to which a person believes that using an IT will be free of effort (Davis et al., 1989).
Subjective Norm	The degree to which an individual perceives that most people who are important to him think he should or should not use the system (Fishbein & Ajzen, 1975; Venkatesh & Davis, 2000).
Image	The degree to which an individual perceives that use of an innovation will enhance his or her status in his or her social system (Moore & Benbasat, 1991).
Job Relevance	The degree to which an individual believes that the target system is applicable to his or her job (Venkatesh & Davis, 2000).
Output Quality	The degree to which an individual believes that the system performs his or her job tasks well (Venkatesh & Davis, 2000).
Result Demonstrability	The degree to which an individual believes that the results of using a system are tangible, observable, and communicable (Moore & Benbasat, 1991).

Figure 3.3 Determinants of perceived usefulness, Venkatesh and Bala (2008)

TAM 2 (Venkatesh and Davis 2000) and the determinants of PEOU (Venkatesh 2000) were combined to form an integrated model of Technology Acceptance Model 3 (TAM 3) illustrated in Figure 3.4. TAM 3 introduces three relationships that were not empirically tested in previous acceptance models. “With increasing hands on experience with a system, a user will have more information on how easy or difficult the system is to use” (Venkatesh and Bala 2008: 281). Venkatesh and Bala (2008: 281) state that “experience will moderate the relationship between i) perceived ease of use and perceived usefulness; ii) computer anxiety and perceived ease of use; and iii) perceived ease of use and behavioural intention”. The focus for this study is PEOU. Venkatesh and Bala (2008) define the determinants of PEOU (Figure 3.5) as being computer self-efficiency, perception of external control, computer anxiety, computer playfulness, perceived enjoyment, and objective usability. One of the objectives of this study is to expand on the TAM 3, as defined by Venkatesh and Bala (2008), by

identifying any other determinants of PEOU relative to the DUT environment. The themes identified in this study was put together from other studies as outlined in Chapter 2. This study determines the effects of technology literacy and aptitude, ease of use (knowledge on how to use a LMS), software user friendliness and functionality as influencing factors on computer self-efficacy. The remaining factors (Internal support, policies and procedures, time and training and development), are new factors tested on TAM 3.

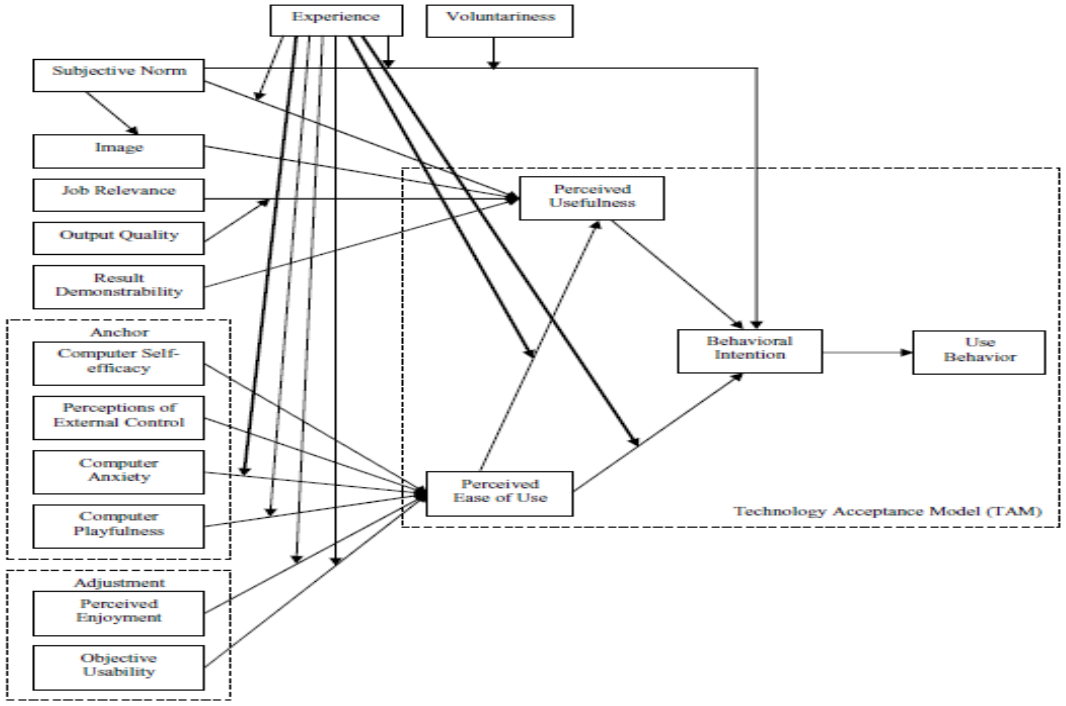

Figure 3.4 Technology Acceptance Model 3, Venkatesh and Bala (2008)

Determinants	Definitions
Computer Self-Efficacy	The degree to which an individual believes that he or she has the ability to perform a specific task/job using the computer (Compeau & Higgins, 1995a, 1995b).
Perception of External Control	The degree to which an individual believes that organizational and technical resources exist to support the use of the system (Venkatesh et al., 2003).
Computer Anxiety	The degree of "an individual's apprehension, or even fear, when she/he is faced with the possibility of using computers" (Venkatesh, 2000, p. 349).
Computer Playfulness	". . .the degree of cognitive spontaneity in microcomputer interactions" (Webster & Martocchio, 1992, p. 204).
Perceived Enjoyment	The extent to which "the activity of using a specific system is perceived to be enjoyable in its own right, aside from any performance consequences resulting from system use" (Venkatesh, 2000, p. 351).
Objective Usability	A "comparison of systems based on the actual level (rather than perceptions) of effort required to completing specific tasks" (Venkatesh, 2000, pp. 350–351).

Figure 3.5 Determinants of perceived ease of use, Venkatesh and Bala (2008)

Author(s)	Category	Main topic
Davis [20]	Development	Development of technology acceptance model (TAM)
Davis [21]	Development	Development of parsimonious TAM
Davis et al. [23]	Development	Introduction of *behavioral intention* as a new variable of the model
Mathieson [58]	Development	Comparison of TAM and TPB models
Davis [22]	Development	Realization of field study of TAM
Barki and Hartwick [8]	Extension	Introduction of the factor *subjective norm* to the model
Igbaria et al. [45]	Extension	Definition of two aspects of *motivation: extrinsic* and *intrinsic*
Taylor and Todd [79]	Extension	Introduction of the factor *self-efficacy* to the model
Chau [14]	Extension	Integration of TAM and personal computer utilization models
Venkatesh and Davis [84]	Development	Consideration of possible introduction of other factors referred to as *external variables*
Agarwal and Prasad [1]	Extension	Introduction of additional belief factor *trialability* to the model
Gefen and Straub [32]	Extension	Introduction of *personality traits* as external variables to the model
Jackson et al. [46]	Extension	Extension of the model to include *situational involvement, intrinsic involvement*, and *argument for change*
Straub et al. [75]	Development	Comparison of the TAM model across different cultures
Dishaw and Strong [27]	Extension	Integration of TAM and task-technology fit (TTF) models
Karahanna et al. [47]	Extension	Introduction of additional belief factor *visibility* to the model
Lucas and Spitler [57]	Extension	Extension of the model to include *social norms, user performance*, and two *control variables*
Venkatesh [82]	Extension	Consideration of role of *intrinsic motivation* as a lever to create favorable user perceptions
Venkatesh [83]	Extension	Identification of the *antecedents* to the *perceived ease of use* variable in the TAM model
Venkatesh and Davis [84]	Development	Development of TAM 2
Venkatesh and Morris [86]	Extension	Introduction of *demographic characteristics* as external variables to the model
Mathieson et al. [59]	Extension	Introduction of the factor *perceived behavioral control* to the model
Plouffe et al. [68]	Extension	Introduction of additional belief factor *result demonstrability* to the model
Brown et al. [9]	Development	Examination of TAM in a mandated use environment
Venkatesh et al. [87]	Development	Formulation and empirical validation of unified model, which integrates elements across eight models of technology acceptance
Lin and Wu [55]	Extension	Introduction of *intra-* and *extra-organizational* factors as causal factors of end user computing perception
Van der Heijden [81]	Development	Identification of differences in user acceptance models for productivity-oriented (or utilitarian) and pleasure-oriented (or hedonic) information systems
Aming and Ziefle [7]	Extension	Introduction of *subjective technical confidence* as moderating variable to the model
Gumussoy et al. [34]	Extension	Introduction of *subjective norms* and *educational level* factors to the model
Schepers and Wetzels [70]	Extension	Moderation of effects of one individual-related factor (*type of respondents*), one technology-related factor (*type of technology*), and one contingent factor (*culture*)
Chow et al. [18]	Extension	Introduction of *computer self-efficacy* construct as external variable to the model
Lee and Lehto [49]	Extension	Introduction of additional belief factor *content richness* to the model

Figure 3.6 Development and Extensions to TAM (Marangunic and Granic 2015)

All the TAM models offer a way to predict whether users will accept and use technology, based on different constructs. It suggests that when users use new technology, certain factors control how, when and if, they will use it. “A key purpose of TAM is to provide a basis for tracing the impact of external variables on internal beliefs, attitudes, and intentions. It suggests that PEOU, and PU are the two most important factors in explaining system use” (Legris, Ingham and Collerette 2003: 192). In addition, TAM suggests that PU “will be influenced by perceived ease of use because, other things being equal, the easier a technology is to use, the more useful it can be” (Venkatesh 2000). TAM has been cited in many empirical studies, discussed later, to show user acceptance of technology in higher education. “TAM evolved into a leading model in explaining and predicting system use” (Marangunic and Granic 2015: 86). According to Davis (1986) the attitude of a user towards using a system is a major determining factor on whether the system is used or not. “Perceived ease of use has a causal effect on perceived usefulness” (Davis 1986: 24).

Venkatesh (2000) used a theoretical model to understand the determinants of system-specific PEOU at three different organisations. It was found that a person’s beliefs are the strongest determinants of system-specific PEOU. The findings point to,

> *“The need for an increased focus on individual difference variables in order to enhance user acceptance and usage, rather than over-emphasizing system-related perceptions and design characteristics as has been done in much prior information systems and human-computer interaction research” (Venkatesh 2000).*

The outcome was that general computer training programs are required since this skill clearly has a strong influence on the acceptance and continued use of systems. “Training can be used to help users develop favourable perceptions of different determinants of perceived usefulness and perceived ease of use” (Venkatesh 2008: 299). While learner perspectives and educators’ attitudes can be linked to PU and PEOU, training can be linked to supportive issues. The implementation of the LMS, on the other hand, links to system quality, service quality and content quality of the IS. Pandey and Pandey (2009) state that some of the earlier benefits that highlight system quality, service quality and content quality, include control over users, providing a secure environment, learner and course centric, shared knowledge, comprehensive access control, and continued contact with former and future students.

There are many reasons or variables that explain why people use a system. “They believe it will help them perform their job better” (Davis 1989: 320). One of these variables is called Perceived Usefulness. Even if a system is believed useful, the user may believe that the system is difficult to use and that the effort required to use a system outweighs the performance benefits. “That is in addition to usefulness, usage is theorized to be influenced by Perceived Ease Of Use” (Davis 1989: 320). “PEOU, in contrast, refers to the degree to which a person believes that using a particular system would be free of effort" (Davis 1989: 320) or that the system will be uncomplicated. Davis (1989: 320) claims that “an application perceived to be easier to use than another is more likely to be accepted by users”. If the system is perceived to be difficult to use then the user may find an alternate method of doing the job instead of using technology. The purpose of the proposed theoretical pedagogical framework is to make the transition from traditional teaching methods to an e-learning environment more controlled which may influence the PEOU on the technology thereby preventing the user from finding alternate methods of doing the job. The themes functionality and ease of use (dependent on skill level of the user) was used in this study to test the effects on PEOU.

Over the years, there have been numerous studies in support of the TAM, TAM 2 and TAM 3 Models. Some studies add constructs to the TAM models as determinants or anchors to the variables PU and PEOU. “The anchors suggested by Venkatesh (2000) are computer self-efficacy, computer anxiety, and computer playfulness, and perceptions of external control (or facilitating conditions)” (Venkatesh 2008: 278). According to Venkatesh (2008) self-efficacy is the user’s beliefs with regards to his or her ability to use a system, external controls relate to organisational resources and support structure to simplify the use of a system and computer playfulness refers to how motivated the user is to use a system. The TAM 2 and the determinants of PEOU was combined to form an integrated TAM 3. “Individuals form perceived ease of use about a specific system by anchoring their perceptions to the different general computer beliefs and later adjusting their perceptions of ease of use based on hands-on experience with the specific system” (Venkatesh 2008: 279). For the purpose of this study, focus is placed on PEOU and the anchors to PEOU in a LMS environment.

One of the objectives of this study is based on the TAM. It is therefore important to understand the model and the iterations the model has gone through in order to understand how to extend the model based on the case of DUT academic staff using a LMS. As explained earlier in this section, TAM explains users' behaviour towards technology. The relevance to this study is to understand what factors affect the PEOU construct of the TAM model regarding the use of LMS software in the DUT environment. The questionnaire was designed using aspects from literature and empirical studies (discussed in Chapter 2) using the TAM models that could identify areas that could impact on PEOU of the TAM relative to the environment in which the software was being used. It is to be seen how a person's beliefs influence PEOU and the amount of effort they perceive is required to use the system.

3.3 Using models and frameworks to identify factors that influence adoption of new technology

TAM has effectively been used in studies on higher education relating to LMSs and empirical studies prove that the constructs effectively measure the users' intention to use technology like LMSs (Goh, Hong and Gunawan 2013; Alharbi and Drew 2014; Binyamin and Smith 2014).

3.3.1 Using TAM for LMS technology

"From the traditional and passive styles of learning to interactive and collaborative learning, higher education nowadays use learning management systems (LMSs) to provide 24/7 accessibility to course materials" (Goh, Hong and Gunawan 2013: 367). Goh, Hong and Gunawan (2013: 367) advocate that "researchers seek to understand the relationship between perceptions about technology (such as PU, PEOU) and usage behaviour of students in adopting technology as a learning tool". The scope of one such study (Goh, Hong and Gunawan 2013) was to determine the actual use of the LMS Moodle by students by exploring the perceptions in using the LMS with regards to PU and PEOU for learning. Hundred and seventy (170) responses were

collected from an online questionnaire to students within a private educational institution that moved from the Backboard (BB) LMS to the Moodle LMS. Google Doc was used to administer the online questionnaire to collect the quantitative and qualitative data. Word of mouth, Facebook and Twitter was used to distribute the questionnaire and emails were used to encourage participation in the questionnaire. The questionnaire comprised of quantitative close-ended questions (multiple –choice and Likert scale items) and open-ended (qualitative) questions. The result was a positive reaction towards PEOU of the Moodle LMS and the respondents agreed that the LMS "is easy to use and useful to help them in learning. However, the results found that there is a lack of interaction with the lecturers and peers in Moodle" (Goh, Hong and Gunawan 2013: 370).

The research reported on in this dissertation, seeks to understand the same, but from the perspective of educators' use of the LMS. It was stated that "TAM is a robust model to assess technology acceptance among teachers and predict the actual use of IT tools in teaching and learning" (Goh, Hong and Gunawan 2013: 368). "Lecturers not only can use the LMS to share lecture notes and learning resources, they can also promote collaboration and interactivity amongst students" (Goh, Hong and Gunawan 2013: 368). It is to be determined whether the educators perceive the LMS as easy to use.

A quantitative study by Alharbi and Drew (2014) modified the TAM model to assist public universities, mainly in Saudi Arabia, and validated the relationship between PEOU, PU, attitude towards usage, and overall impact on BI to use the LMS. External variables (lack of LMS availability, job relevance, and LMS usage experience) were included as possible constructs in the study. A voluntary online survey was used to collect data. The questions in the questionnaire was constructed from literature and from the TAM model constructs, in the context of LMS usage, to ensure validity. A pre-test of the questionnaire was done, by two English speakers, to avoid wording problems and ambiguities. The questionnaire was also available in Arabic due to the native language of the academics at Shaqra University. The back translation method was used so that both versions, English and Arabic, converged. The participants were from different colleges and departments, at Shaqra University. Non-probability convenience sampling was used. The first section of the questionnaire used nominal

scale to gather demographic details (gender, age, teaching experience, academic rank and administration position, academic field, faculty and departmental information, and previous experience with LMS) and the second section used a 7-point Likert scale on TAM constructs. It was distributed to 109 academics with a URL and a choice of language. Sixty-nine responses were received of which 59 were valid. “This study confirms other empirical evidence and findings based on TAM. Further, the study successfully confirms the applicability of TAM in the Arab world, specifically in Saudi Arabia in higher-education settings” (Alharbi and Drew 2014: 153). The results showed that the environment influences the framework, and the lack of access to the LMS had an effect on the relationship between the TAM ease of use and usefulness constructs. Lack of LMS availability does not mean that academics perceive a LMS as difficult to use. Job relevance had a strong relationship with TAM construct PU. Prior experience with LMS usage was also analysed. It was interesting that the “results for both experienced and inexperienced users confirm the original TAM findings. Within this study, *inexperienced* users indicated a higher degree of positivity towards LMS adoption” (Alharbi and Drew 2014: 153).

Another similar study was conducted in Saudi Arabia. The perceptions, acceptance and use of the LMS, by students, at the King Abdulaziz University (KAU) in Saudi Arabia was tested in a study by Binyamin and Smith (2014). The study aimed to understand which factors lead to actual use of the LMS, by analysing the association between the actual use of the LMS by students and 5 external variables (prior experience of LMS, satisfaction, social influence, computer self-efficacy and the educators’ role). The motivation for the research was the limited research about Saudi students LMS use and external factors. The study was aimed at students at the university at different levels and different fields of study. A non-probability convenience sampling technique was employed. Google forms, an online tool, was used to administer questionnaires to collect data. The questionnaire was emailed to the students via a link and was accessible for 3 weeks. Only 31 students showed interest in responding. A decision was then made to distribute the questionnaire manually. A total of 150 responses were received after manual distribution and 142 were used for analysis. Section one gathered information on the students demographics (age, gender, prior experience with LMS, education level, field of study and GPA) whilst

section two involved the TAM constructs and external variables. The 7-point Likert scale rating was used for 38 items that were adapted from literature to ensure reliability and validity. The English and Arabic versions of the questionnaire followed the same process as adopted by Alharbi and Drew (2014). Statistical Package for the Social Sciences version 24.0 (SPSS) was used to draw statistics. The results were that the external variable, students rated educators' role, was the most influential factor on LMS usage, followed by students' satisfaction. Results showed that Saudi students perceive a LMS positively. "Spearman rank correlation test demonstrates that the students' use of LMS is associated with the 5 external variables: prior experience with LMS, satisfaction, social influence, computer self-efficacy and teacher role" (Binyamin and Smith 2014). "The research provides fundamentals for LMS acceptance and usage; therefore, the study can be used during the development stage of LMS to ensure the adoption of the proposed factors" (Binyamin and Smith 2014). The questionnaire for this study included similar demographic variables and adopted a similar rating Likert scale as the two studies mentioned above.

The study by Goh, Hong and Gunawan (2013) was conducted to understand the relationship between perceptions and the use of technology. The relevance to this study is that the research reported on in this dissertation, seeks to understand the same, but from the perspective of educators' use of the LMS. The study by Alharbi and Drew (2014) looked at external factors that affect the constructs in the TAM model. Some of the questions in this study used the LMS availability and LMS usage experience from Alharbi and Drew (2014) study, together with literature, as two areas that could influence PEOU. Alharbi and Drew (2014) also used the two languages as part of the survey, English and Arabic. This idea was adopted for this study. Telephonic translations for the questions were available to participants who did not understand the questions. This resulted in a higher response rate. Furthermore, Alharbi and Drew (2014) used different colleges and departments. This study used a similar approach but instead used all faculties across all departments within the chosen campuses. The design of the questionnaire for this study was based on the study by Alharbi and Drew (2014). The first section was used to gather demographic details and the second section used a Likert scale rating system on themes that could possibly influence the TAM constructs. The results from this study confirms the applicability of TAM in SA

HEI towards PEOU of LMS software. It further showed that the environment does influence the TAM.

3.4 Information Systems Success Model

The Information Systems Success model (Figure 3.7) was published in 1992 by DeLone and McLean (2003: 9) "as a framework and model for measuring the complex dependent variable in IS research". It was as a result of theoretical and empirical research findings in the 1970s and 1980s. The purpose of the model was to combine research on information system success and to provide guidance for other researchers. Over the years research contributions "that apply, validate, challenge and propose enhancements" (DeLone and McLean 2003: 9) to the original model were evaluated and an updated model was presented. Delone and Mclean's Information System Success Model measures technical success, semantic success, and effectiveness success. The changes applied were as a result of research by Shannon Weaver's framework in 1949 and R.O. Mason's extensions in 1978. The model suggests that,

> *"An IS is first created, containing various features, which can be characterized as exhibiting various degrees of system and information quality. Next, users and managers experience these features by using the system and are either satisfied or dissatisfied with the system or its information products" (DeLone and McLean 2003: 11).*

DeLone and McLean (2003) advocate that using the system influences the user in his or her work conduct which collectively impacts the organisation.

> *"The first dimension, user behaviour, based on the generic TAM, includes four factors: Perceived Usefulness (PU), Perceived Ease Of Use (PEOU), intention to use (ITU), and system use (SU)" (Wang and Wang 2009: 763). While TAM is the most widely used model in explaining system usage, the Delone and Mclean "IS success model is one of the most widely used models for evaluating the success/failure of IS implementation" (Wang and Wang 2009: 763).*

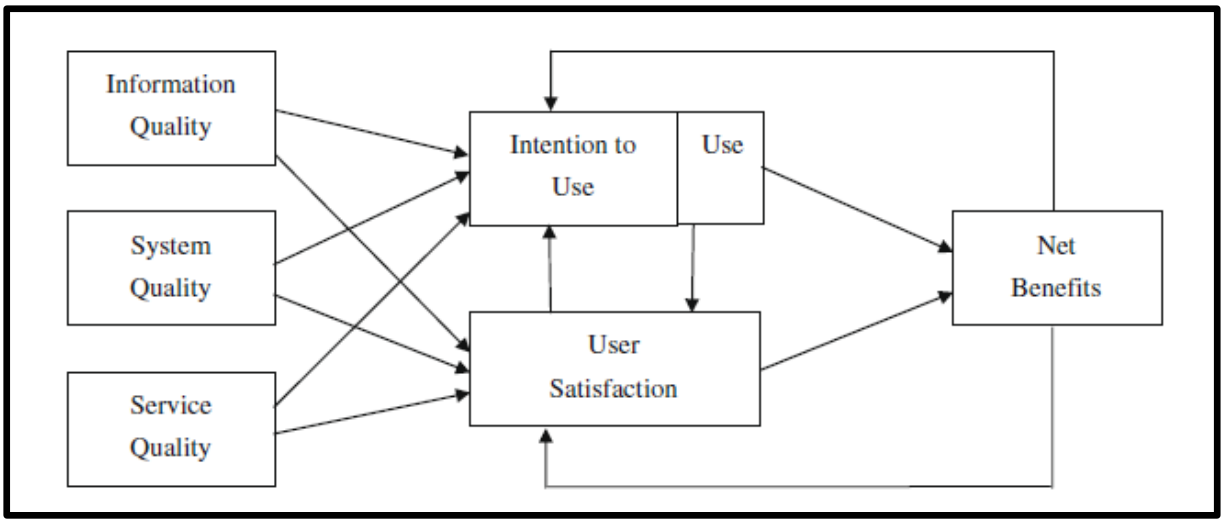

Figure 3.7 D&M Information System Success Model (DeLone and McLean 2003)

Fabito (2017) sought to determine the critical success factors (CSFs), as identified by literature and expressed by both the TAM and the Information Success Model, that affect BI of the students to use mobile learning (m-learning) and to further determine which demographics significantly affect students BI to use m-learning. The CSFs were grouped into the following categories: learner's characteristics, instructor's characteristics, system quality and m-learning environment, institution and service quality, course and information quality, and motivation. The study was conducted at a university in the Philippines. The 46 respondents, from the College of Computer Studies – National University, selected through convenience sampling, were used to test the CSFs. Regression was used to indicate the link between BI to the actual use of m-learning. Questionnaires about e-learning were reconstructed to relate to m-learning. The results showed that the majority of the respondents used a learning management tool with only 2% that did not. The demographics, age (tested by a one-way AVONA) and gender (tested by Chi-square), did not affect the BI, but learners whose mobile capabilities was higher to access material, had a positive link to m-learning. Furthermore, the use of the mobile phone to access the learning management tool had no link on the BI to use m-learning. Those students who did not use their mobile phones to study their courses, resulted in a negative BI to use m-learning compared to those that did. The educator's characteristic, the m-learning environment, course and information quality, and motivation was seen as predictors for the learner's BI to use m-learning.

A qualitative research, by Halonen, Acton, Golden, and Conboy (2009), used the Delone and Mclean success model (2003) as a descriptive tool to describe the success of a virtual learning environment, as perceived by students, from a service perspective at a private institution offering vocational adult schooling. The source of the information was prior research. The study focused on degree qualifications and not individual courses or modules. It applies the Delone and Mclean success model to an entire e-learning environment and discusses how the model was used and developed over time in different environments. The approach used was a case study to help understand the success of the environment. Empirical data was collected from a quantitative questionnaire, consisting of 29 closed questions and three open-ended questions, administered over the web to students of basic or vocational examinations in computing or information systems. The data helped illustrate the use of the environment. The questionnaire also gathered information about the respondent's background which was used to determine if the respondent met the target group criteria. The closed questions adopted Likert's 5 step rating scale. Content analysis (descriptive statistical analysis) was used to analyse the responses. The requirements were that the virtual learning environment be used throughout the day, and must have been accessed in the past 1.5 months. The target group was 64 students of which 25 students responded. A web-based learning platform, using Moodle, was in use for ten years at the institution. E-learning coursework was asynchronous implying that the students worked during the day and studied in the evenings. The conclusions drawn from the study is that the Delone and Mclean's 2003 model "can be used as a descriptive tool when evaluating a virtual learning environment. The six dimensions offer possibilities to explore and describe the environment from several approaches" (Halonen *et al.* 2009). The Delone and Mclean 2003 model was adapted and new measures were added. "Five measures (system quality, service quality, use, user satisfaction and net benefits) were interpreted positive. Information quality was perceived good but more material was desired into the environment" (Halonen *et al.* 2009). The model gave a clear impression of the usability of the virtual learning environment. Despite the positive conclusion, it is questionable if the right questions were asked. Also, respondents were all adult students so it's unclear how the younger generation would have responded to the same questions and the differences in measures because of age. Furthermore, the pedagogic approach adopted by

educators was not in the scope of the study and no discussion was made on technological solutions.

DeLone and McLean (2003) advocate that an information system has many features which demonstrates the quality of the system. Only by using the system can the users experience the features and then decide if they are satified with the system or not. Similarly, this study seeks to determine if users perceive LMS use in HE as a positive enhancement to delivery of education or not. Part of the information system success model by DeLone and McLean (2003) is based on the TAM model. It extends the model to incorporate system use. This study uses the TAM 3 model to determine what external factors contribute to PEOU which ultimately could affect the use of the LMS if perceived negatively. This study identifies these factors and creates a pedagogical framework to ensure that crucial factors are considered when adoption a LMS. If the adoption of the LMS is successful this could result in promoting positve perceptions of ease of use right at the onset. The theory from the IS success model was used to build the pedagogical framework however the success or failure of the LMS implementation was not evaluated and is not in the scope of this study.

The first study discussed, determines which demographics significantly affect usage. Demographics age and gender was used in this study to indicate the influence on PEOU. The study by Halonen *et al.* (2009), applies the Delone and Mclean success model to an e-learning environment. The approach used was a case study. The data helped illustrate the use of the Delone and Mclean success model in different environments. The limitation of the study was that the pedagogic approach adopted by educators was not in the scope of the study. This study however takes into account lecturers and illustrates how the environment at DUT influences the PEOU of the LMS.

3.5 Technological pedagogical content knowledge framework (TPACK)

The pedagogical design framework (TPACK) for e-learning focuses on using IT to overcome the limitations of other educational systems, which in itself, would be the appeal that is supposed to be apparent to users. TPACK is an evolution of the original pedagogical content knowledge (PCK) developed in 1986 by Lee Shulman. The TPCK

framework by Angeli and Valanides (2009) (Figure 3.8) illustrates the areas that overlap to form the TPCK framework. TPACK “is primarily used in the field of education” (Sobel and Grotti 2013: 255) and occasionally in library settings. It makes use of several teaching principles and perspectives to accomplish this task. This framework “is most suitable for technologies that will directly affect large number of individuals” (Sobel and Grotti 2013: 256) like educators and students. The Alignment Principle in educational learning is one of the methods implemented in the framework. It focuses on imposing consistency throughout the learning process, and could theoretically be effective in changing the behavior and attitude of learners and lecturers toward e-learning. “The framework makes use of constructive and social teaching methods to enable the student to perform better and , as a result, increase the reputation of the e-learning technology used” (Meyers and Frietas 2004). Meyers and Frietas (2004) go on to state that “Pedagogical frameworks describe the broad principles through which theory is applied to learning and teaching practice.”

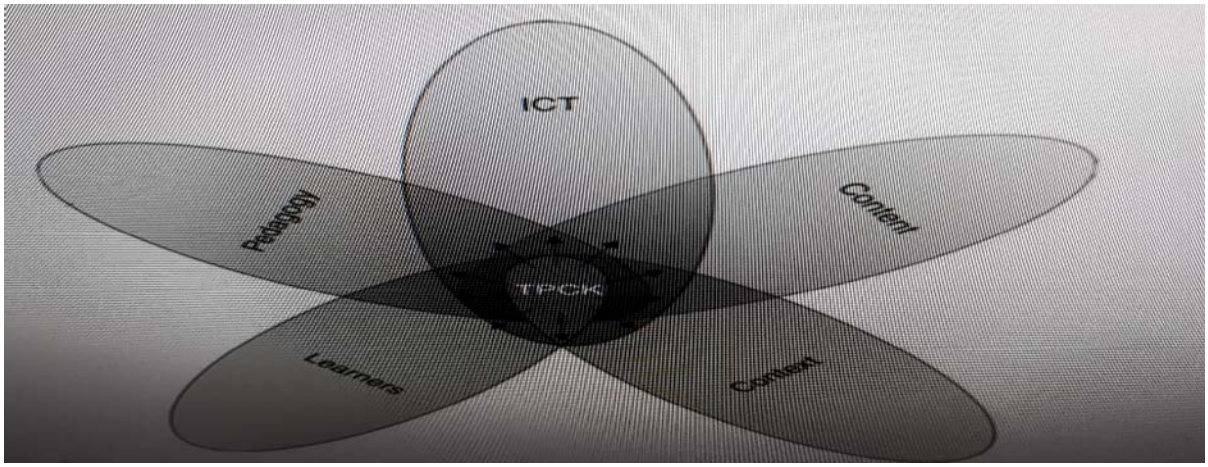

Figure 3.8 TPCK framework by Angeli and Valanides (2009).

The TPACK model allows educators to “pose their own procedural structures to ensure that they are not overwhelming students with technology while still providing opportunities for students to utilize technologies to assist their learning” (Vu, Fredrickson and Moore 2017: 163). The framework in Figure 3.8 shows competencies that educators need to develop to be able to use information and communication technology (ICT) to teach. “Teachers have been increasingly expected to be capable to integrate technology into their instruction for innovative teaching” (Wu 2013). The

pedagogical framework does well to increase the performance of people already making use of Information technology but falls short on its ability to persuade potential and infrequent users (of various age groups and economic denominations) of the benefits of e-learning technology. This is especially true of enduring misconceptions fueling the negative perception and distrust of IT as a means of teaching and organising. These misconceptions are related to the security, stability and simplicity of IT and much of it has little to do with e-learning but, nevertheless, has a cumulative psychological effect that dissuades people from using it.

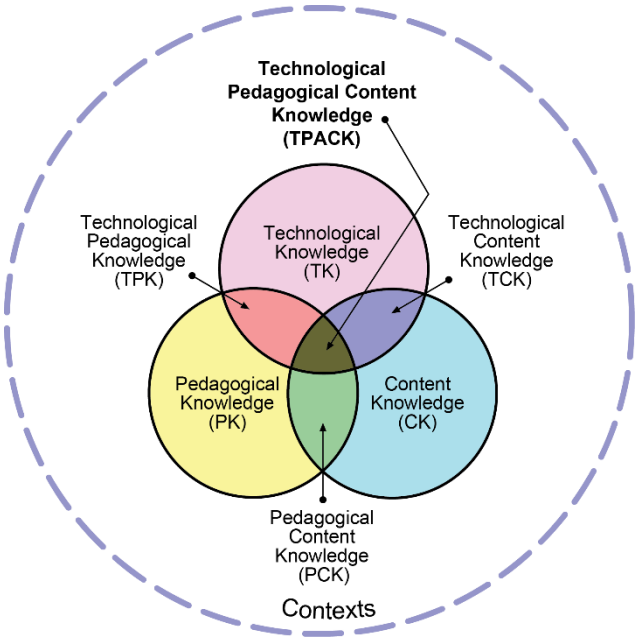

Figure 3.9 The stages of TPACK. Reproduced by permission of the publisher, © 2012 by tpack.org

Figure 3.9 infused the TPACK and the Universal Design Learning (UDL) framework to cater for the needs of all students, including those with special needs. In order for educators to teach students with disabilities and at-risk students, this framework was proposed as a "sound and conceptual framework to aid the development of such teacher knowledge" (Herring, Koehler and P 2016). This blended framework "would enhance the collaboration between general and special education and would increase teacher efficacy to teach diverse and exceptional students" (Herring, Koehler and P 2016).

> *"The term techno-pedagogy refers to using technology to teach. It consists of 3 knowledge areas "namely: content, pedagogy, and technology. Content is the subject matter that is to be taught. Technology encompasses modern technologies such as computer, Internet, digital video and commonplace technologies including overhead projectors, blackboards, and books. Pedagogy describes the collected practices,*

processes, strategies, procedures, and methods of teaching and learning" (Thakur 2015: 183).

"At the core of the TPACK framework, there are three areas of knowledge: CK (ie. Knowledge about the subject matter that is to be learned or taught), PK (ie, knowledge about the processes, practices or methods of teaching and learning and knowledge about educational aims, values and purposes) and technology knowledge (ie, knowledge about more commonplace technologies including overhead projectors, blackboards and modern technologies, such as computers, the Internet, interactive whiteboard" (Wu 2013).

The theoretical pedagogical framework proposed in this study is based on the framework in Figure 3.9. The TK, CK and PK components are incorporated into the last layer of the proposed framework.

Wu (2013) state that "research in which the TPACK framework is explicitly used in exploring teachers' teaching with technology has been flourishing". Wu (2013) conducted an empirical study to systemically review studies published from 2002-2011, that explicitly explore educator's TPACK. The researcher assessed at the status of the TPACK studies, what sample groups were used, what subject domains were used, and what research methods were adopted. The Social Science Citation Index (SSCI) database was used as a source of information or literature in which the keywords "technological pedagogical content knowledge", "TPCK", "TPACK" was used to extract only journal papers. The extracted papers were systemically screened to ensure that they were empirical studies relating to TPACK research. A total of 24 empirical studies were used for the study. The results from the number of papers published "suggest that the TPACK research has received increasing attention from researchers and educators" (Wu 2013). The results from the sample groups imply that the TPACK studies tended to be conducted in teacher education contexts" (Wu 2013). The subject domain showed that science and mathematics are the two major subjects in the domain-specific TPACK studies. This could be attributed to the fact that "science and mathematics are relatively more abstract to students, and science teachers and maths teachers may be more tended to adopt technologies to help students overcome their learning difficulties" (Wu 2013). With regards to research methods, various research methods were used by education researchers.

The TPACK framework is mostly used in pedagogy. It uses constructive and social teaching methods to promote e-learning technology. The framework identifies skills that lecturers need to be able to use technology to enhance their teaching. It focuses on using technology to overcome barriers. This model allows lecturers to use their own teaching methods whilst incorporating technology into their teaching. The TPACK framework was used as a basis for developing the proposed pedagogical framework in this study. The proposed framework incorporates the three areas of knowledge into the lower level of the framework.

3.6 The Activity Theory

The Activity Theory (AT), developed by Yrjö Engeström, originated in Soviet Russia. It was based on work by Lev Vygotsky, Alexei Leont'ev and Sergei Rubinstein on cultural historical psychology. It is sometimes called the Cultural-Historical Activity Theory and has since been applied in educational environments. Similar to most frameworks and theories, the AT has also gone through enhanced development.

Figure 3.10 illustrates the AT.

- Object is being neutral or unbiased about the reality; items are considered objective with social and cultural properties.
- Subject – actors (people) engage in activities (mental process)
- Community – people involved in the activity
- Tools – the items (or concepts) used in the system. As the knowledge grows the tools influences the interaction and experience of the actors (people). The use of the tools helps to gather social knowledge.
- Division of labor – social division of activities among actors(people)
- Rules – guidelines governing the activities

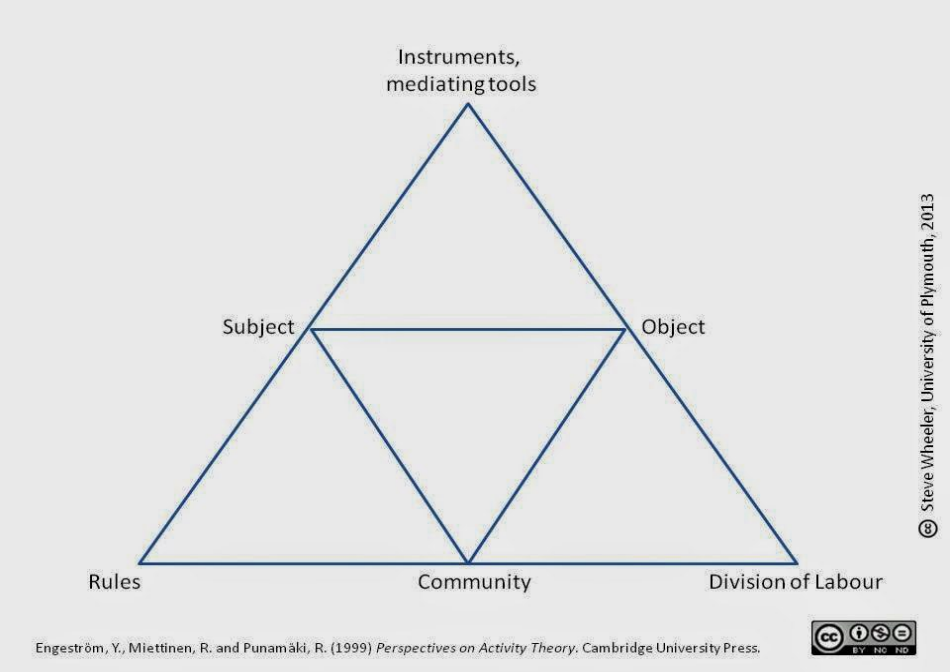

Figure 3.10 The Activity Theory by Yrjö Engeström (Wheeler 2018)

Wheeler (2018) states that,

> *"In Activity Theory people (actors) use external tools (e.g. hammer, computer, car) and internal tools (e.g. plans, cognitive maps) to achieve their goals. In the social world there are many artifacts, which are seen not only as objects, but also as things that are embedded within culture, with the result that every object has cultural and/or social significance. Tools (which can limit or enable) can also be brought to bear on the mediation of social interaction, and they influence both the behavior of the actors (those who use the tools) and also the social structure within which the actors exist (the environment, tools, artifacts)."*

For this study the people are the academic staff at DUT, the external tool is the computer and the internal tool is the frameworks used in implementing software. The tools being the BB LMS influences the behaviour and perceptions of the users thereby affecting the environment to which the users belong. This influence can affect the PEOU of the software which could render the continued use of the LMS as successful or unsuccessful. Interaction between students and lecturers and the behaviour of lectures are influenced by technology. Tools could possibly limit interaction thereby affecting the PEOU of the tool. AT is used for qualitative research including case

studies. It is used to understand a phenomenon and find patterns in data. The phenomena to be understood in this study is PEOU of the BB LMS at the DUT. The qualitative findings revealed how the respondents perceived the use of the BB LMS.

3.7 Expanding the Technology Acceptance Model and Building a Framework

Literature, as highlighted earlier, expanded on the TAM models to show external factors that influence the constructs in those TAM models. This study will highlight the external factors, as experienced by the users of a LMS, the academics, which affect PEOU. In order to use e-learning technology effectively, it is imperative to consider the perception of the user to determine intent on using the LMS. The objectives of this study is; to evaluate the respondents perceptions and attitudes regarding ease of use of LMS technology, to determine the external factors that have a significant influence on PEOU and to expand on the TAM 3 as defined by Venkatesh and Bala (2008), and to further propose a framework that will promote a positive attitude towards the adoption and use of LMS technology in education.

As mentioned in the scope of this study (Chapter 1), the categories of technology literacy and aptitude, Internal support, policies and procedures, ease of use (knowledge on how to use a LMS), software user friendliness, functionality, time and training and development have been identified in literature, to sometimes have an effect on technology acceptance. This study assesses which of these factors influence the use of LMS technology acceptance. As per the definition of the determinants (Figure 3.5), the categories technology literacy and aptitude, software user friendliness, ease of use (knowledge on how to use a LMS) and functionality, is based on the current computer self-efficacy determinant of the TAM 3. The remaining four concepts measured is new determinants that was assessed. The TAM 3 model was changed accordingly.

3.8 National Support for e-learning

The department of education supports e-learning as a resource for teaching and learning in the same way that a text book is considered a resource. No distinction is made in the category of resource. One of the aims for the DUT e-learning project was to produce an e-learning policy. The policy (Appendix F) was delivered in the form of an institutional policy approved by Senate (dated September 2016) and an e-learning procedures and guidelines document compiled to support the policy (Appendix G). The policy references the DHET Distance Education Policy (Appendix I). There is a strong encouragement in the form of government legislation in section 3 and section 7 of the 2013/2014 Department of Education White Paper for the post-school education and training, approved by cabinet. Both these documents have a very thorough reference section so that the policy embedded in the DUT approved policy cross-referenced the references made in the white paper (national policy), meaning that these documents are in line and follow through from one to the other. In 2012, the Minister of Education released a Green Paper for Post-school education and training for public comments. Nearly 200 responses were received confirming an interest in a post-school education and training policy. The feedback received from this Green Paper was read and considered. This led to the development of the White Paper (2013). The White Paper considered other approved National policies, for example the National Development Plan, The New Growth Path. The White Paper outlines a framework “that defines the Department’s focus and priorities, and that enables it to shape its strategies and plans for the future […] to improve the capacity of the post-school education and training system to meet South Africa’s needs” (Africa 2013). It focuses on the college system, for example technical and vocational education and training (TVETs) and community colleges, universities, private colleges, disabilities, different modes of learning, the link between education and the workplace and related teaching and learning aims. The policy for the provision of Distance Education in South African Universities (2014) (appendix I) covers importance of distance education, the technological needs in SA, quality, distance education as a “mode of provision” (Africa 2014), and the planning, funding and quality controls that need to be in place. There is a draft framework (appendix H) on Open Learning Policy for Post-School Education and Training which “provides a framework for, and to direct, the implementation of open learning in the PSET system” (Africa 2017) as explained in the 2014 White

Paper. It discusses open learning concepts, international trends, and legislature and policies within SA.

Although literature from over a decade ago from the Partnership for Higher Education in Africa stated that in Africa “the deployment of technology in support of teaching and learning is governed by myriad documents ranging from White Papers to draft policy documents” (Ngugi *et al.* 2007), the case of DUT using a LMS shows that the literature is still relevant to HEIs who are still in the process of going the e-learning route. The actual use of technology in education “tends to emerge as an afterthought” (Ngugi *et al.* 2007). Kenya had a draft framework in 2007, which was not passed into law. SA, on the other hand, did not have a “national policy governing educational technology, [but] a space for innovation and creativity has been opened up in institutions of tertiary education” (Ngugi *et al.* 2007). The survey revealed that in the case of SA, this innovation was created by groups working together without “national or institutional support needed to integrate their efforts fully into the educational system” (Ngugi *et al.* 2007). This, however, has changed as revealed by the case of DUT academic staff using a LMS. The community of practice groups allowed the stakeholders at DUT to take the institution to an e-learning platform. It is logical to follow the advice from literature from the beginning to ensure success so that common mistakes and errors from failed experiences can be mitigated.

National support is integrated into the proposed pedagogical framework at the highest level to illustrate the importance that policies and funding plays in adopting a LMS. Having national support for the e-learning strategy may promote consistency amongst the HEIs in SA. Having national support for e-learning shows the importance of technological needs in SA HEIs delivery of education. Without the appropriate national support, the adoption could result in a failed implementation which could result in negative PEOU of the LMS.

3.9 Summary

There are numerous frameworks, models, policies and theories that support teaching and learning in various disciplines. Similarly, there are various technology adoption

and usage models and this chapter highlighted some of these models. This chapter discusses the iterations and developments that led to the technology acceptance models (TAM). The information systems success model and TPACK are also discussed in terms of how they identify factors that influence adoption of new technology into education. Literature about these models and studies confirming findings about these models where used to either design the questions for the questionnaire or used as input towards the proposed pedagogical framework. The TPACK model was used to develop the lowest level of the proposed framework. The top level of the proposed framework considered national support to be an important factor with policies and funding playing an important role in the adoption of LMS technology into education.

CHAPTER 4 - RESEARCH METHODOLGY

4.1 Introduction

The preceding chapter highlighted the frameworks that support the use of technology and empirical studies that suggest successful use of the frameworks. The research methodology adopted is explained in this chapter. The research design dictates the target population, sampling frame, sample and the sample size. The data collection methods and instruments used is also provided. The data analysis process is presented. A detailed discussion describes the pilot study and the conclusions drawn from the pilot study followed by a discussion of the main study. An explanation of the research ethical considerations is given.

4.2 Aim

The aim of this study is to create positive attitudes with regards to e-learning and to encourage the use of software that support e-learning namely a learning management system (LMS). The Technology Acceptance Model 3 (TAM 3) (Venkatesh and Bala 2008) is one of many user acceptance and usage behavioural models explaining the inter-relationship between Perceived Ease Of Use (PEOU), Perceived Usefulness (PU), and Behavioural Intention (BI) to use. One of the objectives of this research (using the quantitative analysis) was to extend this model by researching the factors that influence Higher Education lecturers' perceptions towards the use of a LMS to deliver electronic learning (e-learning). Extending the TAM 3 (Venkatesh and Bala 2008) provides a better understanding of the barriers to be overcome by this specific subgroup of users, to create positive attitudes towards e-learning and to promote the use of e-learning. The qualitative analysis was used to identify factors that support an adoption framework.

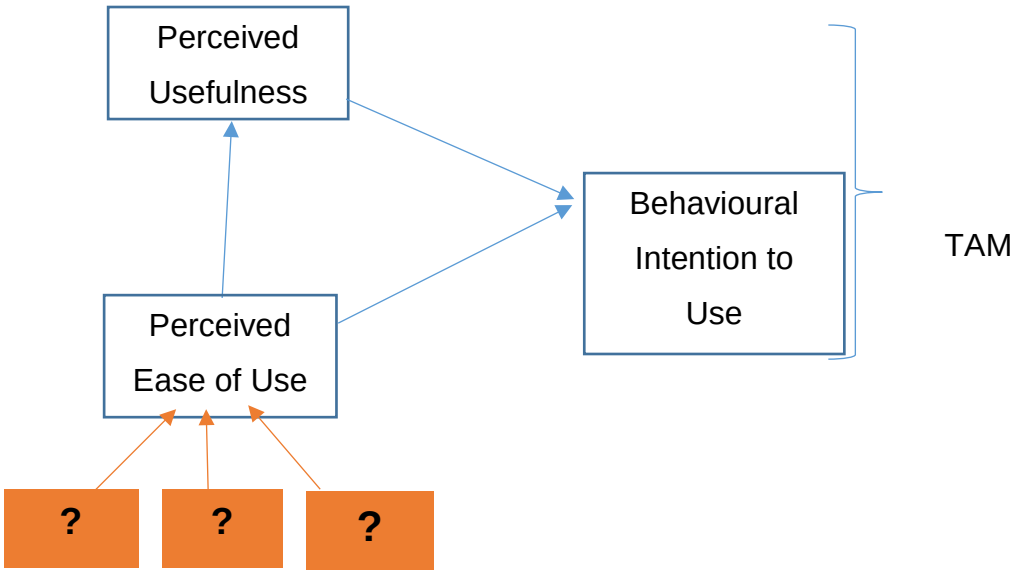

Figure 4.1 Other factors that may affect PEOU in the Technology Acceptance Model (Venkatesh 2008)

Figure 4.1 illustrates which area of the TAM this study focuses on in terms of the influence of additional factors on the PEOU construct.

4.3 Objectives

The high-level aim was to improve usage of LMSs by lecturers. To achieve this, the factors that influence PEOU and strategies to improve PEOU by lecturers were to be identified.

The objectives were to evaluate the emotions, beliefs and attitudes of lecturers with regards to the use of the LMS to enhance teaching and to determine if or how the individual's demographics influences the use of the LMS. This was done by conducting a case study analysis (the case of Durban University of Technology (DUT) academic staff using the Blackboard (BB) LMS). Using the data gathered, the factors that influence PEOU was used to expand on the TAM 3, as defined by Venkatesh and Bala (2008). Thereafter a framework is proposed to promote positive perceptions of ease of use for e-learning (technology in education).

In order to achieve the above, the following was assessed:

- Technology literacy and aptitude
- Ease of use (knowledge on how to use a LMS)
- Software user friendliness
- Functionality
- Software support (i.e. Internal DUT support)
- Policies and procedures
- Time
- Training and development

4.4 Research questions

As stated in Chapter 1, the research was intended to answer the following questions:

- Do academic staff members think there is sufficient support to ensure a PEOU positively within the LMS?

In order to address the question of 'support' the current internal DUT support provided and user based technology training for the use of the LMS was assessed.

- Does the demographic profile (age, race, gender, and citizenship) of the individual influence their PEOU of the LMS?

We are living in an age where advances in technology is growing at a rapid pace. Some empirical studies in higher education indicate that individual demographics influence perceptions on ease of use of the adopted technology. Assessing the demographics showed how these influenced perceptions. An assessment of the influence that age, gender, race/ethnic group, and citizenship on PEOU was conducted.

- Do current practices, policies and procedures guide or promote PEOU of e-learning?

Literature (as discussed in chapter 3) suggests that it is imperative to have documented policies and procedures to guide the adoption of technology into a learning environment. The intention is to provide enough information on the technology to be adopted so that perceptions about the technology is managed prior to the implementation and to avoid mistakes and mitigate risks. The questions highlighted the practices, policies and procedures and determined whether the participants were aware of it.

4.5 Research design

“A research philosophy is belief about the ways in which data about a phenomenon should be collected, analysed and used” (Dudovskiy 2019). The research philosophy adopted for this study is pragmatism. “Pragmatism research philosophy accepts concepts to be relevant only if they support action” (Dudovskiy 2019). Dudovskiy (2019) cited that pragmatics “recognise that there are many different ways of interpreting the world and undertaking research, that no single point of view can ever give the entire picture and that there may be multiple realities”. Dudovskiy (2019) goes on to state that “according to pragmatism research philosophy, research question is the most important determinant of the research philosophy”. This study uses mixed methods (qualitative and quantitative) research and therefore uses both the deductive and inductive approach. A deductive approach is concerned with “developing a hypothesis (or hypotheses) based on existing theory, and then designing a research strategy to test the hypothesis”. The application of the deductive approach is illustrated in Figure 4.2.

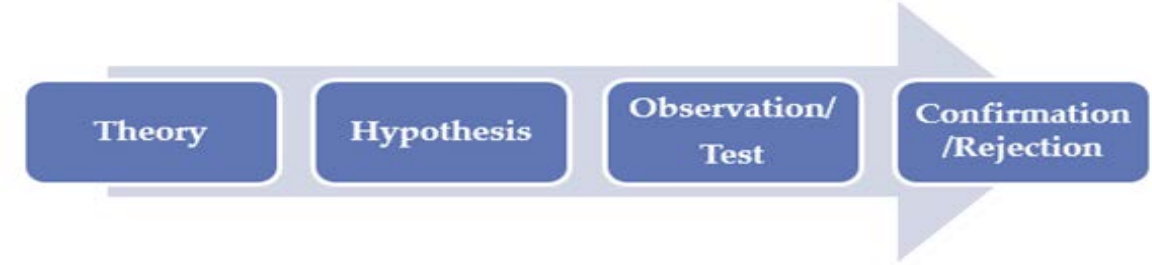

Figure 4.2 Application of Deductive Approach (Dudovskiy 2019)

Dudovskiy (2019) explain the advantages of using a deductive approach as:

> *"possibility to explain causal relationships between concepts and variables, possibility to measure concepts quantitatively, and possibility to generalize research findings to a certain extent.…Generally, the application of inductive approach is associated with qualitative methods of data collection and data analysis, whereas deductive approach is perceived to be related to quantitative methods. Inductive reasoning is based on learning from experience. Patterns, resemblances and regularities in experience (premises) are observed in order to reach conclusions (or to generate theory)."*

The application of the inductive approach is illustrated in Figure 4.3.

Figure 4.3 Application of Inductive Approach (Dudovskiy 2019)

The "integration of quantitative and qualitative data in the form of a mixed methods study has great potential to strengthen the rigor and enrich the analysis and findings" (Wisdom and Creswell 2013). "Mixed methods research is a research design with a philosophical assumption, as well as methods of inquiry, that guide the direction of the collection and analysis and the mixture of quantitative and qualitative approaches in many phases of the research process" (Creswell and Clark 2011). It is further defined as "an approach to knowledge (theory and practice) that attempts to consider multiple viewpoints, perspectives, positions, and standpoints (always including the standpoints of qualitative and quantitative research)" (Johnson, Onwuegbuzie and Turner 2007: 113). This was implemented by using multiple methods and instruments to gather the required data to conclude the case study at DUT.

The research strategy used is a case study and a survey. The data collection was done using open-ended questions and closed questions on a questionnaire and interviews. The reason for selecting this research at a University of Technology (UoT)

is because it could safely be expected from a university of technology to use technology to promote all aspects of the university, including teaching. The case study facilitated an evaluation to determine the practical dimensions and social needs at the institution in relation to using LMSs. The case study was based on a dataset of 579 participants.

The design can be broadly described as:

- Quantitative: closed survey questions.
- Qualitative: open-ended survey questions and interviews

The advantages and limitations to using a mixed methods design is presented in Figure 4.4.

Advantages
Compares quantitative and qualitative data. Mixed methods are especially useful in understanding contradictions between quantitative results and qualitative findings.
Reflects participants' point of view. Mixed methods give a voice to study participants and ensure that study findings are grounded in participants' experiences.
Fosters scholarly interaction. Such studies add breadth to multidisciplinary team research by encouraging the interaction of quantitative, qualitative, and mixed methods scholars.
Provides methodological flexibility. Mixed methods have great flexibility and are adaptable to many study designs, such as observational studies and randomized trials, to elucidate more information than can be obtained in only quantitative research.
Collects rich, comprehensive data. Mixed methods also mirror the way individuals naturally collect information—by integrating quantitative and qualitative data. For example, sports stories frequently integrate quantitative data (scores or number of errors) with qualitative data (descriptions and images of highlights) to provide a more complete story than either method would alone.
Limitations
Increases the complexity of evaluations. Mixed methods studies are complex to plan and conduct. They require careful planning to describe all aspects of research, including the study sample for qualitative and quantitative portions (identical, embedded, or parallel); timing (the sequence of qualitative and quantitative portions); and the plan for integrating data. Integrating qualitative and quantitative data during analysis is often a challenging phase for many researchers.
Relies on a multidisciplinary team of researchers. Conducting high-quality mixed methods studies requires a multidisciplinary team of researchers who, in the service of the larger study, must be open to methods that may not be their area of expertise. Finding qualitative experts who are also comfortable discussing quantitative analyses and vice versa can be challenging in many environments. Given that each method must adhere to its own standards for rigor, ensuring appropriate quality of each component of a mixed methods

study can be difficult (Wisdom, Cavaleri, Onwuegbuzie, et al., 2011). For example, quantitative analyses require much larger sample sizes to obtain statistical significance than do qualitative analyses, which require meeting goals of saturation (not uncovering new information from conducting more interviews) and relevance. Embedded samples, in which a qualitative subsample is embedded within a larger quantitative sample, can be useful in cases of inadequate statistical power.
Requires increased resources. Finally, mixed methods studies are labor intensive and require greater resources and time than those needed to conduct a single method study.

Figure 4.4 Advantages and limitations of using mixed methods design (Wisdom and Creswell 2013).

The reason for choosing the mixed methods design is mainly to gather insight on the participants' experiences and beliefs and to determine if the qualitative findings support the quantitative analysis. Using this design gave the researcher a more holistic view of the reality as opposed to using a single method.

Sekaran and Bougie (2013) defines the objective of basic research as getting more knowledge of certain phenomena and problems in organizations with the objective of findings solutions. Knowledge is gathered to understand the phenomena and theories are built on the research results. The phenomena to be understood in this study is PEOU of the BB LMS at the DUT. The quantitative research results form the basis for identifying the factors that affect PEOU of the LMS, whilst the qualitative research results form the basis for the proposed framework.

Designing the research to yield appropriate results is important. This is confirmed by Garg (2016) who maintains that an "appropriate study design is essential for the intervention outcome in terms of its best possible and most reliable estimate" (Garg 2016: 641).

4.5.1 Questionnaire development

The themes (categories of questions) were chosen in line with the research questions to be answered. Questionnaires from research that used the TAM 3 (Venkatesh and Bala 2008) in educational settings were perused to design the questionnaire for this study. Certain studies presented in Chapter 2 was used as a basis to develop the questionnaire. The key words of those studies, on which this study's themes are

based, is underlined in Chapter 2. The questionnaire was made up of 7 pages consisting of 4 sections (A, B, C, and D). It was highlighted that participation in the survey was voluntary and by completing the survey, the respondent hereby provided consent for the data to be used. Section A covered the respondent's demographic information. The study by Elsaadani (2013), discussed in Chapter 2, concluded that age is an important factor in the acceptance of ICT. Age and other demographic variables (age, gender, faculty, years of lecturing service at any HEI, ethnic group and citizenship) was therefore included in this study to determine if these variables have an effect on the PEOU construct of TAM 3 in the DUT LMS environment. The questionnaire used by Elsaadani (2013) tested the participants in different parts measured by a Likert scale. Similarly, the parts or themes for this study is Section B which covered the quantitative questions. Section B's questions 7 - 13 related to the subjects the respondent's teach and their use of LMSs whilst questions 14 - 55 were based on their perception of the LMS and its use at DUT. Section B (questions 14 - 55) was divided into 8 categories of Likert scale type responses. The eight (8) categories were:

- Technology literacy and aptitude

  This theme measured the basic knowledge that the respondent had using technology (use of the pc, emails, internet, intranet, use of job specific applications like BB, iEnabler and ITS support required). The study by Thakur (2015) identifies competency in technology as an important factor to consider when measuring teaching and learning. The questions for the Technology literacy and aptitude theme for this study therefore measured how comfortable respondents were with tasks like reading emails and browsing the internet.

- Internal DUT Support

  This theme measured the knowledge that the respondent had about what process needs to be followed to get BB assistance from other DUT staff. The researcher, being a staff member in the Information Technology sector at the DUT, used knowledge of support processes and documentation available on the HEI intranet to design the questions for this theme.

- Policies and procedures

  This theme measured the knowledge that the respondent has about existing (if any) BB policies, procedures and guidelines. In the study by Shi and Yu (2016) on MOOCs, it was highlighted that policies and support was put in place to support the MOOCs. This was done to ensure success of the implementation. The Policies and procedures theme was therefore included to determine if it existed in the DUT environment to ensure a successful implementation.

- Ease of use (knowledge on how to use a LMS)

  This theme measured the respondent's perception of how easy BB is to use based on their own knowledge of how to use BB. The study by Emelyanova and Voronica (2014) measured how easy it is to use a LMS based on the skill level of the LMS. This theme was therefore considered for this study.

- Software User Friendliness

  This theme measured how pleasant or friendly the respondent found BB.

  The study by Medina-Flores and Morales-Gamboa (2015) and the study by Alturki, Aldraiweesh and Kinshuck (2016) took into account items that could measure software user friendliness. Software user friendliness will determine whether the user has a good experience on the software or not as declared by Sahid *et al.* (2016). This study used similar criteria to measure software user friendliness relative to the DUT environment and LMS technology used.

- Functionality

  This theme measured how to use BB. Croitoru and Dinu (2016) compared different LMSs and the functionality that they considered important to have. The questions that measured this theme covered the basic functionality for example how to add subject material and how to respond to students.

- Time

  This theme measured the availability of time that is required to ensure the housekeeping and maintenance of the subject content loaded onto BB remains meaningful and in line with the curriculum. The study by Emelyanova and

Voronica (2014) indicated that time could play a role in the perceptions of LMS users. The theme Time was therefore considered for this study.

- Training and Development

  This theme measured the training that the respondent received on BB and to what extent it has helped them to use BB and assist their students on the software. Catherall (2005) advocates that one cannot assume that all users are computer literate. Training and development was therefore considered an important marker that determine computer literacy. The study by Gangwar, Date and Ramaswamy (2015) considered training and education as an important external factor to technology adoption in organisations. The study by Esterhausen *et al.* (2013) also considered training and development as important. The theme Training and Development was therefore considered as measurement criteria for this study.

"The Likert scale consists of five items ranging from complete disagreement to total agreement on a certain statement" (Bermudes et al. 2016). The Likert scale adopted (Table 4.1) for this study ranged from "Strongly Agree" to "Strongly Disagree".

Table 4.1 shows the Likert Scale values used in this study

SCORE	**RESPONSE**
1	Strongly Agree
2	Agree
3	Neutral
4	Disagree
5	Strongly Disagree

This rating scale was used for all themes. The questionnaire was piloted before the main study could commence, to test if the Likert scale was sufficient to measure each theme.

Studies conducted by Hung *et al.* showed that it is important to consider the beliefs of respondents as well in order to understand how technology impacts education. Section C (qualitative questions) was designed with this in mind. This section was designed for the respondent to openly, yet anonymously, state their frustrations or to highlight the positive experiences and suggestions on BB. The qualitative questions will highlight some of the advantages and/or disadvantages of HEIs going the e-learning route similar to those highlighted in the study conducted by Razika *et al.*

The themes, mentioned above, was considered as most relevant over and above other measurement criteria used in other studies due to the characteristics of the DUT environment. Simple English was used for each question to avoid ambiguity. Each question was relative to the DUT environment and discretion was used by the researcher on the items that could measure the theme.

4.5.2 Pilot study

For the purpose of this study the theory from the TAM 3 (Venkatesh and Bala 2008) and the Information Systems Success Model (DeLone and McLean 2003) and the empirical studies that used the TAM 3 (Venkatesh and Bala 2008) and the Information Success Model (DeLone and McLean 2003) was used to design the survey instrument (questionnaire).

Permission was received to conduct a pilot study (Appendix A). A pilot study was conducted to test the questionnaire in terms of the distribution and collection methods, design, wording (understanding of the questions) and data capturing.

4.5.2.1 Reasons for conducting the pilot study

Researchers Janghorban, Latifnejad and Taghipour (2014) state that “a pilot or preliminary study is referred to a small-scale of a complete survey or a pre-test for a particular research instrument such as a questionnaire”. Ethical and practical problems could be encountered during the pilot study like “cultural sensitivities, shame and stigma, not being interested to be interviewed due to not having sufficient time or being unwilling because of having a different gender with researcher” (Janghorban,

Latifnejad and Taghipour 2014). It is further explained that “a pilot study leads to identification and management of these ethical and practical problems which could jeopardize the main study or violate human rights of participants” (Janghorban, Latifnejad and Taghipour 2014). A preliminary study was conducted to test certain aspects of the main study and to test the instrument.

A pilot study was carried out under the same conditions as the main study and with participants that have the same characteristics as those in the main study in an attempt to identify any shortcomings so that they can be avoided in the main study. The importance of conducting a pilot study is shown in Figure 4.5.

To determine the feasibility of the study protocol and identify weaknesses in a study.
To test whether the study instrument(s), is asking the intended questions, whether the format is comprehensible and whether the selected validated tool is appropriate for the target population.
To test the appropriateness of data collection using the selected interview technique (face-to-face or telephone) or self-completed questionnaire (postal or administered at the centre).
To test the data collection process – the time taken to complete questionnaire, and the subjects’ willingness to participate in the study
To test data entry, coding of the items, and appropriateness of statistical tests
To obtain preliminary data for the primary outcome measure, in order to calculate a required sample size (especially in randomized control trials).

Figure 4.5 shows the importance of a pilot study (Hassan, Schattner and Mazza 2006: 73)

4.5.2.2 Selection of the participants for the pilot study

The total population for the study was identified as 579 (total staff excluding the administrative staff and those permanent academic staff that may not be involved in classroom education). A sample size of 40 percent was adopted giving a total sample population of 232 lecturers. The pilot study used a ten percent sample of the 232 total sample population. This resulted in 23 participants. The 23 participants were invited to participate in the pilot study. Questionnaire items needed to address the research questions. The pilot was done to test if the questionnaire was “comprehensible and appropriate, and that the questions were well defined, clearly understood and

presented in a consistent manner" (Hassan, Schattner and Mazza 2006: 70). The participants involved in the pilot study were not included in the main study.

4.5.2.3 Implementation of the pilot study

The 'Drop off Pick up' (DOPU) or the 'drop and collect' method was used. "For studies in small or compact geographic areas, DOPU has achieved higher response rates than mail surveys" (Trentelman *et al.* 2016: 68). Three delivery methods were used to test which is the most reliable method of delivering the instrument relative to the environment and characteristics of the participants at DUT.

The first was using an on-line electronic medium to cover a greater geographical area within a shorter space of time. The QuestionPro software was used. One participant was used to test this software. This method proved to be unreliable due to the following reasons:

- The electronic mails did not reach the selected participant even though the researcher received the mail during the test. This could have been due to a number of reasons e.g. software issues, network connectivity, limited mailbox size. There was also no option available to check which emails delivered successfully and which failed delivery. The on-line help however indicated that this verification could be done.
- There was limited internal DUT support for the software however international support by the software team was offered.

The second method used Microsoft Outlook (DUT's primary email software) to email selected participants with all documentation (the information and consent form, questionnaire and gatekeepers letter). Follow-up reminders were sent after a few days. This method proved to be a little more reliable than the first method, but was still not suitable for the characteristics of the participants. The results of this test were that:

- Only a few responses were received.
- Many participant's mailboxes were full which resulted in the email failing on delivery.

The third method was to combine an electronic medium with face-to-face contact and follow-up reminders. This entailed sending out all documentation (the information and consent form, questionnaire and gatekeepers letter) via the email system so that the participant was aware that a BB survey is being conducted. The participant could respond with reply email if they chose to. The researcher visited each participant's department secretary and or head of department for those that did respond to collect the completed questionnaires. If the questionnaire was not complete the participants offered to complete it whilst the researcher waited. This was a good test to determine the approximate time taken to complete the questionnaire. In most cases, the time taken did not exceed 15 minutes. Some participants indicated that they were willing to complete the questionnaire and gave the researcher a date and time for the collection of the completed questionnaire. The outcome was not influenced in any way. Many of the participants indicated that they preferred this method because they could ask questions and because their priority is the students and not their emails. The pilot study confirmed that face-to-face surveys achieve the highest response rates.

4.5.2.4 Period allocated for responses during the pilot study

Two weeks were allocated for the delivery and collection of the questionnaires. This proved to be sufficient time to get a reasonable number of responses for the pilot study. Twenty three participants were invited to be part of the pilot study. Seventeen participants responded.

4.5.2.5 Feedback from the participants

- Participants indicated that the questionnaire was understandable with no ambiguity.
- The questionnaire was not time consuming to complete.
- Questions were unbiased.

4.5.2.6 Changes made to the questionnaire after conducting the pilot

- When delivery method 1 was used, it became clear that using an on-line method did not allow the participant the option to sign and return the consent form. The following phrase was added to the questionnaire to cater for this shortfall:
    - "By completing this survey you hereby give consent to participate in this study (ethics clearance number IREC 088/16)".
- The values for the Likert scale did not appear on question 23. This was corrected.
- Typographical errors were corrected.
- Some participants indicated that the ranges used in some questions were too broad. The ranges were adjusted accordingly.
- The values for the Likert scale (Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree) was added at the beginning of each theme.

The edited questionnaire (Appendix C) was used for the study.

4.5.2.7 Data entry

The researcher used Microsoft Excel to capture the results from the pilot study. A number was allocated to each participant and the Likert scale values per response was captured per section and question number. This is represented in Appendix J. Some participants missed certain questions while completing the questionnaire. This could have been because the participant did not understand the question, however none of the participants expressed this.

Statistical analysis (Appendix E and Appendix K) of the data, in the pilot study, was done. The pilot study validity and reliability tests were performed however it is irrelevant due to the sample size being too small.

4.5.2.8 Pilot study lessons

The pilot study confirmed that the study was feasible. The exercise was not too disruptive to the participants in terms of time taken to complete the questionnaire. The method of using the departmental secretaries to assist in the collection of the questionnaires seemed to be acceptable. The sample was representative of the different faculties, race, age, gender, and citizenship. A similar mix was adopted for the main study. The pilot was effective in identifying flaws in the research instrument. These flaws were amended for the main study. The pilot study provided an understanding of how to improve the process of delivery and collection of the questionnaires.

4.5.2.9 Decisions for the main study

- Delivery method three was used for the main study.
- The questionnaire was changed as per the changes listed in 4.5.2.6.
- A communication network was developed during the pilot study. If there was a need for assistance, certain head of departments and secretaries offered to assist with the distribution, completion and collection of the questionnaires.
- Questionnaires were printed double-sided to save on resources.

4.5.3 Quantitative Approach

Teddlie and Tashakkori (2009: 343) define quantitative research as the “technique associated with gathering, analysis, interpretation and presentation of numerical data”. The quantitative approach helped answer “a series of ‘what?’ questions (e.g. what number or percentage of people prefer product ‘A’ to product ‘B’, or what number of people in a given population have drunk beer in the past week)” (Barnham 2015: 837). The quantitative data was gathered using closed questions on the questionnaire. These questions were more specific and based on factors like gender, age, number of years in the educational field and ethnic group.

4.5.3.1 Population

The target population is defined as the “attribute that makes participants eligible as population members” (Asiamah, Mensah and Oteng-Abayie 2017: 1611). The target population included all full-time staff who were permanently employed academic staff (lecturers) across all faculties within the DUT at the time of extracting the data. Oracle’s Structured Query Language (SQL) was used to extract a list of all permanently employed full-time academic staff at DUT who were recorded on the institution’s Integrated Tertiary Software Human Resource system for the 6 faculties (Accounting and informatics, Applied Sciences, Arts and Design, Engineering and the Built Environment, Health Sciences, Management Sciences). This resulted in a population of 579 staff members.

4.5.3.2 Sampling

It is not possible to study every individual, therefore a “study population is sampled” (Garg 2016: 641). “A sample design is the framework, or road map, that serves as the basis for the selection of a survey sample” (Lavrakas 2008: 2). Lavrakas (2008: 2) explains that the “sample design provides the basic plan and methodology for selecting the sample”. “Sampling is a procedure to select a limited number of units from a population in order to describe the population” (Gallhofer and Saris 2014).

A sampling frame limits the population who qualifies to be part of the sample. It defines a boundary around those members who can be included in the sample. “In order to draw a sample from a population, a sampling frame such as a list of names and addresses of potential respondents is needed” (Gallhofer and Saris 2014). The sample was determined as per the scope of the study as explained in Chapter 1 which consisted of permanent DUT staff members using a LMS. The sample excluded professors, associate directors, directors, head of departments, administrative staff and temporary staff. These individuals were excluded because not all are actively involved in lecturing and may not be users of the LMS. This was done to ensure that information was obtained from the primary user base of the LMS. These are the individuals who will have a perception of ease of use of the LMS and its contributions towards e-learning. Specific details for the sample was extracted by the DUT’s

Management Information Systems (MIS) department. SQL was used by the MIS department to extract reports from the Integrated Tertiary Software, as the source system, containing certain demographic information on permanent academic staff to create the sample base to be used for the survey. Only the email addresses of the participants were supplied. This was used to contact the participants.

“The larger the sample size generally the more precision the estimate will have” (Alasuutari, Bickman and Brannen 2009: 171). Alasuutari, Bickman and Brannen (2009: 171) go on to state that “for unbiased estimates, improving the precision necessarily improves accuracy”. Forty percent of the permanent DUT staff members using a LMS (excluding professors, associate directors, directors, heads of departments, administrative staff and temporary staff) resulted in a sample size of 232. This percentage was chosen to cater for nonresponses or incomplete responses. The sample size was confirmed by using an on-line tool made available by Raosoft (2004). A list of email addresses for the sample was obtained from the MIS department within DUT.

A random sampling method was used. “Random sampling ensures the law of Statistical Regularity which states that if on an average the sample chosen is a random one, the sample will have the same composition and characteristics as the universe” (Kumar 2008: 43). Each sample unit will have an equal chance to participate with no bias and conclusions will be based on the representing sample. Using this method allowed each member an equal and independent chance of being selected into the sample group. The following process was adopted:

- The total population (total staff excluding the administrative and temporary staff and those permanent academic staff that may not be involved in classroom education (e.g. where the main profile of the individual is the head of department, deputy director, director)) was identified (579)
- A sample size of 40 percent was adopted (232)
- The population was listed in a Microsoft Excel spreadsheet, as obtained from the MIS department.

- The Microsoft Excel RANDBETWEEN function was used to randomly select the 209 participants for the study sample group (232 participants less the 23 participants of the pilot study).

4.5.3.3 Data collection

It has been common practice to collect data through paper-based methods. Information and Communications Technology (ICT) now allows “many researchers to see the Internet as a research tool” (Tella 2015). Even though electronic data collection methods have gained popularity over the years and can deliver results in a faster more cost effective manner. Westfall, Kim and Ma (2012) state that “electronic means for collecting data have not been adequately researched since this method is relatively new”. These researchers go on to state that it is “critical that researchers from the academic and managerial communities understand the influence the choice of data collection methodology has on their respondents and survey responses, particularly when making survey design decisions” (Westfall, Kim and Ma 2012). Tella (2015) explains that a “researcher has control over access to the survey in the paper-based method compared to the electronic method, and there is opportunity to monitor the progress of the research and clarify ambiguity by the researcher”. Another shortfall is that the “electronic method is limited in terms of collecting data from only the respondents who are computer-literate with good Web skills, while the paper-based method is limited by higher attrition rate, money and time consumption” (Tella 2015). As described, the pilot study revealed that the electronic means was not successful and if implemented in the main study, it could have a negative effect on the response rates. Therefore, a paper-based questionnaire was used to collect data.

The ‘Drop-Off-Pick-Up’ method was adopted. “DOPU allows the surveyor to interact with and establish (even if only briefly) a relationship with the participant at the door before the participant has seen the questionnaire and other survey materials” (Trentelman *et al.* 2016). This instrument and method facilitated interaction with the respondent to clarify any misunderstandings and to express gratitude for participation.

4.5.3.4 Data analysis

Data analysis and statistics are an important part of any study because “regardless of the study design, investigators need to summarize the collected information for interpretation and presentation” (Simpson 2015: 311). Simpson (2015: 311) explains that “categories in a *nominal* variable are names, for example, male and female” for the variable gender whilst *ordinal* variable implies that the categories can be placed in a meaningful order” e.g. frequency (never, sometimes, often, or always). “*Statistics* are mathematical formulae that are used to organize and interpret the information that is collected through variables. There are 2 general categories of statistics, descriptive and inferential” (Simpson 2015: 312). *Descriptive* statistics are names given to describe the information, e.g. value ranges. This descriptive statistics help researchers understand the study sample. *Inferential* statistics helps the researcher to make associations or comparisons and draw conclusions from the study data collected and to make inferences and generalise beyond the sample to the general population.

4.5.3.4.1 Data capturing and verification

The 156 responses were captured on Microsoft Excel for analysis (Appendix N). Once the data was captured, all Likert scale responses were checked by a volunteer to eliminate human error in the data capturing process. Capturing errors were verified against the questionnaire before changes were made. The data collected from the responses (Likert scale items) were analysed by a statistician with the use of a statistical software package Statistical Package for the Social Sciences version 24.0 (SPSS). The data analysis for the main study is attached in Appendix O.

4.5.3.4.2 Reliability statistics

The two most important aspects of precision are **reliability** and **validity**.

4.5.3.4.2.1 Cronbach’s Alpha

“Cronbach’s alpha (or *coefficient alpha*), developed by Lee Cronbach in 1951, is a way to measure reliability, or internal consistency” (*Statistics how to* 2014). Cronbach’s alpha was used to test consistency for the Likert scale items to determine if the scale is reliable and valid. It will promote understanding if the questions reliably measure the same latent variable (perceived ease of use of e-learning). Cronbach’s Alpha tested item (each question) reliability, whilst the factor analysis test measured factor (each theme) validity. Reliability is computed by taking several measurements on the same subjects. A reliability coefficient of 0.70 or higher is considered as acceptable. Reliability and factor analysis was done to make sure that the Likert scale items were reliable and valid.

4.5.3.4.2.2 Factor Analysis

As stated previously, the factor analysis test measured factor (each theme) validity. According to Statistics how to (2014), factor analysis is used to establish whether the measures actually measure the same thing and to:

1. show underlying or hidden patterns
2. to understand how those patterns overlap
3. identify characteristics of multiple patterns
4. put similar items together into sets(variables) called dimensions

Factor analysis was applied to each section for section analysis per sub theme that was defined. Factors differ in weighting i.e. the factors that affect the question the most will have the largest or highest factor. The values vary from -1 to 1. A factor loading of zero means no effect whilst values close to -1 or 1 affect the variable more than others.

In this study, all of the variables have communalities greater than 0.5. An alternative method of testing EFA for small samples is to use regularised EFA (REFA). However, this is generally for much smaller samples (for example sample size < 80). The Kaiser-Meyer-Olkin Measure of Sampling Adequacy and Bartlett's Test of Sphericity are met and the characteristics of the sample ensured that the objectives of the study are met.

> *“The factor analysis literature includes a range of recommendations regarding the minimum sample size necessary to obtain factor solutions that are adequately stable*

and that correspond closely to population factors. A fundamental misconception about this issue is that the minimum sample size, or the minimum ratio of sample size to the number of variables, is invariant across studies. In fact, necessary sample size is dependent on several aspects of any given study, including the level of communality of the variables and the level of overdetermination of the factors. The authors present a theoretical and mathematical framework that provides a basis for understanding and predicting these effects. The hypothesized effects are verified by a sampling study using artificial data. Results demonstrate the lack of validity of common rules of thumb and provide a basis for establishing guidelines for sample size in factor analysis" (MacCallum, Widaman, Zhang and Hong 1999).

4.5.3.4.2.3 Chi-Square

"A chi-square goodness of fit test determines if a sample data matches a population" (*Statistics how to* 2014). The Chi-square test was used to determine relationships between variables and the relationships are interpreted using a P value. This test could be performed because the data was grouped into themes and there was a sufficient sample size in order for the chi-square to be valid. The Chi-Square test is not very strict with regards to the data that it can use. It was used to determine if the statistical relationship between factors like age and gender play a role in the use of technology currently at the university. The chi-square test will be used to meet the objectives by applying the test on each of the factors to determine which factors influence PEOU of the LMS. The chi-square test was applied across all of the demographic variables per theme per item or question. The test helped to meet the objectives of the study by identifying the variables and the p-values that have significant relationships. The test met the objective of identifying if or how the individual's demographics is influencing the use of the LMS. The test also met the objective of identifying the factors that influence PEOU, which was used to expand on the TAM 3 as defined by Venkatesh and Bala (2008). These include:

- Technology literacy and aptitude

  This is measured by questions related to how comfortable the participant is using technology like emails, the intranet, internet, DUT ERP system, LMS

- Ease of use (knowledge on how to use a LMS)

Questions were based on the knowledge that the participant has on the BB LMS. That is how easy does the participant find using the BB LMS with the knowledge that they have of the application.

- Software user friendliness
  Questions were based on how the participant views the systems graphical user interface development to be easy or difficult for the participant to use the system.

- Functionality
  Questions were based on the basic functionality of the BB LMS to add, edit, and respond to students.

- Software support (i.e. Internal DUT support)
  Questions were based on the awareness of guidelines/training documentation and support information when assistance is required.

- Policies and procedures
  Questions were based on the policies, procedures and guidelines/training to follow when assistance is required.

- Time
  These questions related to the allocation of time in the participants work day to be able to use the BB LMS productively.

- Training and development
  These questions related to the training that participants received prior to being asked to use the BB LMS, the on-line help on the LMS, and the participant's ability to advise students on how to use the LMS.

If the significance values (p-values) are less than 0.05 (the level of significance), it implies that the distributions were not similar. That is, the differences between the way respondents scored (Agree, Neutral, and Disagree) were significant.

4.5.4 Qualitative approach

Qualitative research entails “the correct choice of appropriate methods and theories; the recognition and analysis of different perspectives; the researchers’ reflections on the research as part of the process of knowledge production; and the variety of approaches and methods” (Flick 2009: 14). In more recent literature, Flick (2018: 8) states that “the subjectivity of the researcher and of those being studied becomes part of the research process. Researchers’ reflections on their actions and observations in the field, their impressions, irritations, feelings, and so on, become data in their own right, forming part of the interpretation”. This study uses the qualitative approach and phenomenological analysis to attain the subjective views and experiences (insider experiences) of the participants. The researcher looks at “how someone makes sense of a major transition in their life – for example, starting work” (Smith, Flowers, and Larkin 2009: 3). “Experience is always dependent on what participants tell us about the experience, and that the researcher need to interpret that account from the participant in order to understand their experience” (Smith, Flowers, and Larkin 2009: 3). The experience in this study is the change in traditional teaching methods to the use of LMS technology to aid teaching. Figure 4.6 shows the criteria to be considered during qualitative analysis to ensure that the researcher is not biased. Credibility, transferability, dependability, confirmability was ensured by using random sampling, phenomenological analysis, using different methods to gather data, and by not imposing the researcher’s believes or assumptions on the study. Furthermore, the limitations/shortcomings of this study is discussed in Chapter 6.

Provisions that may be Made by a Qualitative Researcher Wishing to Address Guba’s Four Criteria for Trustworthiness

Quality criterion	*Possible provision made by researcher*
Credibility	Adoption of appropriate, well recognised research methods Development of early familiarity with culture of participating organisations Random sampling of individuals serving as informants Triangulation via use of different methods, different types of informants and different sites Tactics to help ensure honesty in informants Iterative questioning in data collection dialogues Negative case analysis Debriefing sessions between researcher and superiors Peer scrutiny of project Use of “reflective commentary” Description of background, qualifications and experience of the researcher Member checks of data collected and interpretations/theories formed Thick description of phenomenon under scrutiny Examination of previous research to frame findings

Transferability	Provision of background data to establish context of study and detailed description of phenomenon in question to allow comparisons to be made
Dependability	Employment of "overlapping methods" In-depth methodological description to allow study to be repeated
Confirmability	Triangulation to reduce effect of investigator bias Admission of researcher's beliefs and assumptions Recognition of shortcomings in study's methods and their potential effects In-depth methodological description to allow integrity of research results to be scrutinised Use of diagrams to demonstrate "audit trail"

Figure 4.6 shows the four criteria for trustworthiness in qualitative research (Shenton 2004: 73)

4.5.4.1 Population

The population for the qualitative research was the same as the quantitative research. All permanently employed full-time academic staff at DUT who were recorded on the institution's Integrated Tertiary Software Human Resource system for the 6 faculties (Accounting and informatics, Applied Sciences, Arts and Design, Engineering and the Built Environment, Health Sciences, Management Sciences) comprised the study's population.

4.5.4.2 Sampling

Boddy (2016: 426) states that "the determination of sample size is contextually and partially dependent upon the scientific paradigm under which investigation is taking place". The experience from all those participants who indicated an interest in e-learning, a total of 43 as per the survey, were grouped together. The Microsoft Excel random function was used on this set's employee numbers (as voluntarily provided by the participants) to create another random list of six academic members of staff. The initial plan was to conduct a focus group discussion with this group, however, due to time constraints and the nature of the lecturers' employment it was decided that individual interview discussions were more suitable and effective. The participant's details on the DUT email system was used to contact the participants. The purpose of these interviews were to outline the case of DUT using a LMS. The information gained during these interviews were used together with supporting literature to build a theoretical framework for the adoption of a LMS.

4.5.4.3 Data collection

The same questionnaire, with open-ended questions (Sections C and D), combined with interviews (a walk-through of the case of DUT academic staff using a LMS) with specific respondents, defined the qualitative approach for this study. It provided an understanding of participants' current experiences, behaviours, beliefs, opinions, and emotions with regards to a LMS. It assessed multiple realities of subjective beliefs of the participants.

Section C of the questionnaire dealt with general items. This section allowed the respondent to add comments and express their views on the DUT's adoption of the LMS and the effect it has had on them as an academic staff member of DUT. In Section D respondents could indicate whether they would like to participate in a discussion regarding LMSs and e-learning.

In-depth face-to-face interviews were conducted in an attempt to gain a cumulative understanding of the PEOU and adoption of a LMS for teaching. A one-on-one interview with an e-learning project champion revealed the approach taken by the DUT HEI in their efforts to adopt a LMS.

4.5.4.4 Data analysis

The data from the open-ended questions in the questionnaire were analysed to see if the qualitative findings supported the findings of the quantitative analysis. The responses were analysed using phenomenological analysis. Sekaran and Bougie (2013) advocate that this analysis method, for qualitative data, evaluates recorded data, gives the researcher the opportunity to analyse large quantities of textual data and identifies the presence of themes. The responses were analysed using the NVivo 11 software package, which generally supports qualitative (with unstructured data) and mixed methods research. NVivo 11 helped to organise and analyse fieldwork. Comments from the questionnaire were captured in text format. Similarities or links in the data were identified using word clouds, tree maps and cluster analysis. This analysis identified themes and suggestions regarding how technology in education is currently perceived.

Interviews were used to obtain reliable data, and to understand and interpret themes in order to build the framework. Information gathered from the interviews, empirical studies and literature was used to build the theoretical framework.

4.6 Implementation for main study

4.6.1 Administration – delivery of instrument

The total of 232 questionnaires were distributed (23 for the pilot study and 209 for the main study). The sample members were based at the 3 chosen campuses. It was convenient to reach the participants (electronically and face-to-face) both for distribution and collection of the questionnaires. The questionnaires were administered using an electronic medium with face-to-face contact and follow-up reminders. Different methods were used for distribution:

- The information and consent form, questionnaire and gatekeepers letter were distributed via the DUT email system (MS Outlook) with a read receipt.
- Hand delivery of the information and consent form, questionnaire and gatekeepers letter for participants that could not be found on the email system or where a read receipt was not received.
- With assistance from departmental secretaries.

A period of two weeks was provided to complete the questionnaire per campus. A total of six weeks was allocated for all three campuses. The implementation started at the ML Sultan campus, then the Ritson campus followed by the Steve Biko campus. Distribution and collection was being handled simultaneously e.g. if questionnaires were dropped off or emailed to Steve Biko participants then collection was facilitated at the ML Sultan campus.

4.6.2 Administration – collection of instrument

Follow-up reminder emails were sent a week after distributing the questionnaire. Many academics expressed willingness to complete the questionnaire but lack of time posed

a problem. The reasons included university strikes and tests. The participants responded in different ways:

- Responses were received with reply email.
- Some participants chose the DUT internal email system.
- Others gave a collection date and time for the researcher to pick-up.
- Majority of participants communicated via the departmental secretaries who collected the questionnaires on behalf of the researcher.
- Some participants chose to complete the questionnaire whilst the researcher waited.

Incomplete questionnaires and questionnaires that were returned after the closing date was collected but not included in the study.

4.7 Ethical considerations

As per the moral rights model (ethics) decisions were made bearing in mind the rights of society as set out by the South African Constitution. “Ethical clearance application processes may differ across institutions” (Ramrathan *et al.* 2017). The ethics requirements specific to the Faculty of Accounting and Informatics were adhered to and dictated the acceptable behaviour during the research. Ramrathan *et al.* (2017) state that “no research can be carried out without ethical clearance approval”. They go on to state that “permission is needed from an authorised individual of an institution or an organisation. This is called gatekeeper’s permission” (Ramrathan *et al.* 2017). A request for access to the participants information, referred to as a ‘gatekeeper’s letter’, was submitted and approved (Appendix B) by the DUT for a list of the representing sampling units. The information extracted had to be in accordance with the Protection of Personal Information Act (POPI) which the DUT adopts, as confirmed by the MIS department. The research was an expedited review which entailed the participation of humans only (with minimal risk to organisations, animals, or any environment). The data was collected and disseminated in a way that ensured confidentiality of the raw data and the protection of the participant’s identity. This was implemented by allocating numbers to the participants. Informed consent was required from the participants that

are employed by the same organisation as the researcher. A clause was included in the questionnaire indicating that by completing the questionnaire the participant hereby gives consent. All research material was presented in English and a colleague known to the researcher was contacted for explanations that were required in isiZulu. Furthermore all research material used will be stored for a period of five years and then securely destroyed.

> *"Participants must know their rights and limitations within the research process. These rights include: the right to full disclosure of the research intentions, the right to full disclosure of the nature of the participants' involvement within the research design, the right to full disclosure of the potential risks to the participants, confidentiality of information provided by participants, the ability to withdraw from the research process without any consequences to the participants" (Ramrathan, Le Grange and Shawa 2017).*

The rights of the participants were of great importance during this study. The study took into consideration the fairness, compassion, integrity, privacy, consent, anonymity and the purpose of the study during all stages of the study. It was an ethical obligation to treat all participants equally, with the same respect and without bias, regardless of their race, culture, gender or age during the study. Permission to conduct this research was obtained from the Institutional Research Ethics Committee (IREC). IREC approval (Appendix M) is attached.

"Consent letters are participant-specific, meaning that each participant must consent to taking part in the research process with the understanding of his or her roles, responsibilities and rights within the research process" (Ramrathan *et al.* 2017). The information letter and consent forms (Appendix D) explained the aims of the research and the participants' involvement in the study. Contact details for both the researcher and the supervisor were supplied should the participant have any queries or objections towards the study. The consent form assured confidentiality during participation. All participants were required to provide consent for participation. In addition to the information letter and consent form, a clause was included at the beginning of the questionnaire "By completing this survey you hereby give consent to participate in this study (ethics clearance number IREC 088/16)". This explained that by completing the questionnaire the participant hereby freely gives consent to participate in the study even if they did not complete the consent form. The information and consent forms

were emailed or hand delivered, but not all participants signed the forms. They expressed that the clause on the questionnaire was sufficient. The participants were not influenced in any way. It was highlighted that participation in the study was completely voluntary.

The questionnaire was designed in a manner that allowed confidentiality. The participant's details were only supplied if the respondent voluntarily supplied their contact details and wanted to be part of a further discussion concerning e-learning and PEOU. This confirmed confidentiality and anonymity because one could not determine who completed the questionnaire unless the participant voluntarily provided their details. Data from the Likert scale items of the questionnaires were captured (using the scale values) in Microsoft Excel before being handed to the statistician. The statistician conducted the necessary tests, which was then interpreted and analysed. This ensured that any persons involved in the study could not ascertain who responded. During the interview process, emphasis was made on participants' details remaining confidential unless permission is provided by the interviewee to use his or her identity, should there be any reason to do so.

4.8 Summary

This chapter explained the research approach, the study design and the sampling process. An explanation of how data was collected was discussed. The research instrument was tested during a pilot study before the main study could take place. The data analysis methods were explained. Lastly, the ethical principles adopted were highlighted. The next chapter discusses the findings, with interpretation and discussion of the primary data.

CHAPTER 5 - RESULTS AND DISCUSSION: STATEMENT OF FINDINGS AND DISCUSSION OF THE PRIMARY DATA

5.1 Introduction

The previous chapter discussed the research methodology. This chapter explains how the qualitative and quantitative data gathered in this study were analysed and the findings obtained from the analysis. The questionnaire was the primary tool used to collect quantitative data and was distributed to the sample population as discussed in the previous chapter. The primary instrument used to collect the qualitative data was open-ended questions in the questionnaire followed by interviews. The quantitative data collected was analysed with Statistical Package for the Social Sciences version 24.0 (SPSS). The results presented the descriptive statistics in the form of tables and figures. Inferential techniques included the use of correlations and chi-square test values, interpreted using the p-values. The qualitative data was analysed using NVivo 11.

5.2 Quantitative results

5.2.1 The sample

The sample consisted of 232 participants, 23 of whom were involved in the pilot study and excluded from the main study. Of the 209 participants, 156 returned questionnaires, resulting in a 74.6% response rate.

5.2.2 Data gathering instrument

The questionnaire consisted of 55 items, with a level of measurement at a nominal (low) or an ordinal (high) level. The questionnaire was divided into nine categories, each measuring various themes as illustrated in Table 5.1:

Table 5.1 Themes in the questionnaire

A	Demographic data
B	Technology literacy and aptitude
C	Internal DUT support
D	Policies and procedures
E	Ease of use
F	Software user friendliness
G	Functionality
H	Time
I	Training and development

5.2.3 Pilot study (23 participants)

A pilot study was conducted with 23 participants. As explained in Chapter 4, the pilot study helped identify any ethical and practical shortcomings. These participants were excluded from the main study.

5.2.4 Quantitative results of main study (209 participants, 156 returns)

5.2.4.1 Reliability and validity of the questionnaire

As described in Chapter 4, the two most important aspects of precision are **reliability** and **validity**. A Cronbach's alpha reliability coefficient of 0.70 or higher is considered as "acceptable" (IJME 2011).

Table 5.2 Cronbach's Alpha for each theme in the questionnaire

Theme		Number of Items	Cronbach's Alpha
B	Technology literacy and aptitude	6	0.797
C	Internal DUT support	6	0.861
D	Policies and procedures	4	0.843
E	Ease of use	6	0.847
F	Software user friendliness	4	0.912

G	Functionality	6	0.928
H	Time	3	0.883
I	Training and development	4	0.755

The reliability scores for all sections (Table 5.2) exceeded the recommended Cronbach's alpha value. This indicated the degree of acceptability and consistent scoring for the items in these sections of the questionnaire.

5.2.4.2 Factor analysis

To prove sampling adequacy to apply factor analysis, the requirement is that KMO Measure of Sampling Adequacy should be greater than 0.50 and Bartlett's Test of homogeneity of variances less than 0.05. "Bartlett's test of sphericity indicates whether the correlation matrix is an identity matrix, which would in turn mean that the variables in the table are unrelated. Very small values (0.05) indicate that there are probably significant relationships among the variables" (Doble and Supriya 2011). Factor analysis was applied to the Likert scale items. Certain components were sub-divided into smaller components. This is explained below in the resulting rotated component matrix.

As can be seen in Table 5.3, the conditions were satisfied in all instances, proving sampling adequacy homogeneity of variances. The results below are the factor results for the positive loading statements of the research.

Table 5.3 KMO Measure and Bartlett's Test of Sphericity for all themes

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.875
Bartlett's Test of Sphericity	Approx. Chi-Square	3422.196
	df	666
	Sig.	.000

The conditions for factor analysis are met with KMO > 0.5 and Bartlett's test < 0.05.

5.2.4.3 Rotated Component Matrix

The main use of factor analysis is to reduce or minimise the number of variables (that have high loadings on each factor) and to identify relationships between variables. It simplifies the interpretation of the factors. “Principal Component Analysis reduces dimensions by projecting the whole data set onto a completely separate space. The original variables are transformed into a new set of artificial ones, which are the Principal Components” (*Statistics how to* 2014). PCA is used when data sets exhibit multi-collinearity. “Principal component analysis technique is used to combine two or more variables by a single factor. The extraction of principal components amounts to a variance maximizing (varimax) rotation of the original variable space” (Doble and Supriya 2011). The PCA method is the factor analysis extraction method and the rotation method used was Varimax with Kaiser Normalization.

PCA took a smaller set of data (variables), which was still representative of the larger set of data, so that data were simpler to understand. It preserved as much data as possible to ensure that accuracy was maintained. The range of variables was standardised, meaning that each variable contributed equally to the end-result using data ranges. This was done to ensure that there was no bias in the analysis. The results are presented in Table 5.4.

Factors with negative loadings were omitted, as well as factors loading less than 0.5.

Table 5.4 Principle Component Matrix values

Rotated Component Matrix[a]								
	Component							
	1	2	3	4	5	6	7	8
I am very comfortable using a PC at work	.085	.121	.804	.034	.064	.122	.037	-.148
I send and respond to emails on a daily basis	.098	-.026	.819	-.050	-.032	-.097	.064	.060
I regularly browse the intranet to find out about DUT related matters	.047	-.099	.492	.007	-.031	.061	.193	.589
I regularly browse the internet for personal, work, and study matters	.108	-.066	.739	.136	.011	.087	-.119	.216
I am very comfortable using work related applications like ITS and iEnabler	.331	.188	.642	.051	.151	-.074	.051	.083
I am very comfortable using work related applications like BB	.752	.060	.259	.173	.084	.104	.059	.095

I know what process to follow when I need assistance on BB	.522	.432	.071	.246	-.002	.057	.009	.000
There are policies, procedures and guideline documentation available	.202	.484	.143	.411	-.162	-.044	.047	.499
This documentation is easily accessible to all staff to follow when assistance on BB is needed	.113	.422	.004	.419	-.048	.086	.164	.641
Any queries on BB are answered promptly and in time for me to continue with my task	.101	.237	-.077	.817	-.039	.158	.157	.068
Contact details for BB support staff are known	.202	.183	.073	.812	-.007	-.019	.048	.178
Support staff are ready to assist and available when needed	.096	.297	.170	.786	.184	.120	.163	-.002
There are known policies in place at DUT regarding BB	.087	.546	.049	.268	.104	-.085	.049	.385
Academics (including myself) are aware of procedures to follow regarding the use of BB e.g. How to add my subject/module to BB	.127	.771	.150	.143	.171	.014	.065	-.095
There are known guidelines to follow to add my subject and class and course material to BB	.234	.808	-.030	.224	.031	.165	.095	.099
I follow the guidelines provided to allow the use of BB to aid in my teaching	.307	.753	-.073	.160	-.021	.222	.135	.047
I know how to access BB	.684	.079	.256	.249	-.022	.036	-.057	-.117
I know how to access student submissions on BB	.747	.060	.104	.002	-.017	.052	-.091	.335
BB is easy to use	.632	.158	.066	.100	.180	.427	.214	.118
The adoption on BB has positively changed the way I teach	.589	.290	.121	.048	.052	.402	-.041	.076
I can easily find my way around BB	.672	.146	.021	.098	.187	.469	.061	-.091
Screens are easy on the eyes	.497	.041	.010	.191	.170	.705	.119	.024
I can understand where to find the things I need	.590	.264	-.010	.089	.200	.532	.106	.044
I can understand the messages I get from BB and can act accordingly	.640	.165	.114	.066	.190	.542	-.011	-.012
I know what functionality is available on BB	.686	.167	-.097	.072	.065	.367	.199	.175
I know how to use BB to add my subject material	.808	.135	.020	.052	-.017	.165	.087	.004
I know how to use BB to add my class or a student	.789	.084	.061	-.038	.073	.026	.129	.072
I know how to use BB to add/edit/update course material	.855	.041	.159	.101	.072	.028	.121	-.091
I know how to use BB to put up notifications and due dates	.865	.135	.117	.081	.136	.028	.021	-.024
I know how to respond to students using BB	.811	.104	-.010	.079	.123	.086	.081	.053
There is adequate time during work hours to attend to lectures and BB	.176	.007	.111	.033	.901	.039	-.024	.027
I find the workload between my lectures and the maintenance on BB manageable	.244	.062	.028	.015	.856	.055	.031	-.065
Using BB is not time consuming	.032	.100	-.008	.020	.856	.163	.003	-.018
I received training on how to use BB	.230	.093	.002	.264	-.304	.003	.673	-.120
I received a training manual on how to use BB	.030	.079	.037	.044	.096	.036	.825	.132
On-line help on BB is useful and adequate	.377	.155	.039	.164	.101	.162	.651	.177
I am able to advise my students on how to use BB	.759	.144	.091	.035	.056	-.026	.313	.063

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 7 iterations.

It is noted that the statements that constituted components 3, 4, 6 and 7 loaded perfectly along a single component. This means that these sections measured what they had set out to measure. However, components 4 and 6 loaded along the same component, indicating an overlap in terms of the measurements.
The remaining factors split over 2 or 3 components.

5.2.4.4 Questionnaire Section Analysis

The section that follows, analyses the scoring patterns of the respondents per variable per theme. The results presented are summarised percentages for the variables that constitute each section. Results are then further analysed according to the importance of the statements.

5.2.4.4.1 Section A: Demographic data

This section summarises the demographic characteristics of the respondents.

5.2.4.4.1.1 Age

Table 5.5 shows the demographic variable age that the respondents belong to.

Table 5.5 Age to which the respondents belong.

Age Group					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	≤ 30	33	21,2	21,3	21,3
	31 - 35	12	7,7	7,7	29,0
	36 - 40	17	10,9	11,0	40,0
	41 - 45	39	25,0	25,2	65,2
	46 - 50	23	14,7	14,8	80,0
	> 50	31	19,9	20,0	100,0
	Total	155	99,4	100,0	
Missing	System	1	0,6		
Total		156	100,0		

The most responses were received from respondents that were 41 years or older.

5.2.4.4.1.2 Gender

Table 5.6 Gender to which the respondents belong.

Gender					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	78	50,0	52,0	52,0
	Female	72	46,2	48,0	100,0
	Total	150	96,2	100,0	
Missing	System	6	3,8		
Total		156	100,0		

As can be seen in Table 5.6, the overall ratio of males to females is 52:48. This means that an approximately equal number of males and females responded to the survey.

*Age Group * Gender Cross-tabulation:*

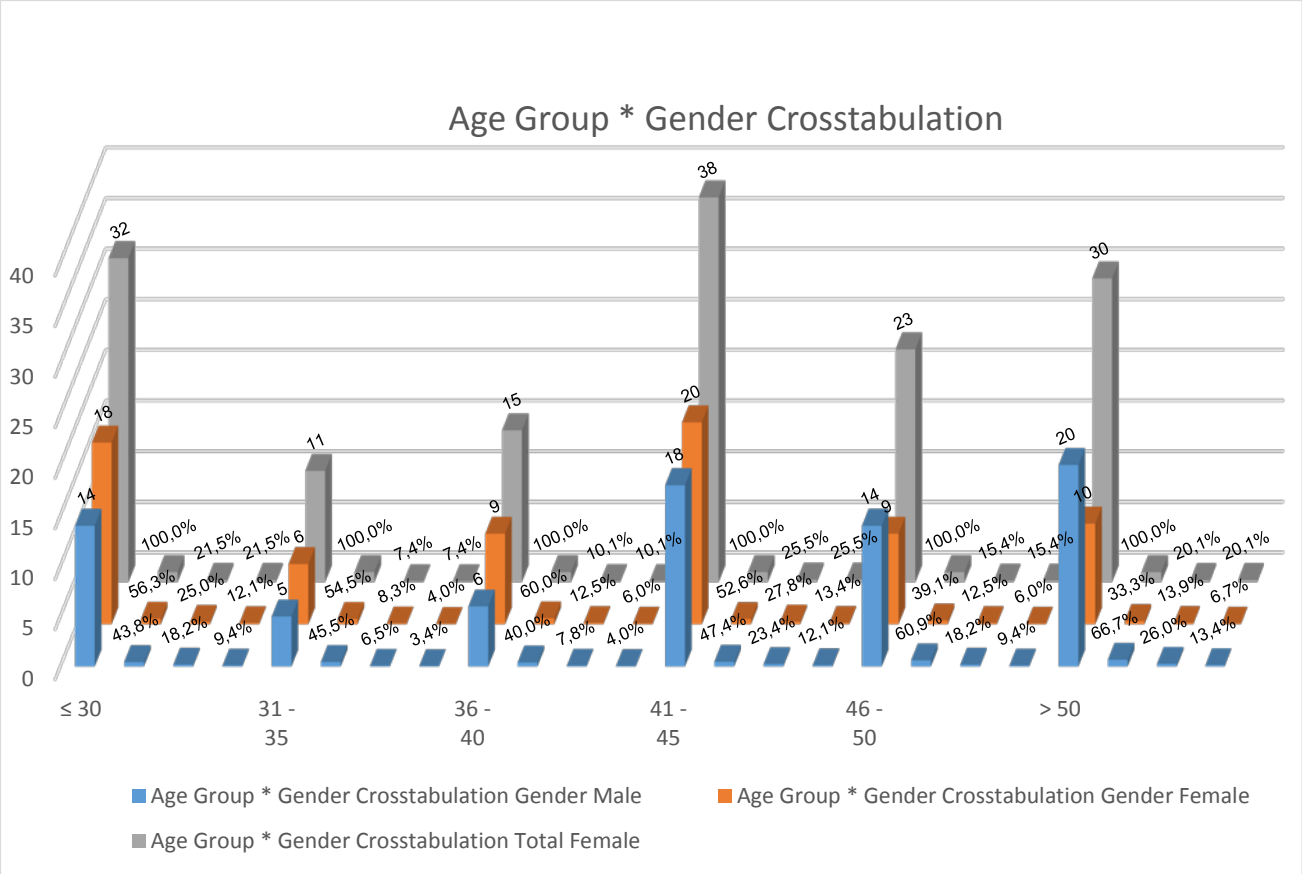

*Figure 5.1 Age Group * Gender Cross-tabulation*

Figure 5.1 shows the age group and gender cross-tabulation. An example of the cross-tabulation between an age category and gender (Table 5.7) is explained.

Table 5.7 Overall gender distribution by age for the 41-45 age group.

			Gender		Total
			Male	Female	
Age group	41 - 45	Count	18	20	38
		% within Age Group	47.4%	52.6%	100.0%
		% within Gender	23.4%	27.8%	25.5%
		% of Total	12.1%	13.4%	25.5%

The full table is available in Appendix O1.

Within the age category of 41 to 45 years, 47.4% were male. Within the category of males (only), 23.4% were between the ages of 41 to 45 years. This category of males between the ages of 41 to 45 years formed 12.1% of the total sample. Similarly 13.4% of the total sample consisted of women in the age group 41-45.

5.2.4.4.1.3 Faculty

Table 5.8 Faculty to which the respondents belong.

		Number of responses	Percent
Valid	Accounting and Informatics	53	34,0
	Applied Sciences	23	14,7
	Arts and Design	12	7,7
	Engineering and the Built Environment	12	7,7
	Management Sciences	42	26,9
	Health Sciences	14	9,0
	Total	156	100,0

As can be seen in Table 5.8, most responses received where from the Faculty of Accounting and Informatics. This can be linked to the information gained during the qualitative findings, during the interviews with key role players involved in the e-learning project at DUT. The case of DUT using a LMS, explained in the results of the main study (qualitative) under the Interviews section (5.3.3), revealed that this faculty

took a more formalised approach to the community of practice technique to promote online learning. This could explain why most of the responses came from this faculty. The smaller number of responses received, were from the Faculty of Arts and Design. This could be because the scope of the research was limited to only specific campuses, while the majority of faculty members from Arts and Design reside on a different campus. A similar low response was from the Faculty of Engineering and the Built Environment. During the interview process, it was clear that this faculty preferred the Moodle LMS as opposed to Blackboard (BB). They were in fact using a LMS, but were not keen on completing the questionnaire purely because questions made mention of BB. There would have possibly been a better response rate from this faculty if the term LMS was used instead of BB. The interviews revealed that the Faculty of Management Sciences have a similar community of practice group to the Faculty of Accounting and Informatics. The number of responses received from this faculty shows enthusiastic support for the use of a LMS.

As per the faculty Table 5.8, a similar response rate was received from the Arts and Design, Health Sciences, and the Engineering and the Built Environment faculties. This was significantly lower than that of the Applied Sciences, Management Sciences, and the Accounting and Informatics with ratios of 1 : 1 : 1 : 2 : 4 : 5 (7.7% : 9% : 7.7% : 14.7% : 26.9% : 34%) respectively.

5.2.4.4.1.4 Length of service at any HEI

Table 5.9 shows that nearly 79% of the respondents had been employed at DUT for 5 years or more. This is useful, as it indicates responses from experienced academics who are relatively well skilled in teaching.

Table 5.9 Lecturing service at any HEI that the respondents were employed at

		Number of responses	Percent
Valid	< 5	33	21,2
	5 - 10	38	24,4
	11 - 15	21	13,5
	16 - 20	31	19,9
	21 - 25	17	10,9

	> 25	14	9,0
	Total	154	98,7
Missing responses		2	1,3
Total		156	100,0

A total of 71 respondents have teaching experience of between 1 and 10 years, whilst 83 respondents have teaching experience of 11 years and more. This indicates that the participants were of an equal mix of well-experienced academic staff compared to those that are relatively new to teaching.

*Years of lecturing service at any Higher Educational Institution * Age Group Cross-tabulation:*

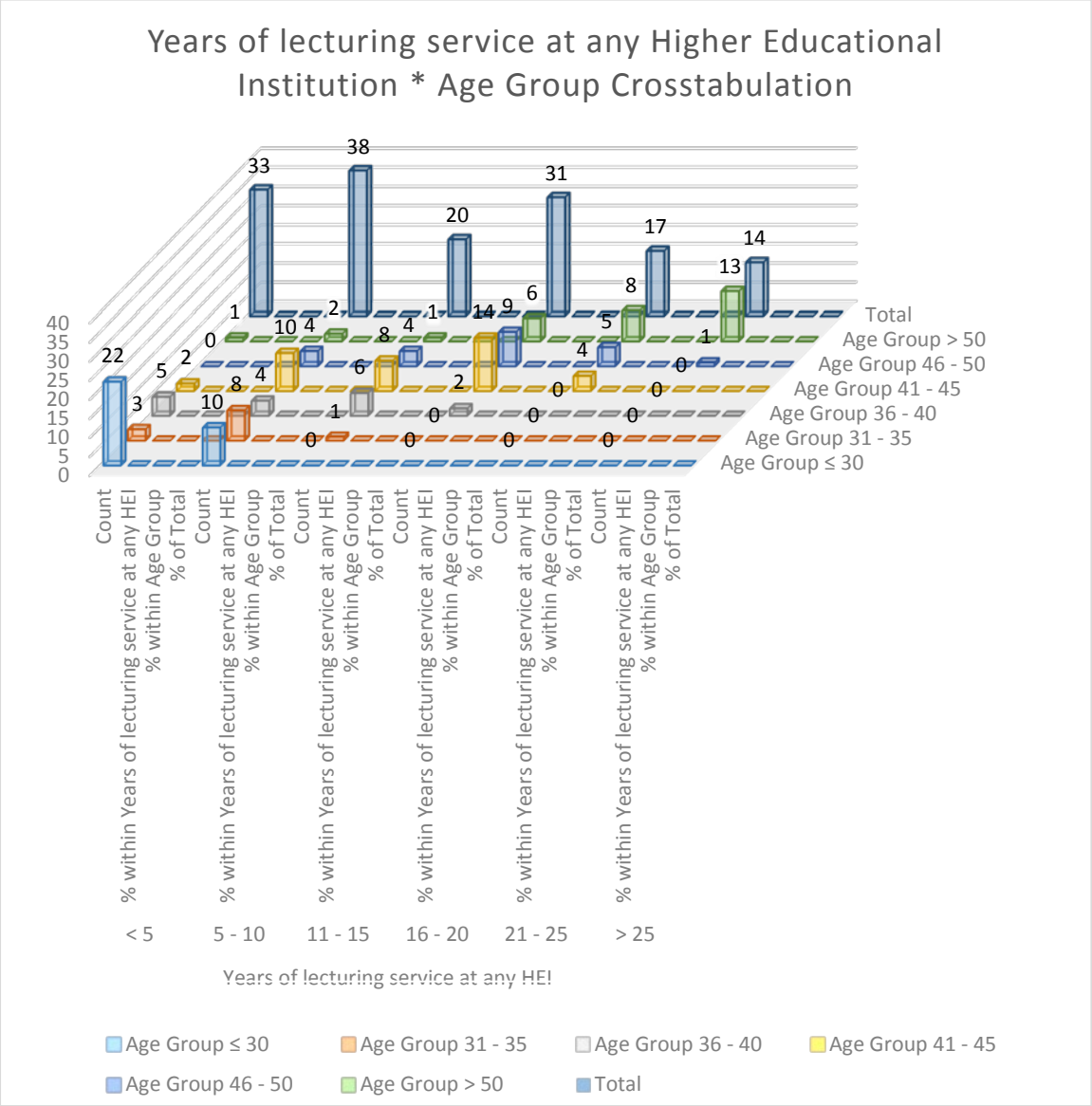

*Figure 5.2 Years of lecturing service at any Higher Educational Institution * Age Group Cross-tabulation*

As can be seen in figure 5.2 there are 13 respondents with more than 25 years of lecturing service that fall into the age group of more than 50 years old. There are 22 respondents with less than 5 years of lecturing service that fall into the age group less than or equal to 30 years old. A total of 106 respondents (38 + 20 + 31 +17) have lecturing service between 5 to 25 years across the different age bands. This shows that respondents are experienced in lecturing across the age bands.

5.2.4.4.1.5 Ethnic group

Table 5.10 Ethnic group to which respondents belong.

		Number of responses	Percent
Valid	African	65	41,7
	Coloured	8	5,1
	Indian	69	44,2
	White	13	8,3
	Total	155	99,4
Missing responses		1	0,6
Total		156	100,0

Table 5.10 shows that the majority responses where received from the African and Indian members of staff with a cumulative of approximately 86%. There was a 75% response rate for the main study which means that of the 156 responses, 134 respondents were either African or Indian and the remaining 22 responses were from either the Coloured or White ethnic groups.

5.2.4.4.1.6 Citizenship

Table 5.11 Citizenship to which the respondents belong.

		Number of responses	Percent
Valid	SA citizen	133	85,3
	Non SA citizen	19	12,2

	Total	152	97,4
Missing responses		4	2,6
Total		156	100,0

As can be seen in Table 5.11 majority (85%) responses were from SA citizens and 12% from non SA citizens.

5.2.4.4.1.7 Nature of subject

Table 5.12 Nature of the subject that the respondents teach.

		Number of responses	Percent
Valid	Theory	46	29,5
	Practical	2	1,3
	Theory and Practical	105	67,3
	Total	153	98,1
Missing responses		3	1,9
Total		156	100,0

Table 5.12 shows that only two responses were received from lecturers who teach subjects that are purely practical in nature. This indicates that the nature of the subject does influence the Perceived Ease Of Use (PEOU) of the LMS. The majority (67%) of the subjects are of a mixed nature, theory and practical. This means, that to promote adoption of the LMS, it needs to cater for subjects with course material that are both theoretical and practical.

5.2.4.4.1.8 Mode of study

Table 5.13 Mode of study of the subject or subjects that the respondents teach.

		Number of responses	Percent
Valid	Part-time	10	6,4
	Full-time	94	60,3
	both part-time and full-time	46	29,5
	Total	150	96,2
Missing responses		6	3,8
Total		156	100,0

The mode of study of the subject or subjects that the respondents teach, represented in Table 5.13, shows the ratio of full-time only to both part-time and full time studies is approximately 2:1 (60%; 29.5%). Both the part-time and full time percentages are interesting, because the LMS should appeal to lecturers that teach part-time students in order to reach the part-time students, despite the student's geographical location and availability.

*Mode of study * Nature of the subject I teach Cross-tabulation:*

An example of the cross-tabulation between the mode of study and nature of the subject I teach (Table 5.14) is explained. The full table is represented in Appendix O1 Frequencies.

Table 5.14 Cross-tabulation between "Mode of study" and "Nature of the subject I teach".

			Nature of the subject I teach			Total
			Theory	Practical	Theory and Practical	
Mode of study	Full-time	Count	25	1	68	94
		% within Mode of study	26.6%	1.1%	72.3%	100.0%
		% within Nature of the subject I teach	54.3%	100.0%	66.7%	63.1%
		% of Total	16.8%	0.7%	45.6%	63.1%

Within the mode of study category of full-time teaching, 72.3% teach subjects that are both theory and practical in nature. Within the category of theory and practical (only), 66.7% were teaching full-time students. This category of theory and practical teaching over the full-time mode of study formed 45.6% of the sample.

Table 5.14 also shows that for the category Practical, there is approximately 1% across the full-time mode of the study group. This shows that there are very few respondents teaching full-time subjects that are purely practical in nature using the LMS.

Table 5.15 Respondents use of other LMSs other than BB.

	Frequency	Percent
Yes	62	40.0
No	93	60.0
Total	155	100.0

The majority (60%) of respondents have not used any other LMS software (Table 5.15) apart from BB. The other 40% have used other LMSs, represented in Table 5.16.

Table 5.16 Other LMSs respondents used other than BB

	Frequency	Percent
WebCt	5	3.2
Webct and Moodle	3	1.9
Webct and Desire2learn	1	0.6
Moodle	41	26.3
Desire2learn	2	1.3
Other	8	5.1

From the 40% that have used other LMSs, 26.3% from this group used Moodle and approximately 2% used Moodle and WebCT, which is an earlier version of BB. This indicates that respondents are relatively familiar with LMSs. The other category (5.1%) includes the e-learning software (Table 5.17) with respective percentages.

Table 5.17 LMSs respondents used other than Webct, Moodle, and Desire2learn

	Frequency	Percent
BB	1	0.6
cisco	1	0.6
edmodo	1	0.6
global next university	1	0.6
lemass	1	0.6
sakai	1	0.6
tlz	1	0.6
turn it in as a LMS	1	0.6

This shows that staff may have knowledge of BB and they may have knowledge of another LMS with similar functions as BB.

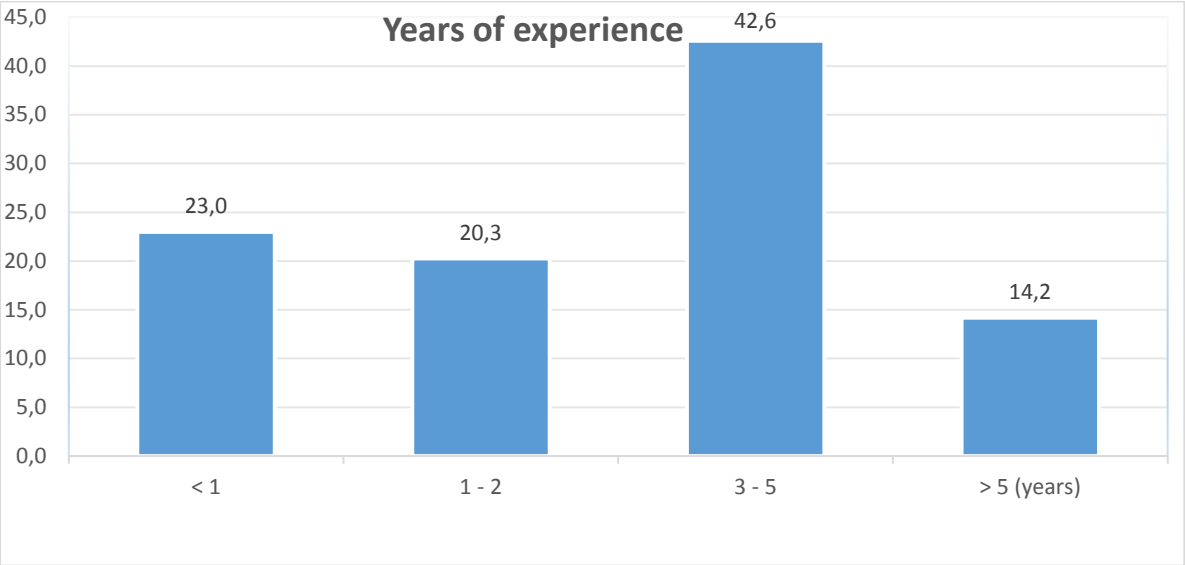

Figure 5.3 Years' of experience using any LMS

Overall, the ratio of respondents with three or more years' of LMS experience to those with two years or less' of LMS experience is approximately 6:4 (57%:43%) (Figure 5.3). This means that for every 10 respondents at least six respondents have three or more years of LMS experience. This indicates that respondents are not new to an environment that supports e-learning.

Table 5.18 Percentage of respondents who have students at DUT registered on BB for the subject or module that he or she teaches

	Frequency	Percent
Yes	136	88.9
No	17	11.1
Total	153	100.0

As can be seen in Table 5.18, approximately 89% of respondents already have students that are actively registered on the LMS. This indicates that the majority of the respondents are in fact using the LMS.

5.2.4.4.2 Section B: Technology literacy and aptitude

This was an application of a single sample chi square test that looks at whether the distribution per alternative is similar. The null hypothesis states that there is no difference in the frequencies per option. The alternative indicates that there is a difference (with $p < 0.05$).

This section deals with the subjects that the respondents teach, their use of LMSs, their perception of a LMS and their adoption of a LMS at DUT.

Table 5.19 Items that made up the theme *Technology literacy and aptitude*

Section B		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Chi-Square p-value
I am very comfortable using a PC at work	B14	78,2%	16,7%	3,2%	0,6%	1,3%	0,000
I send and respond to emails on a daily basis	B15	76,3%	16,7%	5,1%	0,6%	1,3%	0,000
I regularly browse the intranet to find out about DUT related matters	B16	40,9%	34,4%	14,3%	5,8%	4,5%	0,000
I regularly browse the internet for personal, work, and study matters	B17	65,2%	31,0%	3,2%	0,0%	0,6%	0,000
I am very comfortable using work related applications like ITS and iEnabler	B18	47,1%	34,8%	10,3%	6,5%	1,3%	0,000
I am very comfortable using work related applications like BB	B19	44,0%	30,0%	10,7%	12,7%	2,7%	0,000
I often require assistance when using IT software	B20	10,5%	21,1%	23,0%	25,7%	19,7%	0,040

The following patterns were observed from Table 5.19:

- The statements that measured computer literacy with regards to basic use of the PC (B14), emails (B15) and the use of the internet (B17) show significantly higher levels of *agreement* (Strongly Agree + Agree), whilst levels of *agreement* are lower (but still greater than levels of *disagreement* (Disagree+Strongly Disagree)) for the use of the intranet (B16), the DUT internal applications like ITS and iEnabler (B18), and the use of BB (B19).
- B20, which measured assistance required when using IT software, indicated higher levels of *Strongly Disagree*, and *Disagree* than of *Agree* and *Strongly Agree*. This indicates that respondents did not require IT assistance or support. That is, the more computer literate the respondent is, the less support is required.
- The significance of the differences, Chi-square, was tested and shown in Table 5.19, and was found to be significant with values < 0.05.

To determine whether the scoring patterns per statement were significantly different per option, a chi-square test was done. The null hypothesis claims that similar numbers of respondents scored across each option for each statement (one statement at a time). The alternate states that there is a significant difference between the levels of agreement and disagreement. The results are shown in the tables in Appendix O5 questions B14 to B20. The highlighted sig. values (p-values) are less than 0.05 (the level of significance), it implies that the distributions were not similar. That is, the differences between the way respondents scored (Agree, Neutral, and Disagree) were significant.

5.2.4.4.3 Section C: Internal DUT support

It is important to note that this section refers to the technical software (LMS) support and not training and development of academic staff.

Table 5.20 Scoring patterns for questions C21-C26, relating to the theme *Internal DUT support* experienced by respondents

Section C		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Chi-Square p-value
I know what process to follow when I need assistance on BB	C21	22,9%	43,8%	15,7%	15,0%	2,6%	0,000
There are policies, procedures and guideline documentation available	C22	13,0%	34,4%	42,2%	8,4%	1,9%	0,000
This documentation is easily accessible to all staff to follow when assistance on BB is needed	C23	11,9%	32,5%	39,1%	13,9%	2,6%	0,000
Any queries on BB are answered promptly and in time for me to continue with my task	C24	14,7%	30,0%	36,7%	15,3%	3,3%	0,000
Contact details for BB support staff are known	C25	17,9%	39,7%	24,5%	13,2%	4,6%	0,000
Support staff are ready to assist and available when needed	C26	14,6%	41,7%	28,5%	9,9%	5,3%	0,000

The following patterns were observed from Table 5.20:

- Responses to some statements show *neutral* responses for policies, procedures and guideline documents (C22) that are related to LMS technical support (which is different to Section D LMS policies, procedures and guidelines, for example, the process to follow to get real-time assistance), accessibility of documentation (C23) and real-time support

(C24) are higher than other levels of *disagreement* whilst other *neutral* responses are lower (but still greater than levels of disagreement) for statements that indicate support and support contact details (C21, C25, C26). This means that respondents were aware that support staff are available and ready to assist. They are also aware that policies, procedures and guideline documents exist, however they have not put the support process to test to indicate if it works or not when support is required.

- Results for knowledge on how to get support (C21), support contact details (C25), and availability of support staff (C26) indicate higher levels of *agreement* (Strongly Agree + Agree).
- The significance of the differences, Chi-square, was tested and shown in Table 5.20, and was found to be significant with values < 0.05.
- The graphical representation is found in Appendix O4 section C.

5.2.4.4.4 Section D: Policies, procedures and guidelines

Table 5.21 summarises the scoring patterns for the questions relating to the LMS usage policies and procedures, Questions D27 – D30. The questions in this theme questioned whether the respondents were aware of policies, procedures and guidelines related to the LMS.

Table 5.21 Items that made up the theme *Policies and Procedures*

Section D		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Chi-Square p-value
There are known policies in place at DUT regarding BB	D27	10,5%	33,6%	44,1%	8,6%	3,3%	0,000
Academics (including myself) are aware of procedures to follow regarding the use of BB e.g. How to add my subject / module to BB	D28	16,7%	47,3%	21,3%	12,7%	2,0%	0,000
There are known guidelines to follow to add my subject and class and course material to BB	D29	17,9%	48,3%	20,5%	11,3%	2,0%	0,000
I follow the guidelines provided to allow the use of BB to aid in my teaching	D30	15,0%	47,6%	24,5%	11,6%	1,4%	0,000

The following patterns were observed from Table 5.21:

- For statements relating to the respondents' knowledge of functionality on the LMS (D28, D29, D30), respondents' levels of *agreement* were

significantly higher than the levels of *disagreement*. For statements relating to LMS specific policies (D27), however, the *neutral* responses were higher. Although respondents *agreed* that they were aware of and followed the procedures and guidelines for using the LMS, they were *unsure or neutral* on whether e-learning policies were in place at DUT. The DUT e-learning policy is however on the staff portal. This could mean that either the policy was made available on the portal without any communication to staff informing them that the policy is available or that communication was sent out but staff did not read it.

- All statements show much lower levels of *disagreement* (Disagree + Strongly Disagree). This fact indicated that there is existing e-learning documentation available to assist staff to use a LMS.
- The significance of the differences is tested and shown in Table 5.21 with values < 0.05.

5.2.4.4.5 Section E: Ease of use (knowledge on how to use a LMS)

This section presents the results for the ease of use (knowledge on how to use a LMS), questions E31 – E36.

Table 5.22 Items that made up the theme *Ease of Use* (knowledge on how to use a LMS)

Section E		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Chi-Square p-value
I know how to access BB	E31	51,9%	33,8%	5,8%	7,1%	1,3%	0,000
I know how to access student submissions on BB	E32	33,1%	31,2%	16,2%	16,2%	3,2%	0,000
BB is easy to use	E33	23,8%	37,1%	23,8%	11,9%	3,3%	0,000
I very seldom require assistance on BB	E34	20,5%	34,4%	22,5%	19,9%	2,6%	0,000
I support subject content being presented online	E35	32,0%	45,3%	15,3%	5,3%	2,0%	0,000
The adoption on BB has positively changed the way I teach	E36	22,0%	29,3%	36,7%	9,3%	2,7%	0,000

The following patterns were observed from Table 5.22:

- The majority (85.72%) of respondents *agreed* (Strongly Agree + Agree) that they know how to access the LMS (E31).

- Results for all statements indicating the Ease of Use (knowledge on how to use a LMS) (E31, E32, E33, E34 and E35) showed significantly high levels of *agreement* (Strongly Agree + Agree). This indicates that respondents found the LMS easy to use and are knowledgable on how to use the functionality provided by the LMS.
- Overall the ratio of *agreement* (Strongly Agree + Agree) to *neutral* and levels of *disagreement* (Disagree + Strongly Disagree) for the effect that the LMS has had on their teaching (E36) is approximately 1:1 (51.3% : 48.7%). This fact shows that there is approximately an equal number of respondents who feel that the LMS has positively changed the way they teach as opposed to respondents who were *neutral* or in *disagreement* with the statement.
- The significance of the differences is tested and shown in Table 5.22 with values < 0.05.

5.2.4.4.6 Section F: Software user friendliness

Table 5.23 Scoring patterns for questions relating to the theme *Software user friendliness.*

Section F		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Chi-Square p-value
I can easily find my way around BB	F37	21,9%	38,4%	23,8%	12,6%	3,3%	0,000
Screens are easy on the eyes	F38	19,7%	44,7%	21,1%	11,2%	3,3%	0,000
I can understand where to find the things I need	F39	18,7%	42,7%	22,0%	14,7%	2,0%	0,000
I can understand the messages I get from BB and can act accordingly	F40	21,9%	41,1%	27,2%	7,3%	2,6%	0,000
I find it difficult to use BB	F41	5,4%	16,1%	25,5%	30,9%	22,1%	0,000

The following patterns were observed from Table 5.23:

- Some statements show significantly higher levels of *agreement* (Strongly Agree + Agree) (F37, F38, F39, F40) whilst other levels of *agreement* are lower than levels of *disagreement* (F41).
- F41 indicates higher levels of *disagreement* which indicates that the LMS is Perceived as Easy to Use.

- Responses to all statements in this theme indicates that respondents find the LMS software user friendly and easy to use. Software user friendliness therefore is a contributing factor towards PEOU.
- The significance of the differences, Chi-square, was tested and was found to be significant with values < 0.05.
- The graphical representation is found in Appendix O4 section F.

5.2.4.4.7 Section G: Functionality

This theme captured respondents' experiences of the functionality of the LMS.

Table 5.24 Items that made up the theme *Functionality*

Section G		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Chi-Square p-value
I know what functionality is available on BB	G42	13,3%	42,7%	24,7%	14,7%	4,7%	0,000
I know how to use BB to add my subject material	G43	27,8%	50,3%	9,9%	8,6%	3,3%	0,000
I know how to use BB to add my class or a student	G44	26,5%	33,1%	17,2%	17,2%	6,0%	0,000
I know how to use BB to add/edit/update course material	G45	31,6%	42,8%	9,9%	11,8%	3,9%	0,000
I know how to use BB to put up notifications and due dates	G46	31,8%	37,1%	13,9%	13,2%	4,0%	0,000
I know how to respond to students using BB	G47	26,3%	27,6%	25,0%	17,8%	3,3%	0,000

The following patterns were observed from Table 5.24:

- All statements show significantly high levels of *agreement* (Strongly Agree + Agree). This indicates that respondents are aware of the functionality that the LMS offers and are able to use the functionality to support their teaching. Being able to use the LMS effectively contributed to the respondents PEOU of the LMS.
- The significance of the differences is tested and shown in Table 5.24 with values < 0.05.

5.2.4.4.8 Section H: Time

This theme captured respondents' perceptions of time allocation of the LMS.

Table 5.25 Items that made up the theme *Time*

Section H		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Chi-Square p-value
There is adequate time during work hours to attend to lectures and BB	H48	8,6%	29,6%	19,7%	27,0%	15,1%	0,000
I find the workload between my lectures and the maintenance on BB manageable	H49	5,4%	26,4%	31,8%	23,6%	12,8%	0,000
Additional time should be allocated for the housekeeping on BB	H50	25,8%	38,4%	25,2%	7,9%	2,6%	0,000
Using BB is not time consuming	H51	9,4%	22,1%	27,5%	25,5%	15,4%	0,002

The following patterns were observed from Table 5.25:

- The response concerning housekeeping (H50) (64.24%) indicate that more time must be allocated for the housekeeping (keeping material up-to-date) and relevant on the LMS. This indicates that Time is a significult role player in PEOU because without adequate amount of time respondents are not able to maintain the content and this could in the long run affect the content being out of date and result in the respondents not wanting to use the software.
- H48, H49 and H51 show higher levels of *disagreement*
- Overall, it is indicated that time is a major contributing factor towards the PEOU use of the LMS.
- The significance of the differences is tested and shown in Table 5.25 with values < 0.05.

5.2.4.4.9 Section I: Training and development

This theme captured respondents' experiences of training and development of the LMS.

Table 5.26 Items that made up the theme *Training and development*

Section I		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Chi-Square p-value
I received training on how to use BB	I52	21,2%	41,7%	11,3%	17,2%	8,6%	0,000
I received a training manual on how to use BB	I53	7,3%	16,7%	20,0%	38,7%	17,3%	0,000
On-line help on BB is useful and adequate	I54	8,8%	31,8%	41,2%	12,2%	6,1%	0,000
I am able to advise my students on how to use BB	I55	15,4%	38,9%	23,5%	16,8%	5,4%	0,000

The following patterns were observed from Table 5.26:

- Statements relating to LMS training (I52) indicate 62.91% are in *agreement* that they received training on the LMS
- Responses for I53 (receipt of a BB manual) show that 56% of respondents did not receive a training manual for the LMS and 40.54% *Agree* that the on-line help is useful and adequate. 54.36% are able to advise students on how to use BB (I55)
- These figures show that training for the LMS was or is being provided, that training manuals do exist (electronic and hardcopies) and that they do aid in allowing the respondents to advise their students on how to use the LMS.
- Training and development is a contributing factor on the PEOU of a LMS.
- The significance of the differences is tested and shown in Table 5.26 with values < 0.05.

5.2.4.5 Hypothesis testing and crosstab frequencies

A significant result is indicated with "p < 0.05". These values are highlighted with a *. A second Chi-square test was performed to determine whether there was a statistically significant relationship between the variables (rows vs columns).

The null hypothesis states that there is no association between the two. The alternate hypothesis indicates that there is an association. “A null hypothesis is a hypothesis that says there is no statistical significance between the two variables in the hypothesis…An alternative hypothesis simply is the inverse, or opposite, of the null hypothesis” (Gonzalez 2019).

Table 5.27 lists the variables and the p-values that have a significant relationship for age, gender, ethnic group, and citizenship. The full table, Appendix O6 - Hypothesis Testing, also shows all values without an * (or p-values more than 0.05) that do not have a significant relationship.

Table 5.27 Variables and the p-values

Pearson Chi-Square Tests				
	Age Group	Gender	Ethnic Group	Citizenship
I regularly browse the intranet to find out about DUT related matters	.005*			
I regularly browse the internet for personal, work, and study matters	.032*			
I am very comfortable using work related applications like ITS and iEnabler				.047*
I know what process to follow when I need assistance on BB		.035*		
There are policies, procedures and guideline documentation available	.022*	.030*		
This documentation is easily accessible to all staff to follow when assistance on BB is needed	.037*	.002*		
Any queries on BB are answered promptly and in time for me to continue with my task	.012*	.003*		
Contact details for BB support staff are known			.042*	
Support staff are ready to assist and available when needed	.002*			
There are known policies in place at DUT regarding BB			.026*	
I follow the guidelines provided to allow the use of BB to aid in my teaching		.036*		
I know how to access student submissions on BB				.020*
I support subject content being presented online		.008*		
The adoption on BB has positively changed the way I teach		.001*		
I find it difficult to use BB	.016*			
I know how to use BB to add my subject material				.022*
I know how to use BB to add my class or a student		.029*		
I know how to use BB to add/edit/update course material			.024*	.048*
I know how to use BB to put up notifications and due dates		.041*	.028*	
I find the workload between my lectures and the maintenance on BB manageable			.027*	
Additional time should be allocated for the housekeeping on BB			.017*	
Using BB is not time consuming			.031*	
I received training on how to use BB				.015*
I am able to advise my students on how to use BB			.003*	

Table 5.27, variables with significant p-values, was used to determine which demographic elements affect the themes, which ultimately affect the PEOU construct. The cross-tabulation values for these variables against each demographic element with significant p-values are shown in Appendix O Section O8. The highlighted percentages in the sections to follow were used as examples to show how the data were interpreted.

5.2.4.5.1 Age

Table 5.28 shows the variables that has a significant relationship with “Age” and the themes that the variables belong to.

Table 5.28 The relationship between *Age* and the themes

	Variable	**Section/Theme**
1	I regularly browse the intranet to find out about DUT related matters	Technology Literacy and Aptitude
2	I regularly browse the internet for personal, work, and study matters	Technology Literacy and Aptitude
3	There are policies, procedures and guideline documentation available	Internal DUT Support
4	This documentation is easily accessible to all staff to follow when assistance on BB is needed	Internal DUT Support
5	Any queries on BB are answered promptly and in time for me to continue with my task	Internal DUT Support
6	Support staff are ready to assist and available when needed	Internal DUT Support
7	I find it difficult to use BB	Software User Friendliness

The age of the respondent played a significant role in terms of how respondents viewed the regularity with which they browse the intranet or internet; the age groups 41-45 and 46-50 responded that they regularly browse the intranet, whilst respondents from the other age groups did not, as can be seen from Table 5.29.

Table 5.29 shows the “I regularly browse the intranet to find out about DUT related matters * Age Group” Cross-tabulation

Table 5.29 Age Group Cross-tabulation 1

			Age Group						Total
			≤ 30	31 - 35	36 - 40	41 - 45	46 - 50	> 50	
I regularly browse the intranet to find out about DUT related matters	Strongly Agree	Count	13	5	5	20	14	6	63
		% within Age Group	40,6%	41,7%	31,3%	51,3%	60,9%	19,4%	41,2%
		% of Total	8,5%	3,3%	3,3%	13,1%	9,2%	3,9%	41,2%
	Agree	Count	13	5	6	11	4	14	53
		% within Age Group	40,6%	41,7%	37,5%	28,2%	17,4%	45,2%	34,6%
		% of Total	8,5%	3,3%	3,9%	7,2%	2,6%	9,2%	34,6%
	Neutral	Count	1	2	4	7	3	5	22
		% within Age Group	3,1%	16,7%	25,0%	17,9%	13,0%	16,1%	14,4%
		% of Total	0,7%	1,3%	2,6%	4,6%	2,0%	3,3%	14,4%
	Disagree	Count	1	0	0	1	0	6	8
		% within Age Group	3,1%	0,0%	0,0%	2,6%	0,0%	19,4%	5,2%
		% of Total	0,7%	0,0%	0,0%	0,7%	0,0%	3,9%	5,2%
	Strongly Disagree	Count	4	0	1	0	2	0	7
		% within Age Group	12,5%	0,0%	6,3%	0,0%	8,7%	0,0%	4,6%
		% of Total	2,6%	0,0%	0,7%	0,0%	1,3%	0,0%	4,6%
Total		Count	32	12	16	39	23	31	153
		% within Age Group	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
		% of Total	20,9%	7,8%	10,5%	25,5%	15,0%	20,3%	100,0%

As can be seen in Table 5.29 within the age category of 41 to 45 years, 51.3% of the respondents *Strongly Agreed* that they use the DUT intranet to find out about DUT related matters, while this age category formed 13.1% of the total sample. Within the age group of 46-50, 60.9% of the respondents *Strongly Agreed* that they use the DUT intranet to find out about DUT related matters; this age category formed 9.2% of the total sample. The percentages for this age group for the respondents that *Agreed* (Strongly Agree + Agree) to this statement are significantly higher than the other age groups.

The age of the respondent also played a significant role in terms of the internal DUT support for the LMS and the assistance that the respondents required (with the use of policies, procedures, guidelines, documentation, and real time support). Patterns were observed in the age of the respondent and the PEOU of the LMS (for example, I find it difficult to use BB). As can be seen from Table 5.30, 40.9% and 53.6% of the age groups 41-45 and 46-50 respectively *Agreed* and were *Neutral* towards the statement "I find it difficult to use BB", while 33.3%, 37.5% and 39.5% of respondents in the age groups 31-35, 36-40 and 41-45 respectively *Disagreed* with the statement. Similarly, 25.0%, 37.5% and 21.1% of these age groups *Strongly Disagreed* with the statement.

Table 5.30 Age Group Cross-tabulation 2

I find it difficult to use BB * Age Group Cross-tabulation									
			Age Group						Total
			≤ 30	31 - 35	36 - 40	41 - 45	46 - 50	> 50	
I find it difficult to use BB	Strongly Agree	Count	3	2	0	2	1	0	8
		% within Age Group	9,4%	16,7%	0,0%	5,3%	4,5%	0,0%	5,4%
		% of Total	2,0%	1,4%	0,0%	1,4%	0,7%	0,0%	5,4%
	Agree	Count	5	1	2	5	9	2	24
		% within Age Group	15,6%	8,3%	12,5%	13,2%	40,9%	7,1%	16,2%
		% of Total	3,4%	0,7%	1,4%	3,4%	6,1%	1,4%	16,2%
	Neutral	Count	8	2	2	8	2	15	37
		% within Age Group	25,0%	16,7%	12,5%	21,1%	9,1%	53,6%	25,0%
		% of Total	5,4%	1,4%	1,4%	5,4%	1,4%	10,1%	25,0%
	Disagree	Count	7	4	6	15	6	8	46
		% within Age Group	21,9%	33,3%	37,5%	39,5%	27,3%	28,6%	31,1%
		% of Total	4,7%	2,7%	4,1%	10,1%	4,1%	5,4%	31,1%
	Strongly Disagree	Count	9	3	6	8	4	3	33
		% within Age Group	28,1%	25,0%	37,5%	21,1%	18,2%	10,7%	22,3%
		% of Total	6,1%	2,0%	4,1%	5,4%	2,7%	2,0%	22,3%
Total		Count	32	12	16	38	22	28	148
		% within Age Group	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
		% of Total	21,6%	8,1%	10,8%	25,7%	14,9%	18,9%	100,0%

The total percentage of respondents who *Agreed* (Strongly Agree + Agree) to the statement 'I find it difficult to use BB' was much lower (5.4% + 16.2%) as opposed to those that *Disagreed* (Disagree + Strongly Disagree) to the statement (31.1% + 22.3%). Overall respondents found the LMS easy to use, no matter what their age was.

5.2.4.5.2 Gender

Table 5.31 shows the variables that has a significant relationship with "Gender" and the themes that the variables belong to.

Table 5.31 The relationship between *Gender* and the themes

	Variable	**Section/Theme**
1	I know what process to follow when I need assistance on BB	Internal DUT Support
2	There are policies, procedures and guideline documentation available	Internal DUT Support
3	This documentation is easily accessible to all staff to follow when assistance on BB is needed	Internal DUT Support
4	Any queries on BB are answered promptly and in time for me to continue with my task	Internal DUT Support

5	I follow the guidelines provided to allow the use of BB to aid in my teaching	Policies and Procedures
6	I support subject content being presented online	Ease of Use
7	The adoption on BB has positively changed the way I teach	Ease of Use
8	I know how to use BB to add my class or a student	Functionality
9	I know how to use BB to put up notifications and due dates	Functionality

The gender of the respondent played a significant role with regards to the internal DUT LMS support available and the process to follow when assistance was required; the female respondents knew what process to follow when assistance is required on the LMS, whilst the male respondents were more in *disagreement* (Disagree + Strongly disagree) or *neutral* on knowing the process to follow, as reflected in Table 5.32.

The gender of the respondent also played a role in terms of the functionality of the LMS. The patterns were observed between the gender of the respondent and the PEOU of the LMS (for example, I know how to use BB to add my class or a student). As can be seen from Table 5.33, 35.2% and 38.0% of the female respondents were in *agreement* (Strongly Agreed + Agreed respectively), while 8.5% of the female respondents were *Neutral* towards the statement. Similarly, 14.1% and 4.2% of the female respondents were in *disagreement* (Disagree + Strongly Disagreed) towards the statement.

Table 5.32 Gender Cross-tabulation 1

			Gender		Total
			Male	Female	
I know what process to follow when I need assistance on BB	Strongly Agree	Count	13	21	34
		% within Gender	17,3%	29,2%	23,1%
		% of Total	8,8%	14,3%	23,1%
	Agree	Count	29	36	65
		% within Gender	38,7%	50,0%	44,2%
		% of Total	19,7%	24,5%	44,2%
	Neutral	Count	18	6	24
		% within Gender	24,0%	8,3%	16,3%
		% of Total	12,2%	4,1%	16,3%
	Disagree	Count	12	8	20
		% within Gender	16,0%	11,1%	13,6%
		% of Total	8,2%	5,4%	13,6%
	Strongly Disagree	Count	3	1	4
		% within Gender	4,0%	1,4%	2,7%
		% of Total	2,0%	0,7%	2,7%
Total		Count	75	72	147
		% within Gender	100,0%	100,0%	100,0%
		% of Total	51,0%	49,0%	100,0%

Table 5.33 Gender Cross-tabulation 2

			Gender		Total
			Male	Female	
I know how to use BB to add my class or a student	Strongly Agree	Count	14	25	39
		% within Gender	18,9%	35,2%	26,9%
		% of Total	9,7%	17,2%	26,9%
	Agree	Count	23	27	50
		% within Gender	31,1%	38,0%	34,5%
		% of Total	15,9%	18,6%	34,5%
	Neutral	Count	18	6	24
		% within Gender	24,3%	8,5%	16,6%
		% of Total	12,4%	4,1%	16,6%
	Disagree	Count	13	10	23
		% within Gender	17,6%	14,1%	15,9%
		% of Total	9,0%	6,9%	15,9%
	Strongly Disagree	Count	6	3	9
		% within Gender	8,1%	4,2%	6,2%
		% of Total	4,1%	2,1%	6,2%
Total		Count	74	71	145
		% within Gender	100,0%	100,0%	100,0%
		% of Total	51,0%	49,0%	100,0%

5.2.4.5.3 Ethnic group

Table 5.34 shows the variables that has a significant relationship with “Ethnic Group” and the themes that the variables belong to.

Table 5.34 The relationship between *Ethnic group* and the themes

	Variable	**Section/Theme**
1	Contact details for BB support staff are known	Internal DUT Support
2	There are known policies in place at DUT regarding BB	Policies and Procedures
3	I know how to use BB to add/edit/update course material	Functionality
4	I know how to use BB to put up notifications and due dates	Functionality
5	I find the workload between my lectures and the maintenance on BB manageable	Time
6	Additional time should be allocated for the housekeeping on BB	Time
7	Using BB is not time consuming	Time
8	I am able to advise my students on how to use BB	Training and Development

Variables 1, 2, 3, 4, 8 indicate that there is a significant relationship between the respondents ethnic group and the level of LMS support (training, technical and

procedural) required at DUT. Variable 5, 6, 7 indicate respondents from particular ethnic groups find time to be an influencing factor towards the PEOU of the LMS.

As can be seen in Table 5.35 within the ethnic group category of Indian, 30.3% of the respondents *strongly agreed* that additional time should be allocated for the housekeeping on the LMS, while this ethnic group category formed 13.3% of the total sample. Within the ethnic group category of White, 50.0% of the respondents *agreed* that additional time should be allocated for the housekeeping on the LMS. This category formed 4.0% of the total sample. The percentages for the respondents that *Agreed* (Strongly Agree + Agree) to this statement are significantly higher than those respondents that are in disagreement towards this statement.

Table 5.35 Ethnic group Cross-tabulation 1

			Ethnic Group				Total
			African	Coloured	Indian	White	
Additional time should be allocated for the housekeeping on BB	Strongly Agree	Count	10	5	20	3	38
		% within Ethnic Group	15,6%	62,5%	30,3%	25,0%	25,3%
		% of Total	6,7%	3,3%	13,3%	2,0%	25,3%
	Agree	Count	28	0	24	6	58
		% within Ethnic Group	43,8%	0,0%	36,4%	50,0%	38,7%
		% of Total	18,7%	0,0%	16,0%	4,0%	38,7%
	Neutral	Count	19	2	17	0	38
		% within Ethnic Group	29,7%	25,0%	25,8%	0,0%	25,3%
		% of Total	12,7%	1,3%	11,3%	0,0%	25,3%
	Disagree	Count	6	0	3	3	12
		% within Ethnic Group	9,4%	0,0%	4,5%	25,0%	8,0%
		% of Total	4,0%	0,0%	2,0%	2,0%	8,0%
	Strongly Disagree	Count	1	1	2	0	4
		% within Ethnic Group	1,6%	12,5%	3,0%	0,0%	2,7%
		% of Total	0,7%	0,7%	1,3%	0,0%	2,7%
Total		Count	64	8	66	12	150
		% within Ethnic Group	100,0%	100,0%	100,0%	100,0%	100,0%
		% of Total	42,7%	5,3%	44,0%	8,0%	100,0%

Respondents generally *Agreed* that there is not enough time allocated towards the use of the LMS to ensure 'proper' utilization of functionality provided by the LMS.

The ethnic group of the respondent also played a significant role in terms of training and development on the LMS. Patterns were observed between the ethnic group of the respondent and the PEOU of the LMS (for example, I am able to advise my

students on how to use BB). As can be seen from Table 5.36, 37.5% of Coloured respondents *strongly disagreed* towards this statement, whilst 25.0% of coloured respondents were *neutral* towards this statement. A total of 54% (15.5% + 38.5%), of the total respondents, however, were in *agreement* (Strongly Agree + Agree) towards this statement.

Table 5.36 Ethnic group Cross-tabulation 2

I am able to advise my students on how to use BB * Ethnic Group Cross-tabulation							
			Ethnic Group				Total
			African	Coloured	Indian	White	
I am able to advise my students on how to use BB	Strongly Agree	Count	5	1	15	2	23
		% within Ethnic Group	7,9%	12,5%	23,1%	16,7%	15,5%
		% of Total	3,4%	0,7%	10,1%	1,4%	15,5%
	Agree	Count	21	2	27	7	57
		% within Ethnic Group	33,3%	25,0%	41,5%	58,3%	38,5%
		% of Total	14,2%	1,4%	18,2%	4,7%	38,5%
	Neutral	Count	19	2	13	1	35
		% within Ethnic Group	30,2%	25,0%	20,0%	8,3%	23,6%
		% of Total	12,8%	1,4%	8,8%	0,7%	23,6%
	Disagree	Count	15	0	8	2	25
		% within Ethnic Group	23,8%	0,0%	12,3%	16,7%	16,9%
		% of Total	10,1%	0,0%	5,4%	1,4%	16,9%
	Strongly Disagree	Count	3	3	2	0	8
		% within Ethnic Group	4,8%	37,5%	3,1%	0,0%	5,4%
		% of Total	2,0%	2,0%	1,4%	0,0%	5,4%
Total		Count	63	8	65	12	148
		% within Ethnic Group	100,0%	100,0%	100,0%	100,0%	100,0%
		% of Total	42,6%	5,4%	43,9%	8,1%	100,0%

5.2.4.5.4 Citizenship

Table 5.37 shows the variables that has a significant relationship with “Citizenship” and the themes that the variables belong to.

Table 5.37 The relationship between *Citizenship* and the themes

	Variable	**Section/Theme**
1	I am very comfortable using work related applications like ITS and iEnabler	Technology Literacy and Aptitude
2	I know how to access student submissions on BB	Ease of Use
3	I know how to use BB to add my subject material	Functionality

4	I know how to use BB to add/edit/update course material	Functionality
5	I received training on how to use BB	Training and Development

The citizenship of the respondent played a significant role with regards to the PEOU of a LMS. The demographic data (Citizenship) in Section A (5.2.4.4.1.6) indicated that majority of the respondents were of SA citizenship. This means that, in the case of DUT using a LMS, SA citizens found it easier to use a LMS. The most significant role was against the variables measuring LMS functionality.

The citizenship of the respondent played a significant role with regards to the ease of use (knowledge on how to use a LMS) (Table 5.38); the SA respondents knew how to access student submissions on the LMS (35.9% and 33.6% for strongly agree and agree respectively), whilst the Non SA citizen respondents that were in *disagreement* (Disagree + Strongly disagree) towards this statement were 5.3 % and 36.8% respectively. Respondents that were *neutral* towards this statement made up 16.7% of the total respondents, as can be seen from Table 5.38.

Table 5.38 Citizenship Cross-tabulation 1

I know how to access student submissions on BB * Citizenship Cross-tabulation					
			Citizenship		Total
			SA citizen	Non SA citizen	
I know how to access student submissions on BB	Strongly Agree	Count	47	3	50
		% within Citizenship	35,9%	15,8%	33,3%
		% of Total	31,3%	2,0%	33,3%
	Agree	Count	44	3	47
		% within Citizenship	33,6%	15,8%	31,3%
		% of Total	29,3%	2,0%	31,3%
	Neutral	Count	20	5	25
		% within Citizenship	15,3%	26,3%	16,7%
		% of Total	13,3%	3,3%	16,7%
	Disagree	Count	16	7	23
		% within Citizenship	12,2%	36,8%	15,3%
		% of Total	10,7%	4,7%	15,3%
	Strongly Disagree	Count	4	1	5
		% within Citizenship	3,1%	5,3%	3,3%
		% of Total	2,7%	0,7%	3,3%
Total		Count	131	19	150
		% within Citizenship	100,0%	100,0%	100,0%
		% of Total	87,3%	12,7%	100,0%

The citizenship of the respondent also played a role in terms of the technology literacy and aptitude of the LMS. The patterns were observed between the citizenship of the

respondent and the PEOU of the LMS (for example, I am very comfortable using work related applications like ITS and iEnabler). As can be seen from Table 5.39, 47.0% and 36.4% of the SA respondents were in *agreement* (Strongly Agreed + Agreed respectively), while 8.3% of the SA respondents were *Neutral* towards the statement. Similarly, 0.0% and 5.3% of the Non SA respondents were in *disagreement* (Disagree + Strongly Disagreed) towards the statement.

Table 5.39 Citizenship Cross-tabulation 2

I am very comfortable using work related applications like ITS and iEnabler * Citizenship Cross-tabulation					
			Citizenship		Total
			SA citizen	Non SA citizen	
I am very comfortable using work related applications like ITS and iEnabler	Strongly Agree	Count	62	8	70
		% within Citizenship	47,0%	42,1%	46,4%
		% of Total	41,1%	5,3%	46,4%
	Agree	Count	48	5	53
		% within Citizenship	36,4%	26,3%	35,1%
		% of Total	31,8%	3,3%	35,1%
	Neutral	Count	11	5	16
		% within Citizenship	8,3%	26,3%	10,6%
		% of Total	7,3%	3,3%	10,6%
	Disagree	Count	10	0	10
		% within Citizenship	7,6%	0,0%	6,6%
		% of Total	6,6%	0,0%	6,6%
	Strongly Disagree	Count	1	1	2
		% within Citizenship	0,8%	5,3%	1,3%
		% of Total	0,7%	0,7%	1,3%
Total		Count	132	19	151
		% within Citizenship	100,0%	100,0%	100,0%
		% of Total	87,4%	12,6%	100,0%

5.2.4.6 Correlations

Bivariate correlation was performed on the (ordinal) data. The results are found in the Appendix O7.

** Indicates the correlation is significant at the 0.01 level (2-tailed).

* Indicates the correlation is significant at the 0.05 level (2-tailed).

The results indicate the following patterns:

Positive values indicate a directly proportional relationship between the variables. For example, the correlation value between “I regularly browse the intranet to find out

about DUT related matters" and "I regularly browse the internet for personal, work, and study matters" is 0.438. Respondents indicated that the more they browse the internet for DUT matters, the more they also browse the internet for personal and study matters, and vice versa. The general guideline for interpretation of correlation values are represented in Table 5.40:

Table 5.40 The guideline for interpretation of correlation values

Values	Interpretation of correlation
Exactly –1	A perfect negative relationship
–0.70	A strong negative relationship
–0.30 till -0.50	A weak to moderate negative relationship
0	No linear relationship
+0.30 till + 0.50	A weak to moderate correlation
+0.70	A significant correlation
Exactly +1	A perfect correlation or relationship

This means that 0.438 is not particularly significant.

Negative correlation values imply an inverse relationship. That is, the variables have an opposite effect on each other: as one increases, the other decreases. For example, the correlation value between "I am very comfortable using work related applications like BB" and "I often require assistance when using IT software" is -0.415. That is, the more comfortable respondents are using work related applications, the less assistance they require from IT.

Table 5.41 The significant correlation values

Correlations												
		Any queries on BB are answered promptly and in time for me to continue with my task	Contact details for BB support staff are known	BB is easy to use	I can easily find my way around BB	Screens are easy on the eyes	I can understand where to find the things I need	I know how to use BB to add my subject material	I know how to use BB to add my class or a student	I know how to use BB to add/edit/update course material	I know how to use BB to put up notifications and due dates	There is adequate time during work hours to attend to lectures and BB
Spearman's rho	Support staff are ready to assist and available when needed	.714**	.727**									
	Screens are easy on the eyes				.737**							
	I can understand where to find the things I need			.711**	.739**	.781**						
	I can understand the messages I get from BB and can act accordingly				.716**	.721**	.792**					
	I know how to use BB to add/edit/update course material							.725**	.739**			
	I know how to use BB to put up notifications and due dates							.732**	.751**	.866**		
	I know how to respond to students using BB								.717**		.761**	
	I find the workload between my lectures and the maintenance on BB manageable											.807**

Respondents indicated as per Table 5.41:

- The more support is received, the more promptly queries are answered, and the more familiar they become with the contact details for support staff.
- The more user friendly the LMS screens are (easy on the eyes), the easier it is for the respondent to find the things they need.
- The more they understand where to find the things they need, the easier it becomes to use the LMS, the easier it is to find their way around the LMS, the more comfortable they become with the screens.
- The more their understanding is of the LMS messages, the easier it is to find their way around the LMS, the more comfortable they become with the screens, and the more they understand where to find the things they need.

- The more they understand the functionality of the LMS, the easier it becomes to add the subject material, to add a class or subject.
- The more they understand how to put up notifications and due dates, the easier it becomes to add the subject material, to add a class or subject, to edit or update course material.
- The more they understand how to respond to students, the easier it becomes to add a class or subject and put up notifications and due dates.
- The more they are able to manage their lectures and the maintenance on the LMS, the more they find that there is adequate time, during work hours, to attend to lectures and the LMS.

The cross-correlations between the themes were calculated and shown in Figure 5.42.

Table 5.42 Cross-correlations between the themes

		Technology	Software	Ease of Use	Functionality	Internal Support	Policies Procedures	Time	Training
Technology	Correlation Coefficient	1.000							
	Sig. (2-tailed)								
	N	156							
Software	Correlation Coefficient	.433**	1.000						
	Sig. (2-tailed)	0.000							
	N	152	152						
Ease of Use	Correlation Coefficient	.481**	.770**	1.000					
	Sig. (2-tailed)	0.000	0.000						
	N	154	152	154					
Functionality	Correlation Coefficient	.488**	.757**	.805**	1.000				
	Sig. (2-tailed)	0.000	0.000	0.000					
	N	152	152	152	152				
Internal Support	Correlation Coefficient	.372**	.414**	.441**	.472**	1.000			
	Sig. (2-tailed)	0.000	0.000	0.000	0.000				
	N	155	152	154	152	155			
Policies Procedures	Correlation Coefficient	.345**	.473**	.468**	.426**	.675**	1.000		
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000			
	N	153	151	153	151	153	153		
Time	Correlation Coefficient	.202*	.343**	.240**	.194*	0.074	0.159	1.000	
	Sig. (2-tailed)	0.012	0.000	0.003	0.017	0.368	0.051		
	N	153	151	152	151	152	151	153	
Training	Correlation Coefficient	.383**	.455**	.523**	.584**	.504**	.443**	0.110	1.000
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.180	
	N	152	150	151	150	151	150	150	152

- The more technology literate the respondents are
  - ⇒ the more they perceive the software as being user friendly
  - ⇒ The easier they found it to use the LMS based on the knowledge that they have
  - ⇒ the better knowledge they have of the software functionality
  - ⇒ the more aware they are of the internal support and policies and procedures
  - ⇒ the more time is not an issue with regards to housekeeping on the LMS
  - ⇒ the more training and development is not a concern

- The more the respondents found the software user friendly
  - ⇒ The easier they found it to use the LMS based on the knowledge that they have
  - ⇒ the better knowledge they have of the software functionality
  - ⇒ the more aware they are of the internal support and policies and procedures
  - ⇒ the more time is not an issue with regards to housekeeping on the LMS
  - ⇒ the more training and development is not a concern

- The more the respondents found the software easy to use based on the knowledge they have of the software
  - ⇒ the better knowledge they have of the software functionality
  - ⇒ the more aware they are of the internal support and policies and procedures
  - ⇒ the more time is not an issue with regards to housekeeping on the LMS
  - ⇒ the more training and development is not a concern

- The more the respondents were aware of the functionality
  - ⇒ the more aware they are of the internal support and policies and procedures
  - ⇒ the more time is not an issue with regards to housekeeping on the LMS
  - ⇒ the more training and development is not a concern

- The more the respondents were aware of the internal support
  - ⇒ the more aware they are of the policies and procedures

⇒ the more training and development is not a concern

- The more the respondents were aware of the policies and procedures
  ⇒ the more training and development is not a concern

The descriptive statistics for the themes are shown in Appendix O9.

5.3 Qualitative results

5.3.1 Analysis of questionnaire using NVivo

NVivo 11 was used to analyse the social (what people think) phenomena for the following questions in Section C of the questionnaire. The open-ended questions, Section C of the questionnaire, is shown in Table 5.43.

Table 5.43 Section C of the questionnaire

Are there any other comments/feedback that you would like to express regarding the implementation of BB LMS at DUT? If yes, then elaborate.
What do you like most about BB?
What would you like to see improved on BB?
How do you feel about the adoption of BB and the integration of BB into teaching and learning?
Would you like to see BB integrated with other DUT applications like ITS and iEnabler?

“Handling qualitative data is not usually a step-by-step process (first import, then code, then query, then interpret and then write-up). Instead, it tends to be an iterative process where you explore, code, reflect, memo, code some more, query and so on” (QSRI 2019). Figure 5.4 illustrates this process.

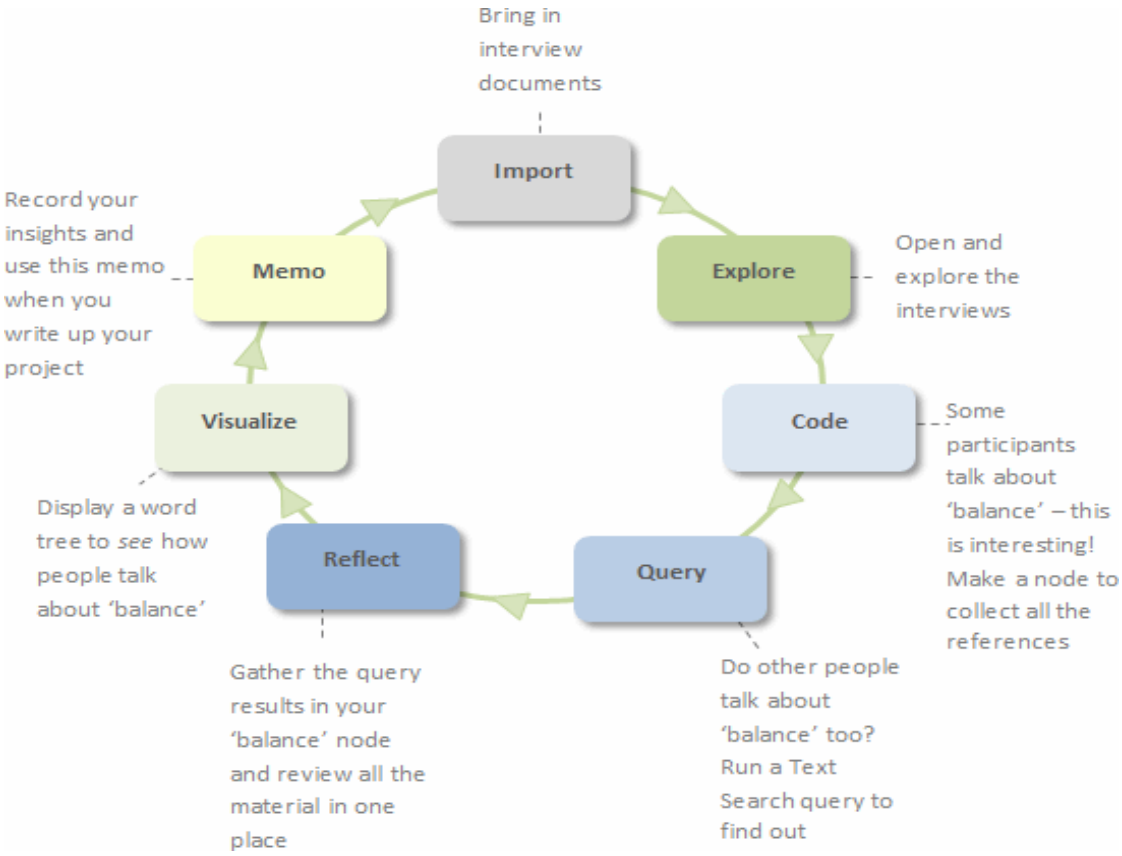

Figure 5.4 illustrates the path taken to analyse a theme (QSRI 2019)

5.3.1.1 Nodes

The responses from the open-ended questions were captured into nodes. Nodes are the categories for which the responses were given and which formed the themes for the qualitative data.

Creating the nodes allowed the researcher to view all the responses according to certain categories. Each node or category was then broken further into smaller components, as if to build a hierarchy per node or category. “Case nodes represent your 'units of observation'” (QSRI 2019). Case nodes (each respondent) or classifications with attributes (descriptive information) were not used, because all the responses came from the open-ended questions of the survey instrument and because descriptive (demographic) data was analysed under the quantitative results. NVivo 11 uses the frequency of words to show the strength of sentiment. The higher the coverage of words the stronger the sentiment.

Table 5.44 NVivo 11 Nodes

Nodes or Categories	Section C of the questionnaire
Adoption of a LMS	How do you feel about the adoption of BB and the integration of BB into teaching and learning?
Most useful features	What do you like most about BB?
Suggested improvements	What would you like to see improved on BB?
Integration of the LMS into teaching and learning	Would you like to see BB integrated with other DUT applications like ITS and iEnabler?

The questions in Section C, as per Table 5.44, were constructed to gather the respondent's opinion on the use of a LMS (adoption), features and improvements that the respondent would like to see in a LMS, and the use of a LMS as part of an integrated solution to promote e-learning. The reason for choosing these questions was to ascertain which area of using a LMS could be affecting PEOU (introducing a LMS, the functionality provided, or the integration of the LMS into the universities technological structure).

5.3.1.2 Cluster analysis

Nvivo 11 allowed the visualisation of connections in the data and the identification of what was most important. Cluster analysis was used to identify patterns in the data by finding similar words. "Sources or nodes in the cluster analysis diagram that appear close together are more similar than those that are far apart" (QSRI 2019). Word similarity is used to determine how many times words clusters appear. NVivo 11 then creates a similarity index and groups the items into clusters. Items are represented as points in space. The data goes through iterations to determine the distance between items, bringing the points either closer together or further apart. "Words that co-occur are clustered together" (QSRI 2019).

5.3.1.3 Word clouds and tree maps

A word cloud is the result of a word frequency query in NVivo 11. The software displays more frequently occurring words in larger fonts compared to few occurrences of other words. Tree Maps, on the other hand, “displays up to 100 words as a series of rectangles, where frequently occurring words are in larger rectangles” (QSRI 2019).

5.3.2 Visualisation of each node

Feedback from the survey was analysed. The data was used to identify ways to improve the perception levels of a LMS at a HEI, which in turn would be used to possibly improve the adoption of LMSs by users. Based on the definitions of a word cloud, tree map and cluster analysis, the large font or rectangles or circles shows commonality and implies that those words were used or perceived more often than other words. The responses are reflected in Appendix P. Word clouds, tree maps and cluster analysis were used on the 4 qualitative areas (adoption of a LMS, most useful features, suggested improvements, integration of the LMS into teaching and learning) to look at the frequency of words used by respondents to identify key areas.

The word clouds, tree maps and cluster analysis diagrams for each of the nodes in Table 5.44 are provided.

5.3.2.1 Adoption of a LMS

Figure 5.5 Word cloud for the adoption of a LMS

For the adoption of a LMS, the large font in the word cloud (Figure 5.5) implies that these words recur more often or was used by more respondents than other words. The most important or recurring words *students, training, staff, lectures, time and upload* are showing that the adoption of a LMS is dependent on things such as training on how to upload course information, assessments and tests. Therefore, *training* plays a big role in the adoption of a LMS. This is supported by the following comments by some of the respondents:

"O*ngoing adequate training should be provided to staff*."
"There is a need for proper coordination of BB training for academic staff on campus."
"Need more consistent training."
"BB training discussions must remain as ongoing to allow staff to be kept updated at any given time."
"The students should be given training but not in lecture time by lecturers"

The word cloud also shows that there is an issue of *time*. Staff and students need time to adapt to a LMS and to make full use of the functionality provided. This is supported by the following comment:

"It is time consuming to type an equation/math formulars"

The tree map (Figure 5.6) shows that students, training and staff are interlinked. These are the biggest blocks, showing that staff need to provide training for students, which is connected to lectures. The first three columns of words show that there is a connection between training, time, lectures, access, content and assessments. This shows that *training and time* are important themes to consider when adopting a LMS. This area can be related or supported by the training and support theme as well as the time theme under the quantitative analysis.

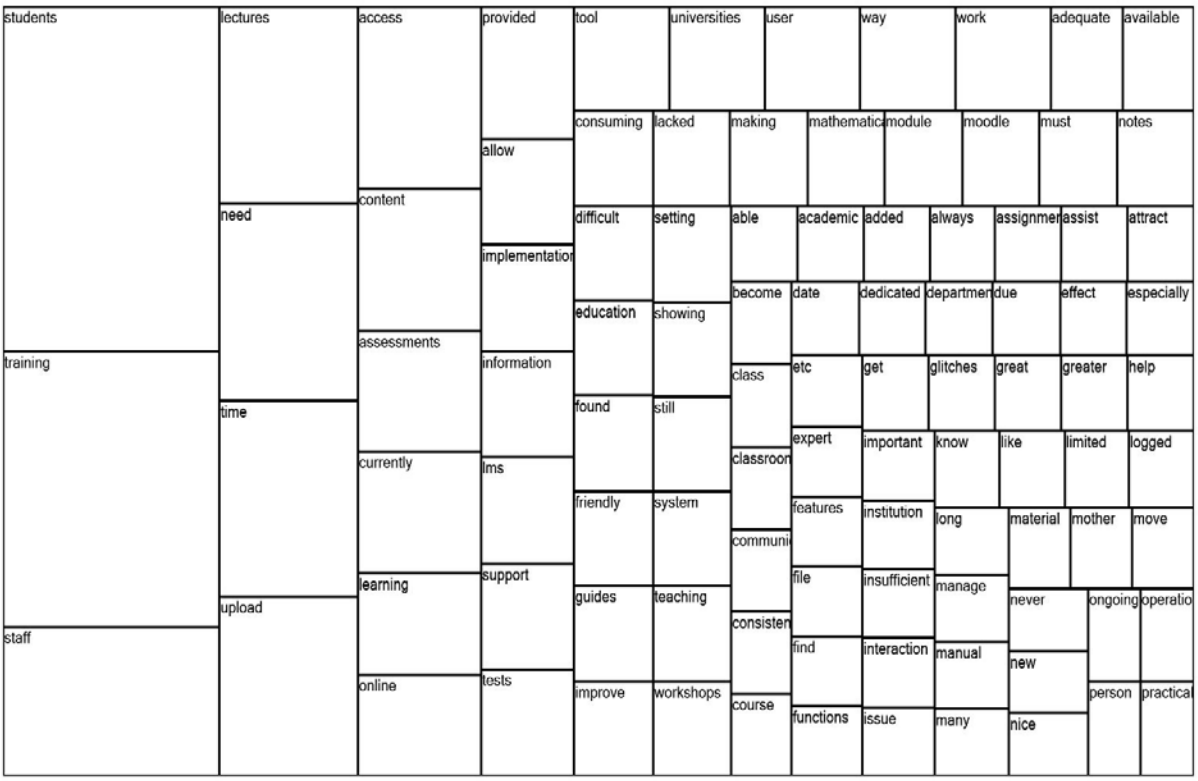

Figure 5.6 shows the tree map for the adoption of a LMS

The cluster analysis (Figure 5.7) shows that the tools, teaching and learning are closely linked because the points or circles are close to one another. This means that the respondents perceive the adoption of a LMS as a tool that improves teaching and learning.

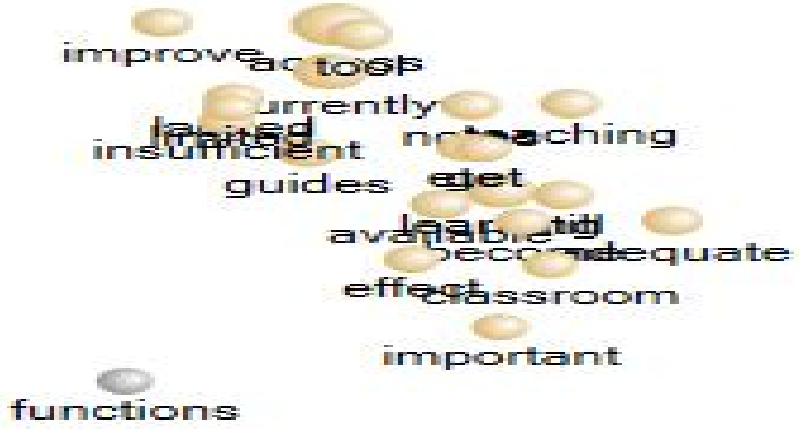

Figure 5.7 shows the cluster analysis for the adoption of a LMS

5.3.2.2 Most useful features

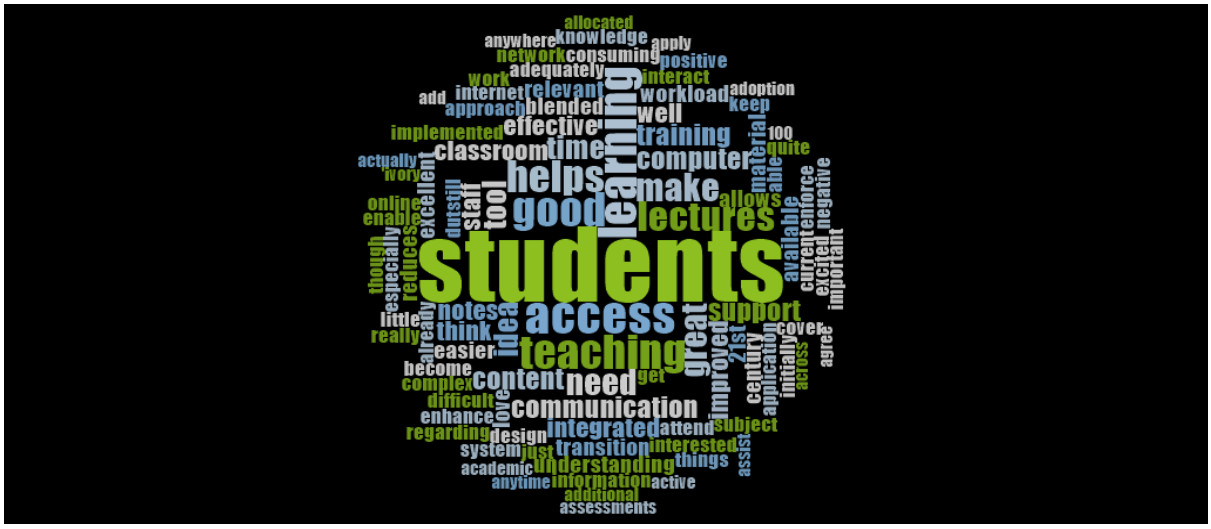

Figure 5.8 The word cloud for the most useful features of a LMS

For the most useful features, the word cloud (Figure 5.8) shows that respondents agreed that students, access, teaching, and learning were important. This means that access to the LMS supports learning. The LMS makes access to content and *collaboration and communication* easier. The following statements by respondents can support this:

"Easily accessible and makes teaching and communication with students much easier."
"Students have access to course content all the time"
"Accessibility beyond the classroom"
"high accessibilty of students and improved communication generally between lecturers and students"

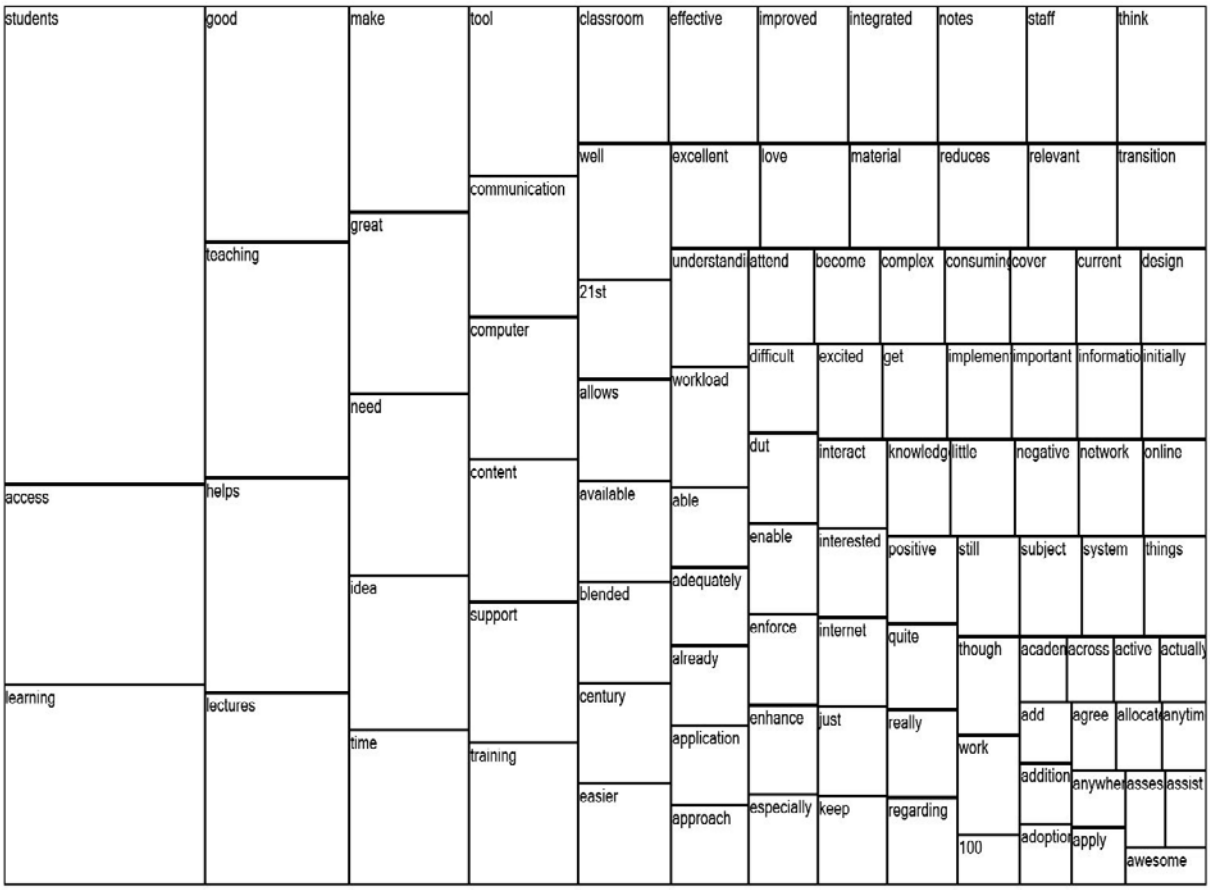

Figure 5.9 shows the tree map for the most useful features of a LMS

The tree map (Figure 5.9) indicated that using a LMS assists during lectures and is beneficial for teaching (aids teaching). It also has the benefit of *time* for lectures and is great for communicating and collaborating with students. These areas can be supported by the time, functionality, technology literacy and aptitude themes, ease of use (knowledge on how to use a LMS) and software user friendliness themes under the quantitative analysis. The following statements support this:

"Ability to communicate with students and facilitate/administer tests/assessments"
"Helps to communicate with students on mass"

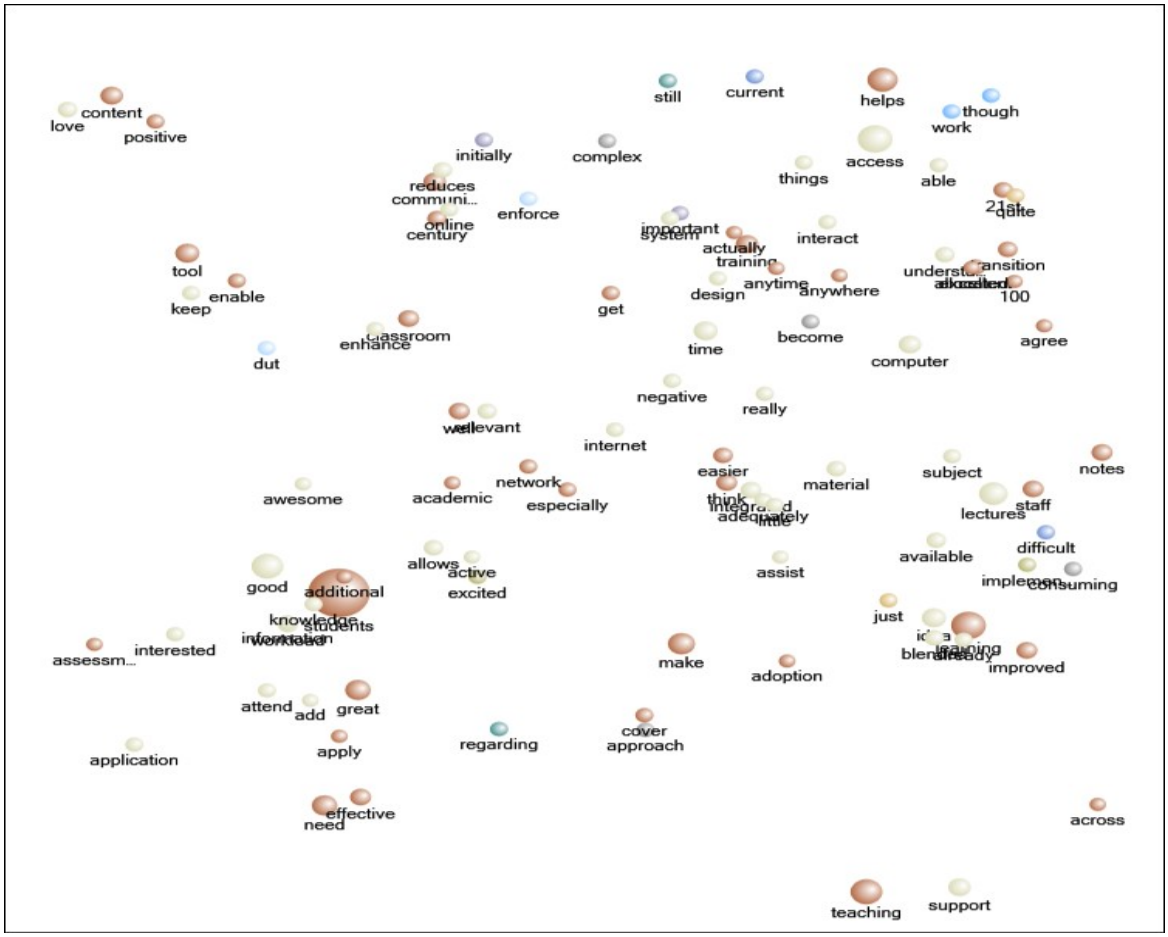

Figure 5.10 shows the cluster analysis for the most useful features

The scattering of points in the cluster analysis (Figure 5.10) indicates that respondents listed many different useful features. The words that co-occurred the most (largest circles) are learning, communication, students and teaching. This means that the respondents perceive the adoption of a LMS as a tool with many useful features that benefits students and is effective for teaching and learning. The following statements support this:

"Students can work their own time"

"Ability to communicate with students and facilitate/administer tests/assessments"

"Teaching and learning can happen in and out of my classroom. Able to flip my classroom"

5.3.2.3 Suggested improvements

Figure 5.11 shows the word cloud from suggested improvements

For the suggested improvements, the word cloud (Figure 5.11) and tree map shows that respondents felt that *students, access, and time* were important and areas of improvement. *Uploading of content, training and availability* were other key areas. These areas can be linked to the time, training and development, functionality, technology literacy and aptitude themes under the quantitative analysis. The following statements support this:

"Training will enable the lecturer to understand it better"
"Students complain they cannot access it"
"I noticed that DUT does not purchase all the packages for BB. There are certain tools/features that are not fully available to us eg. Uploading groups directly into BB"
"There is no time for training"

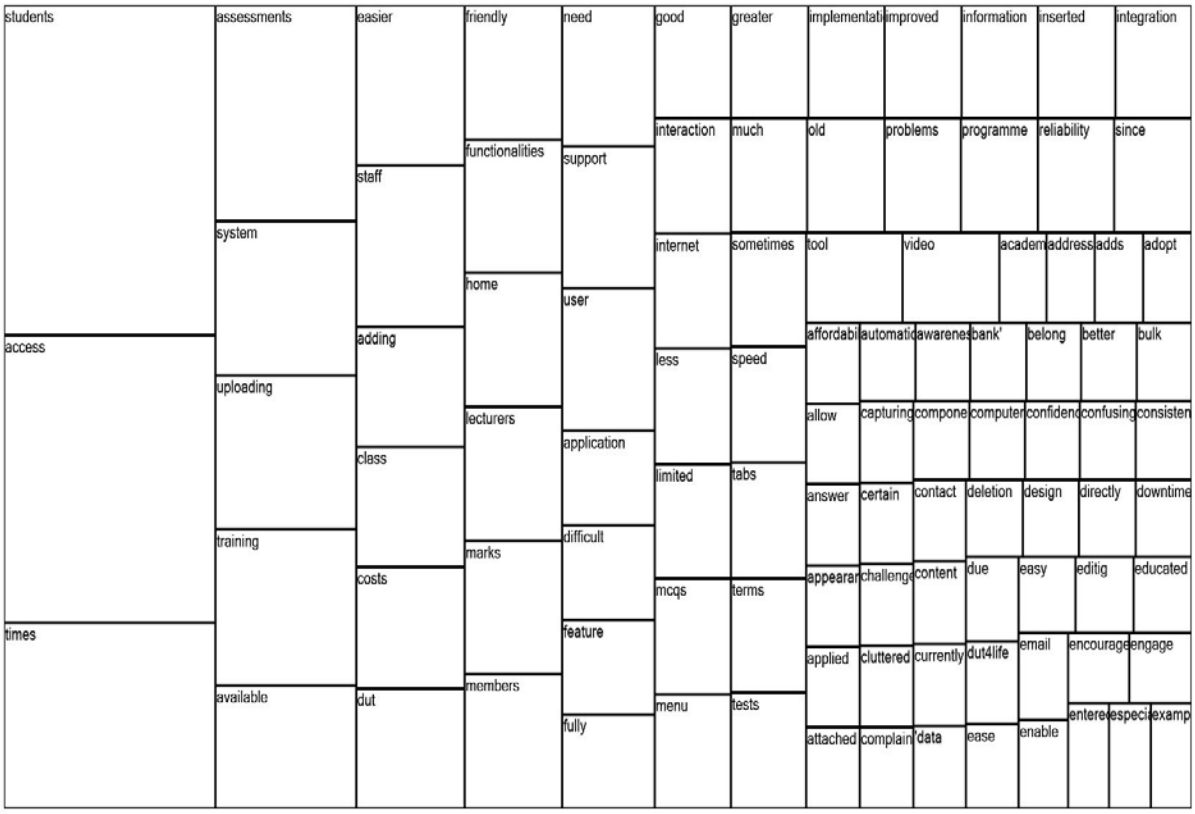

Figure 5.12 shows the tree map from suggested improvements

For the suggested improvements, the tree map (Figure 5.12) also shows that respondents felt that students, access, and time were important areas for improvement.

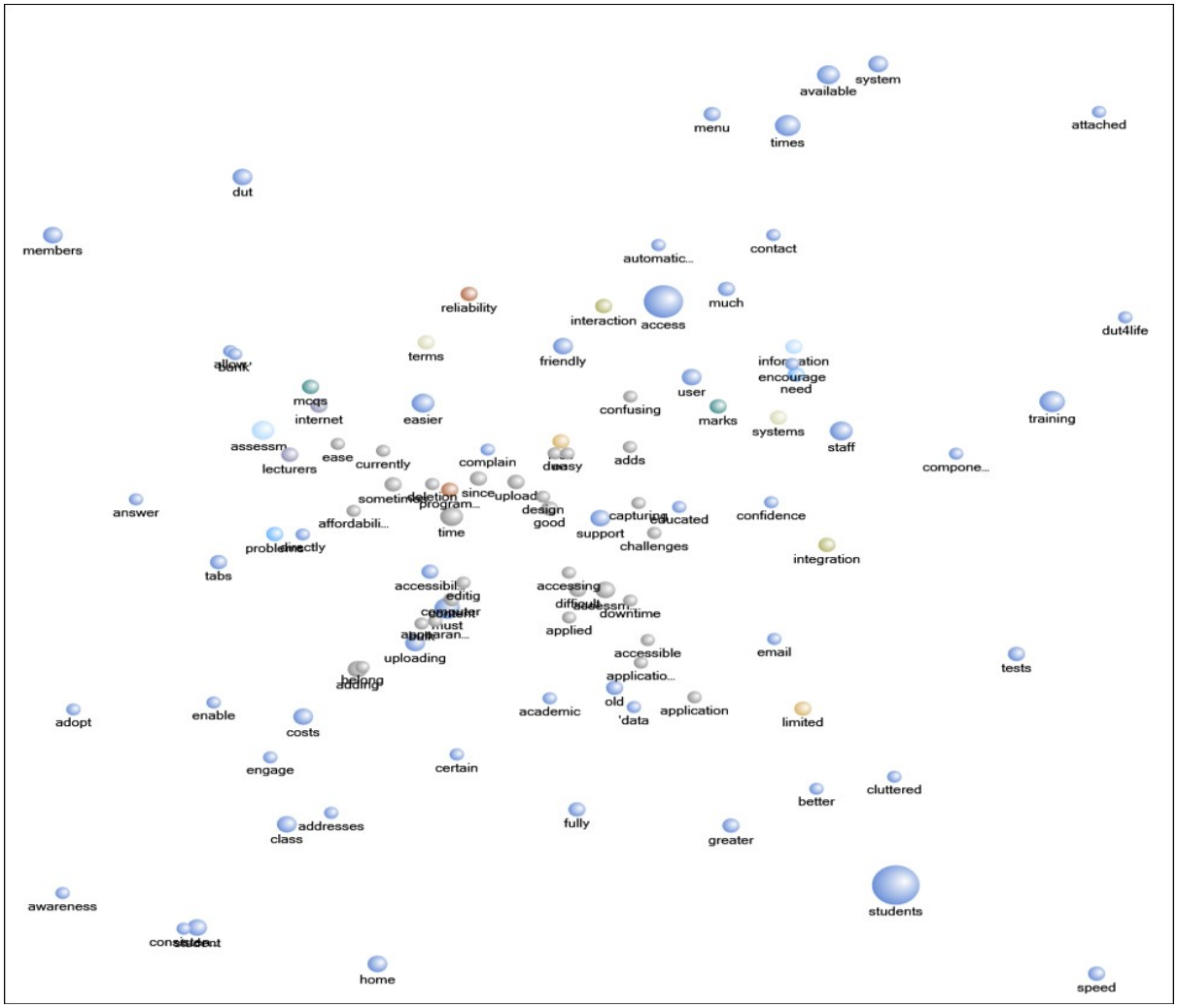

Figure 5.13 shows the cluster analysis for suggested improvements

The scattering of points in the cluster analysis (Figure 5.13) shows that respondents listed many suggestions for improvement. The words that co-occurred the most (largest circles) are access, training, students and times. This means that even though respondents perceive the adoption of a LMS as a tool with many useful features (as per 5.3.2.2), they could still identify areas for improvement. Accessibility is an area that needs to be given attention. Also training and time is a concern. The following statements support this:

"Students complain they cannot access it."

"Not all students have smart phones and wifi access at home"

"There is no time for training"

“I currently do not have off-site access since the last update which is difficult as I use it on my off time”

5.3.2.4 Integration of the LMS into teaching and learning

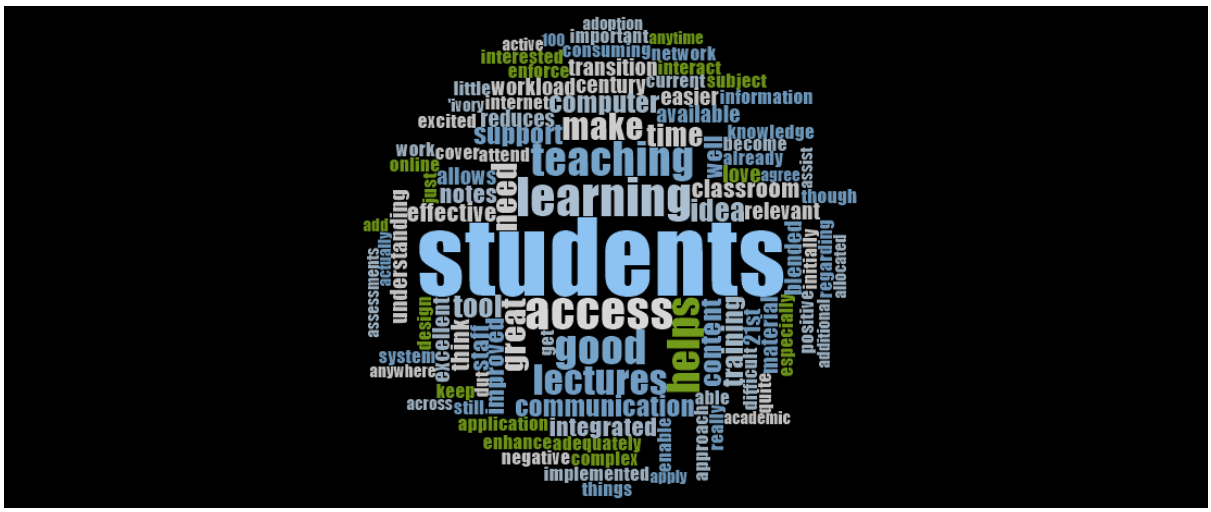

Figure 5.14 shows the word cloud for the integration of the LMS into teaching and learning

For the integration of the LMS into teaching and learning, the word cloud shows that respondents felt that *students, access, and learning* were significant when looking at integration of a LMS into pedagogy. The integration of the LMS into teaching and learning and the most useful features showed very closely related perceptions by respondents. These areas can be supported by the time, functionality, technology literacy and aptitude themes, ease of use (knowledge on how to use a LMS) and software user friendliness themes under the quantitative analysis.

The word cloud in Figure 5.14 indicates that, for integration to occur, access to the LMS is required. Integration is what will support teaching and learning, in the long term, in the classroom.

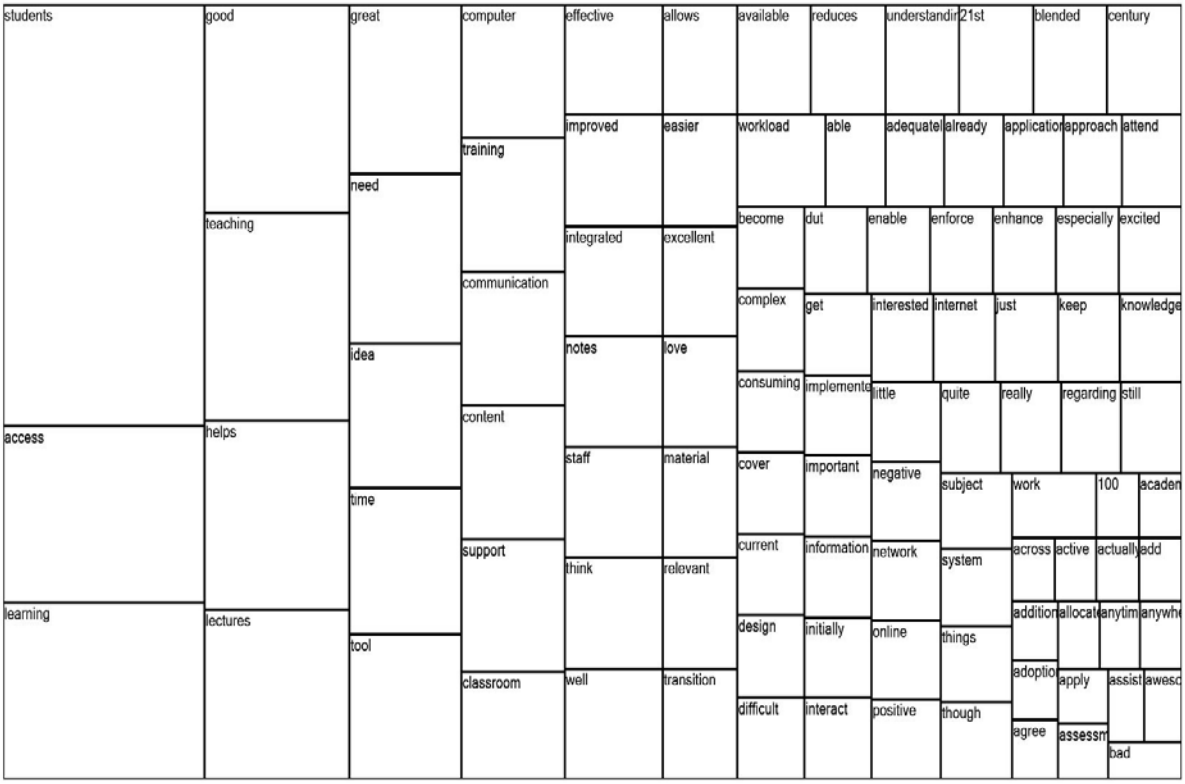

Figure 5.15 shows the tree map for the integration of the LMS into teaching and learning

The tree map in Figure 5.15 indicates that it is a great idea to integrate a LMS into pedagogy. It is a tool that supports teaching and learning. The following statements support this:

"It an excellent way of teaching as you are able to access notes"
"100% access by student anytime, anywhere, cost effectiveness. I think it can become a fantastic tool to have."
"It helps students after hours, granting them access to content beyond the classroom which helps with our student-centred approach"

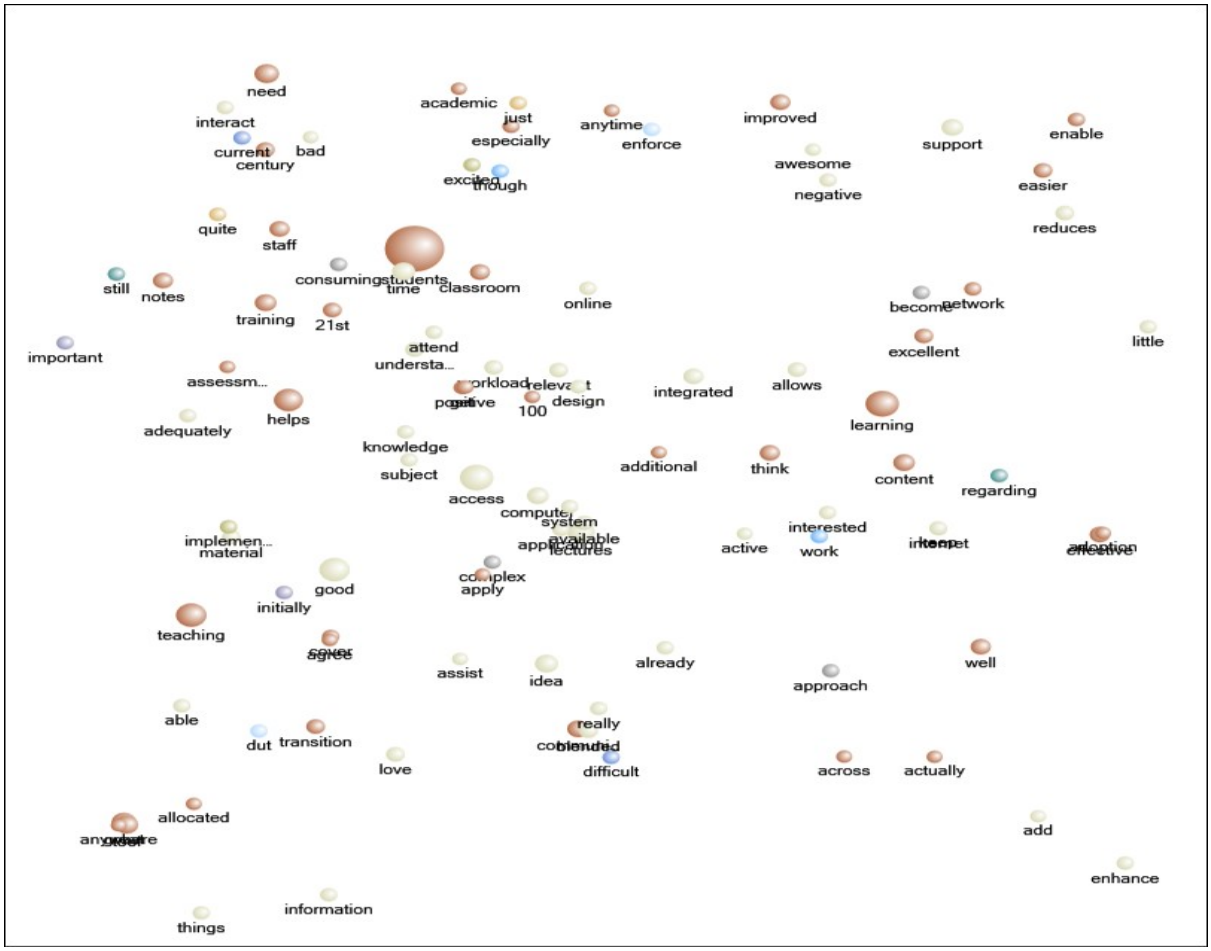

Figure 5.16 shows the cluster analysis for the integration of the LMS into teaching and learning

Figure 5.16 indicates the words that co-occurred the most (largest circles), *students, learning, and teaching*. This is interpreted as, the integration of the LMS into teaching and learning has been beneficial to students in their learning and for teaching. The following statements support this:

"It an excellent way of teaching..."
"It can improve delivery of learning content"
"I think it is a good idea and could make teaching and learning easier"
"Excellent blended learning approach"

Table 5.45 indicates the themes that emerged from the four categories (adoption of a LMS, most useful features, suggested improvements, integration of a LMS into teaching and learning). These themes will be used to make recommendations.

Table 5.45 Themes that emerged from the Nodes

Nodes or Categories	Themes
Adoption of a LMS	Training Time
Most useful features	Collaboration and communication Time
Suggested improvements	Uploading of content Training Availability
Integration of the LMS into teaching and learning	Access Learning

5.3.3 Interviews

The information gained during separate interviews, with six participants, outlined the case of DUT using a LMS. The information provided was scribed and verified by the interviewees as being the sequences of events and details of the e-learning project. The proposed framework used the information from the interviews and supporting literature as a basis. Certain themes were identified during the interview process, like community of practice interest groups, and were incorporated into the proposed framework.

The responses from Sections C's question below was considered during the interview process.

Are there any other comments/feedback that you would like to express regarding the implementation of BB LMS at DUT? If yes, then elaborate.

5.4 Results from the literature review to support the framework

The information gathered from the DUT case and the information provided by literature were combined to construct a tiered pedagogical framework in Chapter 6. The results from the literature review is discussed further.

“All South African universities appear to have some form of dedicated information technology department” (Ngugi *et al.* 2007). The OECD (2005) explains that in order to fully support e-learning institutions must give consideration to their IT infrastructure, the use of a student portal, the use of other applications that support teaching and learning (e.g. a ERP system), online administration of support services (e.g. admissions, student web registration, fee payments), integration of systems, network access, and online resources (e.g. e-books). The IT infrastructure is what holds and connects the organisation together in terms of communication, workflow and software.

5.4.1 Support

The support provided has been an apparent requirement since the earlier years of e-learning. “A range of methods should be used to support both the initial and the long-term use of the e-learning systems for staff and students. Manual or person-to-person support for an e-learning system will typically include training sessions and incidental user support” (Catherall 2005). Support staff are individuals that will assist in resolving incidents or issues on the e-learning system (e.g. how to create a user). The requirement for support will ensure sustainability and long-term use of the LMS. Training and development type of support is also essential. “It may perhaps be useful to consider a few wider [training and] developments in the HE sector” (OECD 2005). Research by Venkatesh and Davis (2000) explains that general computer training programs are required since this skill clearly has a strong influence on the acceptance and continued use of systems.

5.4.2 Collaboration

Research by Ngugi *et al.* (2007) concluded that in the case of SA, the e-learning innovation was created by groups working together without "national or institutional support needed to integrate their efforts fully into the educational system" (Ngugi *et al.* 2007). Twelve years later, the DUT not only has internal institutional support but also support from the government in terms of policies, funding and legislature. In addition, it has formed community of practice interest groups across the faculties to collaborate and build the momentum that will positively influence the PEOU of the LMS.

5.4.3 Financial viability

Financial availability has always been a key driving factor. Bullen and Janes (2007) declare that "infrastructure and funding have been identified as the most important but scepticism about the pedagogical value of e-learning and faculty development are also key". This means that HEIs need to ensure that there is a budget to ensure that products costs are managed.

5.4.4 Policies and procedures

When introducing a LMS to a HEI "a practical 'policy and procedures' document should be developed to ensure service consistency and define service provision" (Catherall 2005). Catherall (2005) explains that "this document must include standard practices for activity on the system, including procedures for user training and support". The procedure for adding, maintaining and deleting user accounts, the procedure for access rights (e.g. administrator versus educator), support procedures (contact details, process for recording and resolving queries), procedure for training of existing and new staff, and the explanation of peoples roles in providing training and support must be clearly defined.

Policies and procedures at an institutional level will drive the use of the LMS and support e-learning. "Manuals, providing a detailed reference for the e-learning system, should be authored for students and academic users" (Catherall 2005). Quinn (2012)

states that an institutional policy needs to be in place. “Policy areas include accessibility, appropriate behaviour, support scope and mechanisms, security and privacy” (Quinn 2012). The policy should highlight the requirements for staff development, programme co-ordination, infrastructure, alignment with university policies and guidelines on teaching, learning and assessment.

5.4.5 Implications for the framework

All layers of a framework will need to be put together and work towards a shared goal of incorporating IT into education. During the pilot of the LMS, the LMS should be demonstrated to all faculties, and senior staff members. Sobel and Grotti (2013) state the “teachers have been trained to think of the three components of TPACK (technology, content, and pedagogy) separately; learning to combine the parts will greatly enhance their teaching skills”. The Partnership for Higher Education in Africa found that ICT frameworks by itself does not “constitute an enabling environment in which educational technology can thrive” (Ngugi *et al.* 2007). The implementation of e-learning is therefore “hampered by the absence of an overall technology plan, the lack of clear acquisition and replacement plan and a dependence on short-term funding models” (Ngugi *et al.* 2007). It is therefore imperative to follow a framework that will assist in the adoption of a LMS and ultimate support positive sentiments in the user community.

By adapting Catherall (2005) explanations to this study, the components can be explained as follows:
Content knowledge (CK) refers to content that must be directly and effectively delivered to the users using the chosen technology. This will help to identify the training needs of the users. Technology knowledge (TK) refers to skills needed to accomplish how to install, implement and use the LMS. This knowledge must be identified. Pedagogical knowledge (PK) refers to knowledge that academics have. Academics will need to identify the groups of individuals that will need training on the LMS. If multiple groups are identified (academics, students, and support groups) then the differences in what each group needs to be trained on must be addressed.

The case of DUT academic staff using a LMS suggested that this HEI was using a framework that was being defined by the e-learning project. The government policies and draft framework (Appendix H) steered the project into its first phase. The information gathered from the DUT case and the pertinent information provided by literature were combined to construct a tiered pedagogical framework. There are three layers in the framework; Information Technology (IT), Support (training and development of staff) and Academic Executive Management.

At the core of the implementation of a common LMS lies the university Information Technology Services (ITS) (non-academic), which would be responsible for providing and maintaining the infrastructure, both hardware and software. The university ITS would be responsible for this layer of support. It would be expected that the ITS, skilled in technical and system management, within a HEI environment, be responsible for the infrastructure, implementation, upgrading and maintenance of the LMS. The automation of business processes, such as integration of LMS classes with the registration of students, should also lie within the ITS space. The research from this study identifies Support as an important theme. The functional support of a common LMS should therefore be provided by the ITS of the HEI.

Since another core theme that emerged was training, the second support layer should be efficient in providing training and the development of the online environment. This support layer should establish communities of practice, as suggested by the literature, to support training. In the case of DUT, this is the responsibility of the Centre for Learning and Teaching (CELT). This support function must be able to adequately train and develop the academic staff to use the LMS and be able to provide real-time support as was found by the evidence of this study. These two layers should work together to deliver the LMS software and provide support.

Since academic staff will be responsible for adding module content and promoting student collaboration, and the results of the study indicated that “Training” for academic staff was identified as an important part of promoting PEOU of the LMS, training on adding module content and general housekeeping of the subject content must be core to the framework. The literature by Parr (2015) who identified trends that accelerate technology adoption in higher education states that universities should

collaborate regarding their technological activities and combine resources, thus allowing them to “work toward common goals concerning technology, research, or shared values” (Parr 2015). Training individuals who have had formal training could be considered a valuable motivational tool in cascading the best practice instances down to every academic. This type of knowledge sharing amongst the academics could promote PEOU as the “Community of practice” suggested in the literature. DUT created internal community of practice interest groups to stimulate an interest in e-learning and to build on that to share knowledge and ideas of how to implement e-learning at the institution. Further to this empowerment of academics, support for the LMS software should ideally be real-time.

The next level lies at Academic Executive Management level. The purpose of this layer is for the individuals to identify where the HEI is and where they would like to be with regards to an online teaching and learning environment. Figure 5.17 illustrates the interconnectivity of the 3 layers that defines the proposed framework described above.

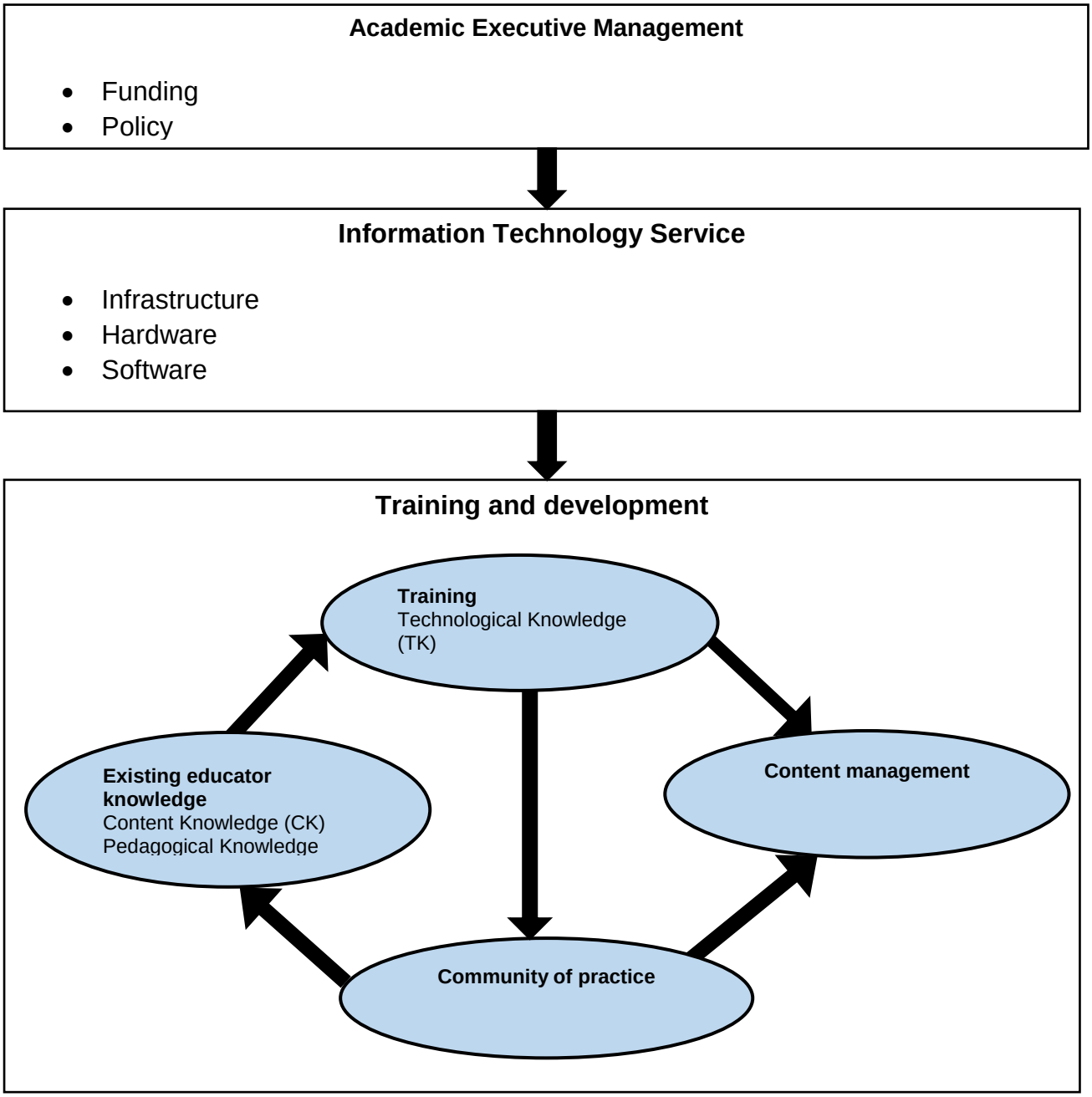

Figure 5.17 illustrates the interconnectivity of the 3 layers that defines the proposed framework (author's own work)

5.5 Summary

This chapter presented the results from the mixed methods used for this study.

For the quantitative analysis, the reliability scores (Cronbach's Alpha values) for all themes in the questionnaire exceeded the recommended value of 0.7. The KMO and

Bartlett's Test figures of 0.5 and 0.05 respectively allowed for the factor analysis procedure. Scoring patterns in the section analysis summarised the demographic characteristics of the respondents. Section analysis for the remaining sections summarised scoring patterns for technology literacy and aptitude, internal DUT support, policies and the procedures and guidelines, ease of use (knowledge on how to use a LMS), software user friendliness, functionality, time, and training and development. Hypothesis testing and crosstab frequencies was conducted by performing a Chi-square test to show significant relationships between items where $p<0.05$. Cross-tabulation amongst all items (i.e. the significance of an item against every other item in the questionnaire) was performed.

For the qualitative analysis, the frequency of words showed the strength of sentiment. It showed the themes that emerged from the subjective views and personal experiences of the participants. The framework presented in this chapter uses relevant information from literature from as early as 2005. The reason for this is that DUT's e-learning efforts started in 2003. It is important to consider literature from that point onwards to determine what has worked and what did not work in terms of providing a guideline to influence PEOU positively.

CHAPTER 6 - INTERPRETATION, CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

The preceding chapter presented the quantitative and qualitative results. This chapter uses the results to draw conclusions, answer the research questions and demonstrates the achievement of the research aim. This chapter uses the analysis from the quantitative data to answer the research questions, set out in Chapter 1. It also uses the quantitative results to extend the Technology Acceptance Model 3 (TAM 3) (Venkatesh and Bala 2008), by identifying other factors that influence Perceived Ease Of Use (PEOU) of a LMS in Higher Education in South Africa. In addition, the themes that emerged from the qualitative results from the case of Durban University of Technology (DUT) using a Learning Management System (LMS), together with literature, is used to propose a theoretical, tiered pedagogical framework. To conclude, the contribution of this study to pedagogy, within a technological environment, is highlighted. References to literature are made from as early as 2005, because the case study at DUT was used as a basis to propose a framework and the DUT's efforts to introduce e-learning started in 2003.

6.2 Summary of the study

This study focussed on identifying factors that could influence the PEOU, one of the constructs of TAM 3 (Venkatesh and Bala 2008), of a LMS at a University of Technology (UoT). The study highlighted the perceptions of the DUT academic community, as defined in the research scope. A total population of 579 academic staff members were identified as using the LMS. A sample size of 40 percent was adopted (232). The pilot study used a ten percent sample (23). For the main study, hundred and fifty six (156) participants completed the questionnaire, and a random list of six participants were interviewed.

The study used mixed methods research. The quantitative data gathered used closed questions on a questionnaire. This information was used to extend the TAM 3 (Venkatesh and Bala 2008). The qualitative data was collected using open-ended questions in the same questionnaire. Interviews conducted, allowed additional information to be gathered. This information, together with literature, was used to create a framework for promoting PEOU for e-learning using a LMS in South African Higher Education.

6.3 Achievement of objectives

Research objective 1: To identify and evaluate the perceptions and attitudes of the academic staff with regards to ease of use of LMS technology.

Research Questions pertaining to Objective 1:

- Do academic staff members think there is sufficient support to ensure a PEOU positively within the LMS?
- Does the demographic profile (age, gender, ethnic group, and citizenship) of the individual influence their PEOU of a LMS?
- Do current practices, policies and procedures guide or promote PEOU of e-learning?

6.3.1 Answers to the Research Questions

6.3.1.1 Research Question 1

Do academic staff members think there is sufficient support to ensure a PEOU positively within the LMS?

The questionnaire used the following themes to extract respondents' beliefs or sentiments:

Technology literacy and aptitude

Results for this theme indicated that respondents were comfortable using technology, did so on a regular basis, used a variety of applications and did not require IT assistance or support when using technology. This could be interpreted as participants having a fairly high level of technology literacy and aptitude.

Internal DUT support

Respondents were aware that, with regard to Blackboard (BB), support staff are available and that documentation (policies, procedures, guidelines) exist. Respondents knew the process to follow if they required assistance, were aware of support contact information if support was required and found queries being responded to promptly. Internal support for the LMS was therefore satisfactory.

Policies procedures and guidelines

Respondents were cognisant of policies for using the LMS, were aware of procedures regarding the use of BB and followed the guidelines.
The responses therefore indicated that electronic learning (LMS e-learning) documentation is available to assist staff to use a LMS and staff members are aware of it.

Ease of use (knowledge on how to use a LMS)

Respondents know how to use the LMS, access student submissions and found the LMS easy to use. Although support for subject content being presented online was cumulatively positive, a large number of respondents remained neutral. An equal number of respondents agreed that the LMS has positively changed the way they teach as opposed to respondents who thought otherwise. The conclusion could therefore be drawn that although the LMS was easy to use, academics did not all find the adoption of the technology conclusively positive.

Software user friendliness

Respondents found BB easy to use, the screens were acceptable as well as the error messages. Therefore, the LMS is Perceived as Easy to Use and user friendly so the software did not present any substantial barriers to using it.

Functionality

Respondents knew what functionality was available, how to add subject material, students or classes, put up notifications and due dates, and respond to students. They were therefore able to use the functionality to support their teaching. Being comfortable to use the LMS positively affected the respondents PEOU of the LMS.

Time

From the results, it could be seen that respondents would like more time to be allocated for keeping LMS material up-to-date, since the responses to using “BB is not time consuming” were cumulatively not in agreement. This was confirmed by the results for “additional time should be allocated”, with which respondents cumulatively agreed to a large extent. The 2nd statement referrred to the workload of each academic, which would mean putting the material on BB should be considered part of the workload. If additional time is not allocated, it could render the LMS material being out-of-date and have a ripple affect on the users PEOU of the LMS software.

Training and development

The majority of respondents received training. Even though some respondents did not receive a training manual, on-line help was found to be available, helpful and adequate. They are also able to assist students on how to use the LMS.

Results from the themes, above, indicate that academic staff members ***generally agree*** that there is sufficient support to ensure a positive PEOU with the LMS.

6.3.1.2 Research Question 2

Does the demographic profile (age, gender, ethnic group, and citizenship) of the individual influence their PEOU of a LMS?

Since the themes identified in the questionnaire were all factors contributing towards a positive PEOU, the analysis of the results revealed that certain demographic elements influenced specific themes in the study more than others. These are listed in Table 6.1.

Table 6.1 Demographic elements that affected the themes

THEMES	DEMOGRAPHIC ELEMENTS
Technology literacy and aptitude	Age , Citizenship
Internal DUT support	Age, Gender ,Ethnic group
Policies and procedures	Gender, Ethnic Group
Ease of use	Gender, Citizenship
Software user friendliness	Age
Functionality	Gender, Ethnic group, Citizenship
Time	Ethnic group
Training and development	Ethnic group, Citizenship

Cross-tabulation results, Appendix O Section O8, indicated that certain demographic elements (age, gender, ethnic group, and citizenship) of the individual does influence PEOU of a LMS. Table 6.2 shows which groups of individuals PEOU were more positive than other groups.

Table 6.2 Groups of respondents whose PEOU were more positive than other groups

	Age	**Citizenship**	**Gender**	**Ethnic Group**
Technology literacy and aptitude	Older group (> 41 years)	SA citizens		
Internal DUT support	Older group (> 41 years)		Females	Indian
Policies and procedures			Females	Indian
Ease of use		SA citizens	Females	
Software user friendliness	Younger group (< 35 years)			
Functionality		SA citizens	Females	Indian
Time				Indian
Training and development		SA citizens		Indian

As can be seen in Table 6.2, it is clear that the older group and SA citizens appear to have higher levels of technology literacy and aptitude. The older group, females and Indians found Internal DUT support good while Females and Indians agreed that Policies and procedures were good. The younger group, however, are more optimistic about the User friendliness of the LMS.

Results from the cross-tabulations indicate that the demographic profile *does influence* their PEOU of a LMS.

6.3.1.3 Research Question 3

Do current practices, policies and procedures guide or promote PEOU of e-learning?

The analysis revealed that respondents are aware of procedures to follow regarding the use of BB, that there are known guidelines with regards to the use of LMS functionality, for example how to add course content, and that they follow the guidelines provided to help them in their teaching. The analysis indicated that there is existing e-learning documentation available that assists academics to use the LMS to help them in their teaching. The academics are not left to figure out the 'how to' elements of the LMS on their own which makes using the LMS easier and which contributes to their Perceptions of Ease Of Use. There is sufficient documentation, policies and procedures to guide and promote positive PEOU of e-learning within this Higher Education Institution (HEI).

6.3.2 An expansion of the TAM 3 as defined by Venkatesh and Bala (2008)

Research objective two was achieved by identifying the factors that affect PEOU of a LMS. Identifying these factors and the reasons why there is an effect on PEOU can be used to positively promote attitude towards technology in education.

Figure 1.3 in Chapter 1 illustrated TAM 3 (Venkatesh and Bala 2008). The model in Figure 6.1 summaries the factors that influences an individual's PEOU towards applications. This means that only certain factors that affect the PEOU construct of the TAM 3 was considered in this study and expanded on. The effects on PU and BI (subjective norm, image, job relevance, output quality, result demonstrability, experience and voluntariness) constructs were excluded. For the PEOU construct perceptions of external control, computer anxiety, computer playfulness, perceived enjoyment and objective usability were excluded from this study. For the computer self-efficacy determinant of the PEOU construct, the categories Technology literacy and aptitude, Software user friendliness, Ease of use (knowledge on how to use a LMS) and Functionality, was included in this study. The remaining four concepts (Internal support, Policies and procedures, Time, Training and development) measured is new determinants that was assessed. The TAM 3 model was changed accordingly.

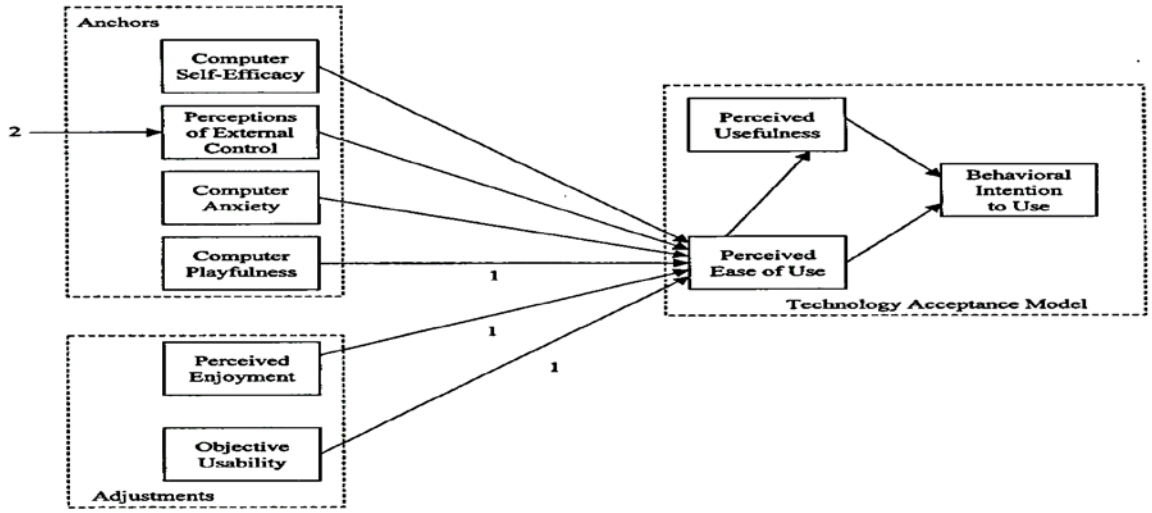

Figure 6.1 shows the Theoretical Model of the Determinants of Perceived Ease of Use (Venkatesh and Bala 2008)

This research was conducted to determine what other factors influences the PEOU of a LMS application within a HEI. The section analysis (Sections B to I) in chapter 5 identified additional factors that influence PEOU of a LMS. All of the variables within each section (theme) had a significant relationship (chi-square value <0.05). The significance of each variable was also presented in Chapter 5 (Section B to I). The hypothesis testing in Chapter 5 indicated which demographic elements that effected the themes.

Using this information, the TAM 3 (Venkatesh and Bala 2008) was adjusted as follows (Figure 6.2):

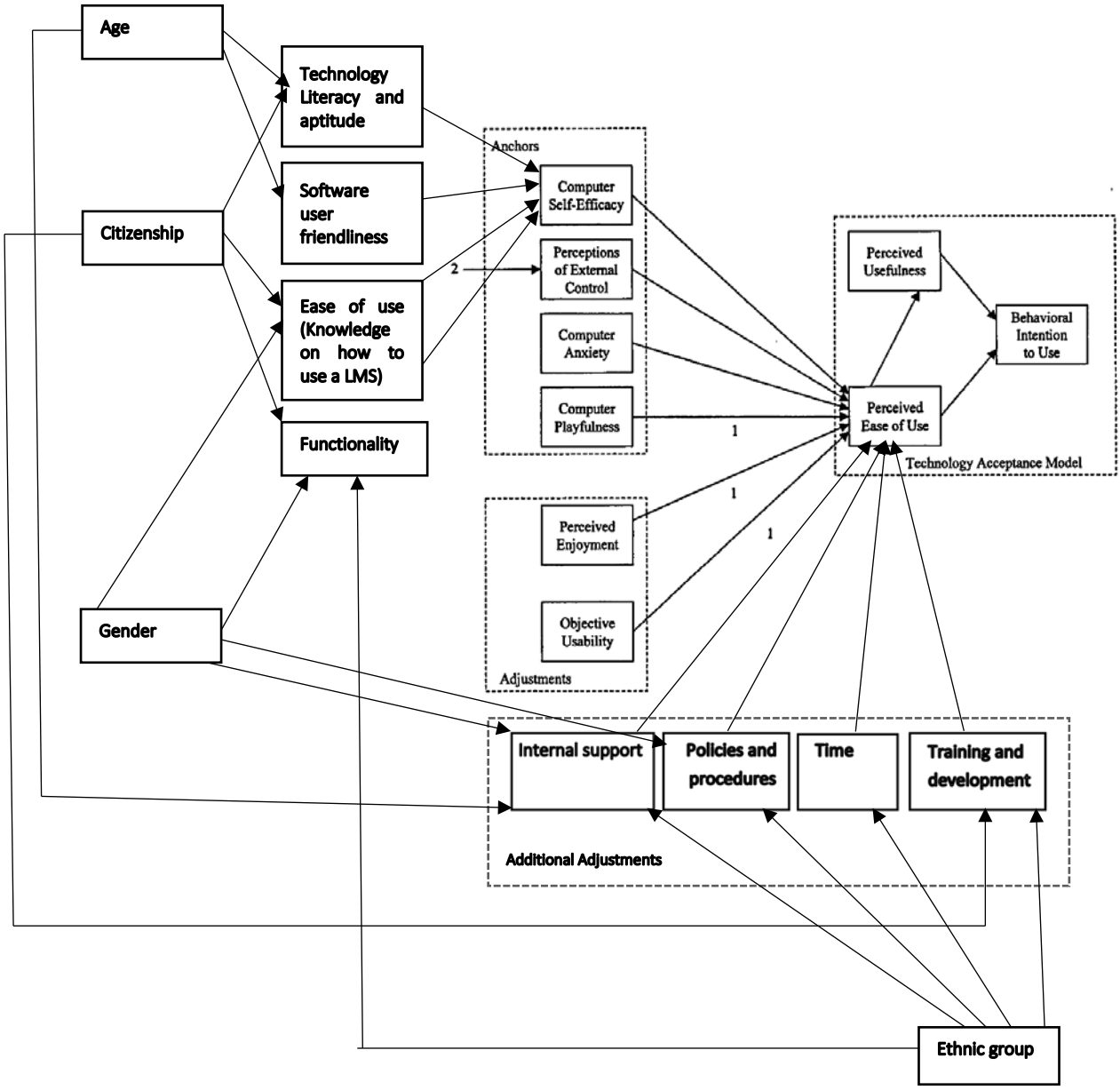

Figure 6.2 illustrates additional factors that influence PEOU of a LMS (author's own work)

Technology literacy and aptitude, Software user-friendliness, Ease of use (knowledge on how to use a LMS) and Functionality in this research is deemed to contribute towards the computer self-efficacy theme in the TAM 3 (Venkatesh and Bala 2008). The analysis confirmed that these themes do in fact influence PEOU of a LMS. In addition to these themes, Internal support, Policies and procedures, Time, Training and development, influenced the PEOU of a LMS. Figure 6.2 further illustrates the

demographic elements that influence each theme. The chi-square values, showing the significant demographic elements, were illustrated in chapter 5 in Table 5.29. The final model was tested (validated statistically) and shown in Appendix Q (Structural Equation Model) and is commented on in the Limitations of this study. Multiple regressions were used to validate the hypothesized relationships.

6.3.3 A theoretical tiered pedagogical framework

Research objective three was achieved by proposing a theoretical tiered pedagogical framework. It is hoped that, if adopted, it will result in promoting a positive attitude towards technology in education. The framework was presented in Chapter 5.

6.4 Limitations of the study

- The scope of this study was limited to a UoT situated in KwaZulu-Natal namely the DUT and the 2017 permanent academic staff at this institution for higher learning. The DUT was chosen because it was convenient for the researcher, being a staff member at this HEI. Part-time staff, administrative staff and those permanent academic staff whose main job profile is the head of department, deputy director, or director were excluded from this study because it was assumed that these individuals might not necessarily use a LMS. Students were excluded from the study because the aim of the research was to create positive attitudes, by academics, towards e-learning and to promote the use of e-learning to academics. The study was further limited to the ML Sultan, Ritson and Steve Biko campuses of DUT, because these campuses are in closer proximity.
- Since personally administered questionnaires, using the Drop-Off-Pick-Up (DOPU) method of delivery was used for reasons explained in the research methodology section, but as a trade-off online delivery of the instrument could have been used to possibly reach participants in a larger geographical area. The pilot study, however, showed that the online delivery method could have

resulted in a lower response rate. Obtaining responses from a larger geographical area may have resulted in different results.

- The name Blackboard should not have been used in the questionnaire. Certain individuals did not complete the questionnaire because they preferred another LMS over BB and openly expressed this.
- Individual interviews were conducted. The shortfall of doing the individual interviews is that there was no debate amongst the participants to either agree or disagree to others' opinions.
- It is important to note that the extension to the TAM 3 (Venkatesh and Bala 2008) and the proposed framework is as per the experiences at DUT and could change in other environments where the infrastructure and technology used is different from that of DUT.
- The overall model analysis was conducted using the Structural Equation Model (SEM). The statistician conducted the necessary tests represented in Appendix Q. As per the summary of Appendix Q, the fit indices of the model do not meet the required cut-off values, indicating that, for this set of data, the model is not the best fit. The model may possibly be improved by increasing the sample size.

6.5 Research Contribution

The study contributions are at different levels.

6.5.1 International level

This study contributes towards HEIs that intend on adopting or promoting e-learning. DUT started its attempts at on-line learning since 2003/2004 (as per the case study) and the project is still growing. The study highlighted what factors are influencing the PEOU of a LMS, by academics, at HEIs more specifically SA HEIs. These factors and the proposed framework could help HEI to plan accordingly and take into account the shortfalls experienced by other institutions. It will have practical implications towards improved educator based interactions and indirectly a better working experience or perception of the LMS.

6.5.2 National level

This study explains what factors could influence the PEOU of academics of a LMS at HEIs more specifically SA HEIs. The theoretical tiered framework can be used for the implementation of a LMS to promote PEOU for e-learning within an academic context. If adopted could improve educator based interactions and perceptions of ease of use and indirectly a better working experience/perception of the LMS by the academics. It is hoped that the framework will assist HEI successfully implement education technology and change the collaboration and communication between departments to a multi-directional type of ongoing collaboration.

6.6 Suggestions for further study

- Limiting the research to a UoT within KwaZulu-Natal could mean that the results from this study may not be applicable to other HEI in SA or international UoTs. Further, studies that include more HEIs or a mix of SA and international HEI could reflect other factors that affect PEOU.
- A study that includes staff and students could also yield a more balanced/holistic view of overall sentiment of PEOU of e-learning.
- Studies in an environment that uses multiple LMSs fit-for-purpose, in terms of the functionality that the LMS offers per faculty/department, for modules that are writing intensive or theory-based modules, could result in different contributing factors to PEOU of a LMS.
- Further research could be done using a different model to determine what can be done to positively change user perceptions for a LMS.
- Further research, could also use HEIs where PEOU is high to build on this proposed framework to add more detail based on experience.
- Another avenue for further research could be to analyse the logs files of the LMS that provides statistics on usage to determine trends in the data and to use business intelligence to make decisions on the use of the system and how to improve the PEOU based on those statistics.

- Repeating this study with a larger sample size so that the SEM could be used to adequately test the model.

6.7 Concluding remarks

The findings from this study adds new factors to the PEOU construct of the TAM 3 (Venkatesh and Bala 2008) in terms of SA HEIs use of LMSs. Further studies could use the new extension for comparative analysis in other environments using different LMSs. The proposed framework, if adopted, can be used as a starting point to guide other HEIs that intend adopting a LMS or changing the selection of a LMS from one LMS to another. As mentioned earlier, further research could build on this framework to create a more sound-proof/concrete framework with little/no room for error. The suggestions made for this study can be used to further mitigate any negative beliefs on PEOU for e-learning thereby bringing HEIs a step closer to closing their technology gap in education and building-up on their attempts of collaborative intelligence.

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APPENDICES

APPENDIX A: Provisional approval to conduct research at the DUT

Institutional Research Ethics Committee
Faculty of Health Sciences
Room MS 49, Mansfield School Site
Gate 8, Ritson Campus
Durban University of Technology

P O Box 1334, Durban, South Africa, 4001

Tel: 031 373 2900
Fax: 031 373 2407
Email: lavishad@dut.ac.za
http://www.dut.ac.za/research/institutional_research_ethics

www.dut.ac.za

24 August 2016

IREC Reference Number: **REC 80/16**

Mrs S Dhebideen
35 Dahlia Road
Umkomaas
4170

Dear Mrs Dhebideen

Creating a framework for promoting perceptions of ease of use for eLearning

I am pleased to inform you that Provisional Approval has been granted to your proposal REC 80/16 subject to:

- Piloting of the data collection tool and
- Obtaining and submitting the necessary gatekeeper permission/s to the IREC.

Full approval is subject to meeting the above conditions.

The Proposal has been allocated the following Ethical Clearance number **IREC 088/16**. Please use this number in all communication with this office.

Approval has been granted for a period of two years, before the expiry of which you are required to apply for safety monitoring and annual recertification. Please use the Safety Monitoring and Annual Recertification Report form which can be found in the Standard Operating Procedures [SOP's] of the IREC. This form must be submitted to the IREC at least 3 months before the ethics approval for the study expires.

Any adverse events [serious or minor] which occur in connection with this study and/or which may alter its ethical consideration must be reported to the IREC according to the IREC SOP's.

Please note that any deviations from the approved proposal require the approval of the IREC as outlined in the IREC SOP's.

Please note that you may continue with validity testing and piloting of the data collection tool. Research on the proposed project may not proceed until IREC reviews and approves the final document. If there are no changes to the data collection tool, kindly notify the IREC in writing.

Yours Sincerely

Professor J K Adam
Chairperson: IREC

DUT DURBAN UNIVERSITY OF TECHNOLOGY

2016 -08- 24

INSITUTUTIONAL RESEARCH ETHICS COMMITTEE
P O BOX 1334 DURBAN 4000 SOUTH AFRICA

APPENDIX B: Gatekeeper's letter from Research office

Directorate for Research and Postgraduate Support
Durban University of Technology
Tromso Annexe, Steve Biko Campus
P.O. Box 1334, Durban 4000
Tel.: 031-3732576/7
Fax: 031-3732946
E-mail: moyos@dut.ac.za

15th September 2016

Ms Sharitha Dhebideen
c/o Department of Information Technology
Faculty of Accounting and Informatics
Durban University of Technology

Dear Ms Dhebideen

PERMISSION TO CONDUCT RESEARCH AT THE DUT

Your email correspondence in respect of the above refers. I am pleased to inform you that the Institutional Research Committee (IRC) has granted full permission for you to conduct your research "Creating a framework for promoting perceptions of ease for use of eLearning" at the Durban University of Technology.

We would be grateful if a summary of your key research findings can be submitted to the IRC on completion of your studies.

Kindest regards.
Yours sincerely

PROF. S. MOYO
DIRECTOR: RESEARCH AND POSTGRADUATE SUPPORT

APPENDIX C: Research Data Collection Instrument

DUT Academic Staff Questionnaire

Dear Staff Member

Thank you for taking the time to participate in this survey. By completing this survey you hereby give consent to participate in this study (ethics clearance number IREC 088/16).

The questionnaire relates to your perceptions on ease of use of the Blackboard (BB) Learning Management System (LMS) and the adoption of eLearning at Higher Education Institutions like the Durban University of Technology (DUT). The questionnaire consists of:

Section A: Demographics/Your Details

There are 6 questions pertaining to you as a DUT academic staff member.

Section B: Research Questions

Questions 7 till 13 relate to the subject/s you teach and your use of LMSs

Questions 14 till 55 are based on your perception of the BB LMS and its use at DUT.

Section C: General (Qualitative Questions)

Here you can add comments you may have on DUTs adoption of the BB LMS and the effect it has had on yourself as an academic staff member.

There are 5 open-ended questions which will give you the opportunity to express your views on BB.

Section D: Participation in a group discussion

An indication of whether you would like to participate in a group discussion.

Confidentiality is guaranteed. All feedback received from this survey will only be used for this study.

SECTION A: (please select an option for all questions)

Please indicate your response to each question

1. Age Group

☐ < =30 years ☐ Between 31 and 35 ☐ Between 36 and 40

☐ Between 41 and 45 ☐ Between 46 and 50 ☐ Over 50

2. Gender

☐ Male ☐ Female

3. I belong to the Faculty of

☐ Accounting and Informatics ☐ Applied Sciences ☐ Arts and Design

☐ Engineering and the Built Environment ☐ Management Sciences ☐ Health Sciences

4. Years of lecturing service at any Higher Educational Institution

☐ < 5 years ☐ Between 5 and 10 years ☐ Between 11 and 15

☐ Between 16 and 20 years ☐ Between 21 and 25 years ☐ Over 25 years

5. Ethnic Group

☐ African ☐ Coloured

☐ Indian ☐ White

6. Citizenship

☐ SA Citizen ☐ Non SA Citizenship

SECTION B:

7. Nature of the subject I teach

☐ Theory ☐ Practical ☐ Theory and Practical

8. Mode of study

☐ Part-time ☐ Full-time ☐ both Part-time and Full time

9. I have used other LMSs other than BB

☐ Yes ☐ No

10. If you answered 'Yes' to number 9, which other systems have you used

☐ WebCt ☐ Moodle

☐ Kewl ☐ Desire2learn

☐ Other

11. If you answered 'Other' to number 10, please specify the e-learning/LMS software you used: ☐

12. How many years' experience do you have using any LMS

☐ None or < 1 years ☐ Between 1 and 2 years

☐ Between 2 and 5 years ☐ Over 5 years

13. Do you have students at DUT registered on BB for the subject/module that you teach

☐ Yes ☐ No

For each statement below please indicate which SINGLE response most accurately reflects your experiences with Blackboard at DUT. Your response is CONFIDENTIAL i.e. no one will have access to this information other than the individuals involved in this study.

Key

1 = strongly agree *2 = agree* *3 = neutral* *4 = disagree* *5 = strongly disagree*

		Strongly Agree	Agree	Neutral	Disagree	Strongly disagree	Not Applicable
	Technology literacy and aptitude						
14	I am very comfortable using a PC at work	1	2	3	4	5	
15	I send and respond to emails on a daily basis	1	2	3	4	5	
16	I regularly browse the *intranet* to find out about DUT related matters	1	2	3	4	5	
17	I regularly browse the *internet* for personal, work, and study matters	1	2	3	4	5	
18	I am very comfortable using work related applications like ITS and iEnabler	1	2	3	4	5	
19	I am very comfortable using work related applications like BB	1	2	3	4	5	
20	I often require assistance when using IT software	1	2	3	4	5	
	Internal DUT Support	Strongly Agree	Agree	Neutral	Disagree	Strongly disagree	Not Applicable
21	I know what process to follow when I need assistance on BB	1	2	3	4	5	
22	There are policies, procedures and guideline documentation available	1	2	3	4	5	

23	This documentation is easily accessible to all staff to follow when assistance on BB is needed	1	2	3	4	5	
24	Any queries on BB are answered promptly and in time for me to continue with my task	1	2	3	4	5	
25	Contact details for BB support staff are known	1	2	3	4	5	
26	Support staff are ready to assist and available when needed	1	2	3	4	5	
	Policies and procedures	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**	**Not Applicable**
27	There are known policies in place at DUT regarding BB	1	2	3	4	5	
28	Academics (including myself) are aware of procedures to follow regarding the use of BB e.g. How to add my subject/module to BB	1	2	3	4	5	
29	There are known guidelines to follow to add my subject and class and course material to BB	1	2	3	4	5	
30	I follow the guidelines provided to allow the use of BB to aid in my teaching	1	2	3	4	5	
	Ease of use	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**	**Not Applicable**
31	I know how to access BB	1	2	3	4	5	
32	I know how to access student submissions on BB	1	2	3	4	5	
33	BB is easy to use	1	2	3	4	5	
34	I very seldom require assistance on BB	1	2	3	4	5	
35	I support subject content being presented online	1	2	3	4	5	
36	The adoption on BB has positively changed the way I teach	1	2	3	4	5	
	Software User Friendliness	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**	**Not Applicable**
37	I can easily find my way around BB	1	2	3	4	5	
38	Screens are easy on the eyes	1	2	3	4	5	
39	I can understand where to find the things I need	1	2	3	4	5	
40	I can understand the messages I get from BB and can act accordingly	1	2	3	4	5	
41	I find it difficult to use BB	1	2	3	4	5	
	Functionality	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**	**Not Applicable**
42	I know what functionality is available on BB	1	2	3	4	5	
43	I know how to use BB to add my subject material	1	2	3	4	5	

44	I know how to use BB to add my class or a student	1	2	3	4	5	
45	I know how to use BB to add/edit/update course material	1	2	3	4	5	
46	I know how to use BB to put up notifications and due dates	1	2	3	4	5	
47	I know how to respond to students using BB	1	2	3	4	5	
	Time	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**	**Not Applicable**
48	There is adequate time during work hours to attend to lectures and BB	1	2	3	4	5	
49	I find the workload between my lectures and the maintenance on BB manageable	1	2	3	4	5	
50	Additional time should be allocated for the housekeeping on BB	1	2	3	4	5	
51	Using BB is not time consuming	1	2	3	4	5	
	Training and Development	**Strongly Agree**	**Agree**	**Neutral**	**Disagree**	**Strongly disagree**	**Not Applicable**
52	I received training on how to use BB	1	2	3	4	5	
53	I received a training manual on how to use BB	1	2	3	4	5	
54	On-line help on BB is useful and adequate	1	2	3	4	5	
55	I am able to advise my students on how to use BB	1	2	3	4	5	

SECTION C:

Are there any other comments/feedback that you would like to express regarding the implementation of BB LMS at DUT? If yes, then elaborate.

What do you like most about BB?

What would you like to see improved on BB?

How do you feel about the adoption of BB and the integration of BB into teaching and learning?

Would you like to see BB integrated with other DUT applications like ITS and iEnabler?

SECTION D:

Please indicate if you are willing to participate in a group discussion concerning e-Learning in general and the implementation of the BB LMS at DUT.

☐ Yes ☐ No

CONTACT DETAILS: VOLUNTARY

You may be contacted if clarity is required regarding your responses in section C or if you indicated 'Yes' for participation in the group discussion.

Name	
Staff Number	
Contact number / Email Address	

Thank you for completing this survey

APPENDIX D: Letter of Information and Consent

-

LETTER OF INFORMATION

Title of the Research Study: Creating a framework for promoting perceptions of ease of use for eLearning

Principal Investigator/s/researcher: Sharitha Dhebideen

RPL BTech: IT with completion of RMIT101

Co-Investigator/s/supervisor/s: Dr. Delene Heukelman

Brief Introduction and Purpose of the Study:

Higher Education Institutions have introduced Learning Management Systems (LMS) into their teaching and learning. The Durban University of Technology (DUT) introduced the Blackboard (BB) LMS to support the sharing and collaboration of information between teachers and learners. As is customary with change resistance to accept technology is being encountered. This could be as a result of training, support, software user friendliness, time etc. The purpose of this research is to evaluate the perceptions and attitudes with regards to ease of use of technology in teaching and to propose a conceptual framework within which academic staff at DUT could work. An evaluation of the perceptions and attitudes will be carried out to determine the factors that could be influencing Perceived Ease Of Use (PEOU).

Outline of the Procedures:

Participation in this study is voluntary and confidential. Please be open and honest during any survey/discussions with the researcher. The procedure for this study will be in 3 parts. You may be selected to participate in all 3 parts of the study or specific aspects. There will be an informal session, of approximately 15 minutes at your workspace, during which the researcher will observe how familiar/comfortable you are on Blackboard. This session, given your consent, will be recorded either by audio or video proxy to simplify the process of data collection, which will later be transcribed for further analysis. You will, thereafter, be presented with an evaluation form to rate Blackboard in terms of perceived ease of use. A copy of what was observed and transcribed will be forwarded to you to ensure accuracy and clarity of the session. You will have the opportunity to add or rectify any information. The evaluation forms will also be used as documentation.

A survey will be conducted to gather personal and research data. An invitation by means of a questionnaire will be emailed to your DUT email address for completion in your own time but within a specified period of time. If chosen to participate in the survey, you will be required to read/sign the covering letter and consent form thereby acknowledging participation in the study. You will be required to complete the questionnaire in full and place it into the survey box situated at the reception area. Please feel free to highlight any of your issues, concerns or positives on Blackboard in the general section. Also, indicate here if you are interested in the subject area under study (eLearning). The approximate time to complete the questionnaire is 30 minutes.

If you have indicated during the survey that you are interested in eLearning then you may be chosen to participate in a group discussion. You will be able to express what you have highlighted during the survey for discussion in an open forum. A meeting request will be forwarded, to the participating group, with an attached agenda. The request will stipulate the date, time and venue. The approximate duration for the discussion will be 60 minutes. This forum will be recorded, given consent from the group, either by audio or video proxy. This will be later transcribed for documentation and analysis purposes. A copy of what is documented will be forwarded to the group for agreement. You may add or amend any information as per the discussion to confirm accuracy.

You were selected to participate based on your academic profile at DUT and your knowledge on Blackboard. This will allow the researcher to gather pertinent data needed to conclude the study. The results from this study will be put forward to the academic staff to further improve the adoption of Blackboard at DUT.

Risks or Discomforts to the Participant:

There are no risks to your participation in this study.

Benefits:

It is hoped that the outcome of this study will be accepted for increased use of Blackboard at DUT and other UoTs who are using a LMS. Findings will be made available through publications on the DUT research library on eLearning and via LMS seminars and workshops at DUT.

Reason/s why the Participant May Be Withdrawn from the Study:

You reserve the right to withdraw, at any point during the study, without any repercussions to yourself or your job. There will be no adverse consequences for the participant should they choose to withdraw.

Remuneration:

There will be no remuneration or compensation awarded to any individual for participating in this study.

Costs of the Study:

There will be no cost implications for the participant during the study.

Confidentiality:

All information provided by you will be confidential. Your identity or any other personal information that could identify you will not be published in any thesis resulting from this study. If in the event of reiterations of what was discussed by means of quotations is required then this will be used, with your permission, by means of anonymous quotations. Only the supervisor, statistician, and the researcher will have knowledge of the data you provide.

Research-related Injury:

All participation in this study is voluntary. No compensation will be awarded should there be any research-related injuries. There are no anticipated research-related injuries that could result from this study.

Persons to Contact in the Event of Any Problems or Queries:

Doctor Delene Heukelman: Deputy Director : Faculty of Accounting and Informatics. Please contact the researcher (031 373 5476), my supervisor (031 373 5562) or the Institutional Research Ethics administrator on 031 373 2900. Complaints can be reported to the DVC: TIP, on 031 373 2382 or dvctip@dut.ac.za.

General:

This study has been reviewed by the faculty research committee and the DUT Institutional Ethics Committee (IREC). Participation in this study is voluntary. You reserve the right to withdraw from this study, at any point during the research. There will be no adverse consequences to you, the participant, should you choose to withdraw. In the event of your withdrawal, please notify the researcher accordingly. Approximately 230 DUT permanent academic staff will be contacted for their contribution to the study. For any further information regarding the study or your participation, feel free to contact me via email at sharithad@dut.ac.za or my supervisor as per the contact details above. A copy of this information letter will be issued to all participants.

DUT DURBAN UNIVERSITY OF TECHNOLOGY

INSTITUTIONAL RESEARCH ETHICS COMMITTEE

CONSENT

Statement of Agreement to Participate in the Research Study:

- I hereby confirm that I have been informed by the researcher, Sharitha Dhebideen, about the nature, conduct, benefits and risks of this study - Research Ethics Clearance Number: IREC 088/16 (IREC reference number: REC 80/16)
- I have also received, read and understood the above written information (Participant Letter of Information) regarding the study.
- I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be anonymously processed into a study report.
- In view of the requirements of research, I agree that the data collected during this study can be processed in a computerised system by the researcher.
- I may, at any stage, without prejudice, withdraw my consent and participation in the study.
- I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.
- I understand that significant new findings developed during the course of this research which may relate to my participation will be made available to me.

Full Name of Participant	**Date**	**Time**	**Signature / Right Thumbprint**

I, Sharitha Dhebideen herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

Sharitha Dhebideen	18 April 2017	
Full Name of Researcher	**Date**	**Signature**
Full Name of Witness (If applicable)	**Date**	**Signature**
Full Name of Legal Guardian (If applicable)	**Date**	**Signature**

APPENDIX E: **Pilot study validity and reliability test**

The pilot study validity and reliability tests were performed however it is irrelevant due to the sample size being too small.
Cronbach's alpha was used to test the reliability of the Likert scale questions. This analysis method measured the item reliability, whilst factor analysis (Kaiser-Meyer-Olkin (KMO) and Bartlett's test) was used to measure factor validity.

The Cronbach's alpha test evaluates how well an item measures up to the underlying hypothesis by calculating the average inter-correlations among the items measuring each of the themes. The general guideline is that reliability coefficient above 0.7 is considered acceptable. The scores for the themes around which this study is based (Technology literacy and aptitude, Internal Durban University of Technology (DUT) support, Policies and procedures, Ease of use (knowledge on how to use a LMS), Software user-friendliness, Functionality, Time, Training and development) were high and acceptable, with the exception of the theme "Time". The Cronbach's alpha test scores is shown in Appendix K.

The high values, close to one, indicate that the items that make up the theme all measure the same underlying structure, meaning they form a reliable factor and they are consistent in between the other items of the theme. The score for the seventh theme (Time), which measured 0.512 was below the acceptable reliability coefficient (0.7). The size of the pilot study sample could have been the contributing factor for the low score. The score did change with a larger sample during the main study.

The factor analysis was executed using the KMO and Bartlett's test. As per the analysis in Appendix K, all conditions were satisfied for factor analysis. For this test the general guideline is that the KMO sampling adequacy value should be greater than 0.500 and the Bartlett's Test for the sphericity significance value should be less than 0.05.

Factor analysis test values (KMO and Bartlett's Test) from the Pilot Study is shown in Appendix K.

All but two questions tested perfectly against the themes. Questions B20 (I often require assistance when using IT software) and F41 (I find it difficult to use BB) did not align perfectly against the themes. This, as discussed earlier, could have been as a result of the sample size used in the pilot study. The results from the analysis suggest that the remaining Likert scale questions perfectly measure the themes for the study.

APPENDIX F: e-Learning Policy

DUT DURBAN UNIVERSITY OF TECHNOLOGY

E-LEARNING POLICY

(Approved by Senate on 8 September 2016)

DURBAN UNIVERSITY OF TECHNOLOGY E-LEARNING POLICY	
Document name:	e-Learning Policy
Co-ordinating Exec Manager/ Document owner:	Professor Nomthandazo Gwele Deputy Vice Chancellor: Academic
Operational manager/s	Prof Graham Stewart
Contact & tel. no. for support:	031-373 2837/6756 stewart@dut.ac.za ursulas@dut.ac.za
Status:	Approved
Approved by:	Senate
Date approved:	8 September 2016
Date last amended:	8 September 2016
Title of manager responsible for monitoring policy implementation	Prof Graham Stewart, e-Learning Project Coordinator
Related policies:	• Learning, Teaching and Assessment Strategy (2013); • Guidelines for Teaching and Learning at DUT (2013); • Assessment Policy (2014); • Plagiarism Policy (2009); • IT Equipment Replacement Policy (2012); • DUT Faculty Awards for Teaching Excellence. Vice Chancellor's Award for Teaching Excellence. Information, Guidelines and Nomination/Application Instructions (2013); • Open Access Policy (Draft) (2016) • CQPA Handbook: Procedures and Guidelines 2016-2017 • General Handbook; • **Annexure:** e-Learning Procedures and Guidelines (Annexure A to this Policy);

Timeline for policy development and approval process

Objective 1: Prepare first draft of document by 25 November 2015
(Submit Draft 00 to reference group 8 October 2015)
(Submit Draft 00a to E-Learning Core Committee 21 October 2015)
(Submit Draft 01 to AEM 3 November 2015)
Objective 2: Disseminate across the institution for comments and input by 15 February 2016. Draft policy and response form to be posted on DUT electronic notice board.
Objective 3: Refine document and finalise for submission to Senate by May 2016, for approval, and to Council for ratification after Senate approval.
(Submit to Faculty Boards February 2016)
(Revise document from Notice Board submissions and Faculty input by April 2016)
Objective 4: Senate approval of policy (Target – August 2016)
Objective 5: Implementation date for policy:(Target – November 2016)

POLICY CONTENT

Purpose of the policy	The policy charts the adoption of e-learning as a core strategy at the Durban University of Technology (hereafter, DUT) in line with the University strategic plan. The policy is presented in the context of the broader University aim to prepare students to be active, participatory learners. E-learning engages students in a structured digital ecosystem that fosters graduate attributes such as: a) comprehending the role of technology in society, b) identifying issues in applying relevant technology and c) critically evaluating and engaging with information from a variety of sources, using relevant technology. DUT aims to provide innovative teaching, learning and assessment that accommodates the diverse needs of our students and enhances the quality of our graduates. E-learning as a core teaching and learning practice deepens the innovative use of technology, improves the quality of learning and has the potential to promote student access to reliable online information and resources. (DUT Strategic Plan 2015: 8) At DUT, e-learning refers specifically to the delivery of modules using online (virtual) classrooms located within the institutional LMS as part of mixed mode (blended) delivery. The policy is aligned with the general principles and practices set out in the *DUT Strategic Plan 2015-2019. Towards Relevance, Responsiveness and Resilience* (2015); *Learning, Teaching and Assessment Strategy* (2013), *Guidelines for Teaching and Learning at DUT* (2013) and *Assessment Policy* (2014). For relevant cross-references, see below. The e-Learning Policy focusses on the special affordances and requirements of this particular delivery mode, supplemented by an annexure with guidelines and outlining implementation procedures (See *Annexure A: e-Learning Procedures and Guidelines*). The policy provides a framework for the University's strategic commitment to e-learning.
Policy	The University aims to embed e-learning as a core teaching and learning practice. E-learning, as an integral feature of programme design, and the general approach to learning, teaching and assessment, promotes the development of all graduate attributes, in particular workplace adaptability, proficiency in technology applications and information literacy. The pedagogical principles underlying the promotion of e-learning relate to student-centredness, and to self-directed and life-long learning (See also, *Assessment Policy*: 2). Consequently, e-learning should be incorporated, where appropriate, into all learning programmes because of its potential to provide a more integrated learning environment for students and lecturers. It should be noted that in the case of programmes that contemplate significant changes in the mode of provision (as specified in the *CQPA Handbook: Procedures and Guidelines 2016-2017*), Senate approval is required.

DUT e-Learning aims to develop the use of technology to:
a) Create and deliver digital learning materials, in particular Open Educational Resources (OER), b) conduct assessments, c) assign grade marks, and d) communicate more interactively with students via the University learning management system (LMS).

To meet minimum requirements for ensuring the quality of e-learning as a delivery method, programmes must address a) Staffing, b) Programme Coordination, c) Infrastructure and d) Alignment with University policies and guidelines on teaching, learning and assessment.

a) Staffing
Sufficient planning and resource provision (in terms of time as well as money) are required to build the capacity of the staff to deal with the demands of developing and delivering electronic learning materials, and the integration of three crucial sets of skills: academic expertise, instructional expertise, and technological expertise. (See also *Learning, Teaching and Assessment Strategy*: 7).

b) Programme Coordination
The use of educational technology for teaching and learning requires a budget for maintaining and continually upgrading the appropriate technology. This must include provision for the appropriate number of academic staff, maintaining a high level of technical and other support staff, and maintaining a learning management system. Academic staff development in e-learning should be provided on an on-going basis. Student preparation for e-learning should be included in student orientation and induction programmes. (See *Learning, Teaching and Assessment Strategy*: 7 – Focus 4, "enhancing student access and success").

c) Infrastructure
By endorsing e-learning as a core teaching and learning activity, the University commits itself to an adequate level of ICT provision, including IT-related resources such as bandwidth; strong consistent wifi coverage; online security; supervision and maintenance of computer labs; and the provision of sufficient up-to-date devices for staff and student use (See also: *IT Equipment Replacement Policy* (2012): 2.2 DUT life cycle for Computer and IT related equipment – page 2). Consideration should be given to finding a mechanism for the provision of off-campus access, where necessary. The academic sector (faculties, departments and programmes) should recognise staff accomplishments in the production and delivery of online course materials by providing time and/or funding for development in this area. Data management systems must be robust and secure and used to track student progress, to identify and proactively support students at-risk and to provide data to inform the programme review process.
(Adapted from CHE *Good Practice Guidelines* 2014: 90;98).

d) Alignment with University policies and guidelines on teaching, learning and assessment.

- *Learning, Teaching and Assessment Strategy* (2013)
  - Focus 4 (page 7): "Using technology enhanced

	learning as an integral feature for the delivery of courses". • *Guidelines for Teaching and Learning at DUT* (2013) o Objective 11 (page 12): "Linked to the idea that students as lifelong learners need to take responsibility for their own learning, promote and support e-learning or blended learning in academic programmes". • *Assessment Policy* (2014) o See page 2: "The policy also takes cognisance of the increasing role of technology in the three intricately intertwined processes of learning, teaching and assessment." o Compliance with moderation requirements as set out in Section 2.10 (page 7). • *CQPA Handbook: Procedures and Guidelines 2016-2017* • *Plagiarism Policy* (2009) o See introduction with regard to the promotion of academic integrity, including detailed information on the avoidance of plagiarism. • *IT Equipment Replacement Policy* (2012) o See Section 2. (page 2): "DUT life cycle for Computer and IT related equipment". • *DUT Faculty Awards for Teaching Excellence. Vice Chancellor's Award for Teaching Excellence. Information, Guidelines and Nomination/Application Instructions* (2013); o See page 2: "Innovative use of technology in the processes of learning and teaching". • *DUT Staff Awards. Networking the University.* o Awarded to a programme where innovative use of digital technologies in teaching and learning lead to student success The adoption of e-learning as an integral teaching and learning delivery mode is articulated in Chapter 7 "Opening Learning through Diverse Modes of Provision" of the *White Paper for Post-School Education and Training.* (2013). Scaling up e-learning opportunities are seen as a means towards delivering an expansion of the post-school system, and improved articulation options (*White Paper for PSET*, 2013: vii-viii). The *White Paper* places unprecedented emphasis on the important part to be played by ODL (Open and distance learning) and OERs (Open education resources) in future South African HE provision. The *King III Report*, and the associated *Code of Governance Principles for South Africa* (2009) require universities to ensure that IT supports the strategic objectives of the organisation: "The effective use of Information Technology (IT) is a key success factor enabling institutional agility and the ability to respond speedily to students' demands for educational services[…] the use of IT will be harnessed to ensure that everyone has fast, reliable and affordable access to information and knowledge that will enable them to participate meaningfully in the community and economy." (Kana 2009:4).

Applicability	The Policy is applicable to all DUT academic staff, academic development staff, academic support staff and students across all DUT campuses, faculties and organisational support structures and services. The Annual Quality Monitoring (AQM) system requires programmes to account for the quality of e-learning as a delivery mode and will provide Senate with the opportunity to monitor progress in terms of the use of e-learning in the delivery of education and in the quality of its use.
Definitions	These definitions are intended to expand the meaning of the 'digital ecosystems' referred to under Policy Purpose (paragraph 1, page 2). **Asynchronous interaction** is the learning or sharing of information within a group outside the constraints of time and place: e.g. the access to and use of email, discussion forums etc. (CHE 2014: 79) **Augmented learning** is an on-demand learning technique where the environment adapts to the learner. By providing remediation on-demand, learners can gain greater understanding of a topic while stimulating discovery and learning. **Blended learning** refers to the provision of structured learning opportunities using a combination of contact, distance, and/or ICT-supported opportunities to suit different purposes, audiences and contexts. It can also refer to the use of a variety of teaching models and styles of learning.(CHE 2014: 79) **Bring Your Own Device (BYOD)** refers to the policy of permitting staff and students to bring personally owned mobile devices (laptops, tablets, and smart phones) to their educational setting, and use those devices to access institutional information and applications.(CHE 2014: 79) **E-learning** can be usefully categorised on a continuum, ranging through categories including digitally supported, digitally dependent, Internet-supported, Internet-dependent and fully online teaching and learning activities. (DHET 2013: 49). For the purposes of this policy, at DUT, e-learning refers specifically to the delivery of modules using online (virtual) classrooms located within the institutional LMS as part of mixed mode (blended) delivery. **Instructional Design** comprises four main areas: Consistent layout and design; Clear organisation and presentation of information; Consistent and easy-to-use navigation; and Aesthetically pleasing design and graphics. (Uvalic-Trumbic 2012: 8) **Learning Management System (LMS)** (or Virtual Learning Environment - VLE) is a software application for the administration, documentation, tracking, reporting and delivery of programmes and courses. (CHE 2014: 80). "…the use of Learning Management Systems … [makes] it possible to manage scale operations, not least by linking pedagogical activities to student records […] the genius of technology in education […] is to allow

	us to achieve scale, quality and low cost simultaneously. We must not turn our backs on that revolution." (E-learning authority, John Daniel, quoted in CHE 2014: 73). **Media in online learning** includes video, graphics, audio, animation, simulation and live streaming. (Uvalic-Trumbic 2012: 11) **Mode of provision** refers to the dominant mix of methods by which institutions mediate their curricula: by distance or contact-based methodologies– with the blend of methods varying from context to context. (CHE 2014: 79). In the case of DUT, the dominant mode of provision is contact, supplemented by mixed mode delivery, evolving towards higher levels of blended learning. **Open Educational Resources (OER)** are educational resources that are openly available for use by educators and students, without an accompanying need to pay royalties or licence fees (UNESCO and Commonwealth of Learning, A Basic Guide to Open Educational Resources (2011: 5). DUT committed itself to Open Access and Open Educational Resources principles by signing the *Berlin Declaration on Open Access* in 2013. **Synchronous interaction** is the learning or sharing of information within a group that necessitates taking part at the same time, although it could be outside the constraint of place (if supported online): e.g. a lecture in a classroom with facilitator and all students present, or a lecture via Web-conferencing with some or all students online. (CHE 2014: 80)
Contact for support	*Contacts:* e-Learning Project Coordinator (office of the DVC Academic) Staff development and e-learning support: CELT e-Learning: Director: CELT and Programme Coordinator: CELT e-learning LMS Support: LMS Systems Administrator Network and Devices: Director ITSS
Policy authority/ Document owner	DVC Academic Director: CELT e-Learning Director: ITSS Coordinator: e-Learning Project
Related policies	• See cover page.
Implementation procedures	From 2016, all modules will be assigned an online classroom, and students will be enrolled automatically at the start of each semester. Each online classroom should contain (at least) a copy of the module study guide. Detailed targets and timeframes for the implementation of e-learning appear in *Annexure A: e-Learning Procedures and Guidelines.* E-learning take-up has been co-ordinated by the institutional e-Learning Project since 2013. Full details of the project timeline and reports, and minutes of the e-Learning Core Committee are available on the DUT Intranet.
Monitoring	Executive Deans and Heads of Department (Annual Quality Monitoring) Sources of data:

	Faculties/Programmes Student evaluations MIS LMS Database

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APPENDIX G: e-Learning (Procedures and Guidelines)

Annexure A: e-Learning Procedures and Guidelines

This document provides Procedures and guidelines referred to in the DUT e-Learning Policy.

e-Learning implementation timeline

1. **2013-2014:**
   1.1. Faculty Representatives on the e-Learning Core Committee to promote and develop e-learning adoption via Executive Deans and Heads of Department.
   1.2. CELT e-Learning to provide training and support for staff new to e-learning.
   1.3. ITSS to accommodate increased user and space requirement of LMS software, and provide automatic student enrolment on the LMS.
2. **2015:**
   2.1. 50% of qualifications (programmes) to include an e-learning component on the institutional LMS.
   2.2. ITSS to provide automatic student enrolment on the LMS.
   2.3. Staff to prepare 2016 Study Guides in electronic form (e.g. PDF).
3. **2016:**
   3.1. Automatic student enrolment into e-learning classrooms for all DUT modules
   3.2. Provision of (at the minimum) 2016 Study Guides in electronic form for each module's online classroom.
4. **2017**
   4.1. Online classrooms to contain (at the minimum): Study Guide, Discussion Forum, Online quizzes.
   4.2. At least one OER (Open Educational Resource) per online classroom. OERs may be obtained from external sites or locally (DUT) designed and produced.
   4.3. AQMs to include detailed accounts of e-learning provision in programmes.

Guidelines

Consult the extensive guidance and support materials available from CELT e-Learning. All staff have automatic access to (a) the CELT e-Learning online classroom at Blackboard Design Support 2016 at http://thinklearnzone.dut.ac.za/ and (b) The e-Learning Online Help Desk at http://elearning.dut.ac.za/

Basic guides provided in this document:
1. SAIDE Course Outline Template
2. GWU Online Course Layout: Navigation, Structure, Look and Feel

1. SAIDE Course Outline Template

Course Outline Template	
Title of course	
Name of programme in which the course is used	
Purpose/aims of course	
Profile of learners	
Outcomes of the course	
Structure of the course (include reworked syllabus)	→ Unit One • Objectives • Main learning points Lesson topics → Unit Two • Objectives • Main learning points Lesson topics Etc
Learning and teaching strategies	• Independent study (notional hours studying self-learning materials • Learner support strategy (contact sessions, individual contact with tutors face-to-face and by telephone, email support, etc) • Practical work • Workshops • Peer support – study groups • Media
Assessment strategy	• Self-assessment activities • Assignments • Mock examinations • Examinations
Evaluation methods and techniques	

2. GWU Online Course Layout: Navigation, Structure, Look and Feel

Whichever Learning Management System (LMS) you use, there are certain basic functions and design elements that should appear in all courses. These are listed below. You can get an overview of these from the Quality Matters rubric described in the section Evaluating Your Course Design.
Ten Design Tips

1. Consider how students will get ready for your course. For instance, in many programs it is customary to email students an introduction and key information before the official course start.
2. Create a clear starting point for your course. You might, for instance, create a heading at the top of your course menu and put key course start-up information in that section. This can include a welcome message, technology requirements for the course along with key dates, instructions on reviewing the syllabus, and books to order.
3. Create an "introduce yourself" discussion board, blog or wiki due in the first few days of the course. This lets you see who has made it to your course. It also begins a process of student communication that can continue throughout the course.
4. Organize the course menu with meaningful names and clear, logical order for all menu items. In an online course, the menu is very often designed by week. So all materials for Week 1 go there, Week 2, Week 3, etc. You delete or change any of the default menu items in the LMS and give them more descriptive and meaningful names by which to students. Create Dividers or Sub headers to segment the menu, if appropriate.
5. Have all links open in a new page. Whether it's a link to the web or a document, choose the option to have that item open in a new window. This will help keep the user present in the existing LMS while still accessing the new resource. This is real help when students are trying to refer to multiple resources and access assignments and activities because they can juggle and re-arrange windows on the desk top as they see fit.
6. Name course parts and sections consistently throughout the course.
7. Provide a visual calendar of course work and assignments.
8. Provide clear information on how students can find help. Depending on your topic, you might create a designated discussion board or wiki you check daily for student questions. This can eliminate emails and start students giving and receiving answers in a central point.
9. Tie assignments, activities and discussions together with clear instructions. When materials are posted as files without much explanation, students can find it hard to follow what they are being asked to do. For example, when setting up the description of an Assignment, it can be helpful to reiterate guidelines and due dates, even if this information is provided in the syllabus.
10. Establish a clean visual style for your course pages. Modern web design keeps the "text" version of menu items, rather than using the "buttons" style. Use a consistent color scheme, avoiding red/green/purple combinations that are hard for color blind individuals to navigate. Use type fonts like Arial and Verdana which are sans serif and thus more readable online. Reserve serif fonts, such as Times New Roman, for printed pages.

(GWU, 2015)

References:

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APPENDIX H: Government Gazette ODL Policy 7 April 2017

Draft framework

DEPARTMENT OF HIGHER EDUCATION AND TRAINING

NO. 335 07 APRIL 2017

CALL FOR COMMENTS ON THE OPEN LEARNING POLICY FRAMEWORK FOR POST-SCHOOL EDUCATION AND TRAINING

I, Bonginkosi Emmanuel Nzimande, MP, Minister of Higher Education and Training, hereby publish the '*Open Learning Policy Framework for South African Post-School Education and Training*' for public comment under the Higher Education Act (Act No. 101 of 97), Continuing Education and Training Act (Act No. 16 of 2006) and the Skills Development Act (Act No. 97 of 1998).

The full document is available on the website of the Department of Higher Education and Training (www.dhet.gov.za).

All interested institutions, persons and organisations are invited to comment on the policy framework. Comments should be submitted no later than 21 days (3 weeks) from the date of publication of this notice.

Comments in writing should be directed to Mr Lerato Modiba, email address: Modiba.L@dhet.gov.za, Telephone: 012 312 5724. The name, address, telephone number, fax and email address of the person, governing body or organisation responsible for submitting comments must also be provided.

DR BE NZIMANDE, MP
MINISTER OF HIGHER EDUCATION AND TRAINING
DATE: 24/03/2017

higher education & training
Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

Open Learning Policy Framework for Post-School Education and Training

8 March 2017

Table 1: Policy status

POLICY	
1. Name of Policy	Open Learning Policy Framework for Post-school Education and Training
2. Name of responsible Directorate	Career Development and Open Learning
3. Name of coordinator	Trudi van Wyk
4. Coordinator contact details	vanwyk.t@dhet.gov.za
5. Status of policy (State whether it is still a draft or whether the policy is approved. If it is a draft, provide the version date and version number)	Second Draft for public comments Version 2.1
6. Date approved (if applicable)	
7. Gazette Details	
8. Date for next review	27 April 2017

Table of Contents

Glossary

Blended learning: The provision of structured learning opportunities using a combination of contact, resource-based, and/or distance education methodologies, with different levels of ICT support to suit different purposes, audiences, and contexts.

Distance education: A mode of education provision based primarily on a set of teaching and learning strategies (or educational methods) that are used to overcome spatial and/or transactional distance between educators and learners. It is not necessary for learners to attend classes frequently and for long periods. Instead, it may use a combination of face-to-face interactions, different media, learner support mechanisms, discussions, and practical sessions.

e-Learning (also referred to as 'technology-enhanced learning'): e-Learning uses ICT to access programmes or courses. It involves the use of electronic devices (for example computers and mobile devices) to provide, access or interact with learning materials, interact with peers and lecturers, participate in discussions and do assessments. e-Learning can take place online, offline, or in a combination thereof.

Internet: The global system of interconnected computer networks that use the Internet Protocol suite (IP) to link billions of devices worldwide. It is a *network of networks* that consists of millions of private, public, academic, business, and government networks of local to global scope, linked by a broad array of electronic, wireless, and optical networking technologies. The Internet carries an extensive range of information resources and services, such as the inter-linked hypertext documents and applications of the World Wide Web (WWW), electronic mail, telephony, and peer-to-peer networks for file sharing. The Internet has no centralised governance in either technological implementation or policies for access and usage; each constituent network sets its own policies.

Learning management system (LMS): A multi-user software programme for delivering programmes and courses to learners, registering students, administering, tracking, reporting on and documenting their participation, progress, performance and achievement/results. This information is accessible to lecturers, tutors and administrators, and, in most cases, information on each student is made available to the individual concerned, enabling students to track their own progress.

Learning content management system (LCMS): A multi-user software programme enabling lecturers, instructional designers and course/materials developers to create, develop, modify, store, re-use and organise e-learning content. It includes a centralised repository of learning materials and resources archived so as to be searchable and adaptable for use in any online course. Ideally, an LCMS should be entirely compatible and integrated with the LMS used by the same organisation.

Massive open online course (MOOC): An online course aimed at unlimited participation and open access via the World Wide Web. Currently most institutions do not award credit for completing MOOCs; however, many award a non-formal certificate of completion on payment of a fee. There is an international move towards recognising learning obtained through MOOCs in formal learning programmes.

Mode of provision: The method/s by which learning is taking place. There is a move away from traditional, single mode institutions (where all courses and programmes are mediated either by distance or contact-based methodologies) to dual and mixed-mode institutions where courses and programmes are mediated by a range of distance, resource-based and contact-based methods, with the blend of methods varying from context to context. Internationally there is a move away from individual programmes being accredited either as contact or distance provision.

Online learning: The predominant use of the Internet to learn. Learners have to be connected to the Internet to access and interact with learning materials, interact with peers and lecturers, participate in discussions and do assessments.

Open (and) distance learning (ODL): The use of distance education methods to support the realisation of open learning purposes and principles. Omission of the 'and' as in 'Open Distance Learning', and possibly the use of the acronym 'ODL", imply erroneously that ALL distance programmes are based on open learning principles. This policy framework does not support this term because of the ambiguity associated with its meaning.

Open learning: An educational approach which combines the principles of learner-centredness, lifelong learning, flexibility of learning provision, the removal of barriers to access learning, the recognition for credit of prior learning experience, the provision of learner support, the construction of learning programmes in the expectation that learners can succeed, and the maintenance of rigorous quality assurance over the design of learning materials and support systems.

Open Educational Resources (OER): Any educational resources (including curriculum maps, course materials, textbooks, streaming videos, multimedia applications, podcasts, and any other materials that have been designed for use in teaching and learning) that are published under an open licence and are available for use without an accompanying need to pay royalties or licence fees. Openly licensed content can be produced in any medium: text, video, audio, or computer-based multimedia.

Post-schooling (in the South African context): The provision of education and training opportunities to all people who have left school. It includes education and training for out-of-school youth, and institutions offering second chance learning, Technical and Vocational (TVET) colleges, Community Education and Training (CET) colleges, and education and training offered by the Sector Education and Training Authorities (SETAs), universities of technology and universities, private providers and other training colleges and institutes.

Resource-based learning: Learning which actively involves a range of resources (both human and non-human) in the learning process.

Social networking: Interacting and networking with others in a social online environment such as *Facebook* or *Twitter*.

Student support: This can be divided into four elements, namely academic support, counselling support, administrative support and technology support:

1. Academic support may refer to a wide variety of instructional methods, educational services or educational resources provided to students in an effort to help them accelerate their learning progress, catch up with their peers, meet learning standards, or generally succeed in their learning endeavours. Academic support includes but is not limited to face-to-face tutorials, remedial interventions and library services.
2. Counselling support is about life and counselling support for students in the form of career guidance, study skills and computer skills training and assistance for students facing crisis situations and adjustment issues.
3. Administrative support is about providing students with timely, accurate and accessible information to assist with all phases of the learning process.
4. Technology support is about providing students with access to technology, the necessary information relating to computer elements required to support course software, directions for using essential tools like email, chat and discussions for asynchronous and synchronous interaction with lecturers and tutors, and assignment drop boxes.

Technology-enhanced learning: Structured learning mediated through software applications using digital resources (usually combinations of text, audio and visual/video files) and communication, and accessed through a range of fixed or mobile hardware devices. Such learning provision may be on-line and synchronous (e.g. real-time conferencing), on-line and asynchronous (e.g. text-based discussion forums) or off-line (e.g. interactive or resource-based CD/DVD/flash drive). ICT can support learning in contact, blended and distance programmes.

Acronyms

CAT	Credit Accumulation and Transfer
CET	Community Education and Training
CHE	Council on Higher Education
DBE	Department of Basic Education
DHET	Department of Higher Education and Training
Digital-DF	Digital Development Fund
DST	Department of Science and Technology
DTPS	Department of Telecommunications and Postal Services
FET	Further Education and Training (now replaced by TVET)
GCIS	Government Communication and Information System
ICT	Information and Communication Technologies
LCMS	Learning Content Management System
LMS	Learning Management System
MOOC	Massive Open Online Course
NDP	National Development Plan
NEET	People that are not employed, in education or training
NOLA	National Open Learning Agency
NOLF	National Open Learning Forum
NOLS	National Open Learning System
NQF	National Qualifications Framework
NSFAS	National Student Financial Aid Scheme
OER	Open Education Resource
OLII	Open Learning Implementation Index
OL-RIM	Open Learning Review and Improvement Model
PQM	Programme and Qualification Mix
PSET	Post-school Education and Training
QC	Quality Council
QCTO	Quality Council for Trades and Occupations
RPL	Recognition of Prior Learning
SACPO	South African College Principals' Association
SADC	Southern African Development Community
SAIDE	South African Institute for Distance Education
SAIVCET	South African Institute for Vocational and Continuing Education and Training
SANREN	South African National Research Network
SAQA	South African Qualifications Authority
SEIAS	Socio-Economic Impact Assessment System
SETA	Sector Education and Training Authority
TVET	Technical and Vocational Education and Training
Umalusi	Quality Council for General and Further Education and Training
USAf	Universities South Africa
WIL	Work Integrated Learning

Preamble

Since the establishment of the Department of Higher Education (DHET) in 2009, South Africa has been building a new post-school education and training system (PSET) that is responding to the social, economic and transformative needs of the country.

The Department's Strategic Plan: 2015 to 2020, which is informed by the vision espoused in the National Development Plan (NDP), the 2014-2019 Medium Term Strategic Framework and the 2014 *White Paper for Post-School Education and Training*, identifies expanded access to education and training opportunities and diversified provision based on open learning principles to improve learning across the PSET sector.

This *Open Learning Policy Framework for South African Post-school Education and Training* has been developed in the context of:

(i) the strategic intention laid out in the 2014 *White Paper for Post-School Education and Training* to expand this system significantly;

(ii) the commitment of the DHET to implement open learning principles and approaches across the PSET system in a structured and systematic way;

(iii) mounting pressure to expand access to more cost-effective and flexible education and training; and

(iv) increasing, but far from equal, penetration and affordability of information and communication technologies (ICT) across South Africa.

The DHET does not view open learning as the only solution for the many challenges in the post-school sector in South Africa. Rather, the Department is committed to encouraging institutions to adopt open learning approaches, and to supporting institutions to introduce open learning practices as one practical way of addressing crucial issues of widening access to affordable, quality learning opportunities. This is the policy framework's purpose and explicit goal. However, international research and local experience strongly suggest that in pursuing this goal, a shift towards open learning approaches will also nudge the post-school sector towards taking on board discernible changes in the ways new generations of learners are beginning to view learning, education and training.

Open Learning Policy Framework for South African Post-school Education and Training

1. Introduction

1.1 Background and rationale of the policy framework

The Minister of Higher Education and Training, Dr BE Nzimande, MP has repeatedly affirmed that employment is essential for creating social stability in South Africa. People who do not have a reasonable hope of finding decent work – or creating their own sustainable livelihoods – have little to lose and have little stake in maintaining a stable society.

One of the obligations of the DHET is to increase access to educational opportunities for those who experience barriers to learning and for young people who are not in education, training or employment (NEET). Such barriers include:

i. geographic isolation from campuses or learning centres within reasonable proximity;
ii. lack of reliable access to digital infrastructure, adequate bandwidth, the internet and ICT;
iii. inability to take time off from work or family obligations for structured learning;
iv. discrimination on the basis of physical disability, gender, age, social class or race;
v. a lack of qualifications considered necessary as requirements for admission to particular programmes;
vi. financial constraints and an inability to meet the cost of studies; and
vii. past experience of content-based, transmission-type pedagogy and assessment that restrict accessibility, alienate the learner or contribute to a loss of confidence.

The DHET has adopted 'open learning' as a strategy to increase access to education and training opportunities for all and to construct quality learning environments which take account of learners' context and use the most appropriate and cost-effective methods and technologies. The DHET supports the development of open learning opportunities as an integral part of the post-school education and training (PSET) system, and not as an add-on or second-best to face-to-face and/or classroom engagements. There is an intention to forge networks of institutions and learner support centres, and to promote innovation and opportunities for lifelong learning.

1.2 Scope of the policy framework

Following the policy directives presented in Chapter 7 of the *White Paper for Post-School Education and Training*, this policy framework sets out the strategic intent of the DHET in steering the PSET system towards increasing access and improving quality cost-effectively through open learning. The scope of this policy is national; it is aimed at the entire PSET system, including universities, technical and vocational education and training (TVET) colleges and community education and training (CET) colleges, as well as skills providers, but not at the schooling sector. It also covers, where appropriate, private providers.

Distance education, online learning, technology-enhanced learning and e-learning (see par 2.1.2) all offer greatly increased access, while the latter ICT-based modalities also offer a growing range of innovative and effective teaching and learning methods (increasing learners' chances of success). However, this policy framework views these modalities as significant means of achieving open learnings rather than as being synonymous with open learning.

1.3 Purpose of the policy framework

The purpose of the policy framework is to provide a framework for, and to direct, the implementation of open learning in the PSET system as outlined in the 2014 *White Paper for Post School Education and Training*.

The policy framework aims to:

i. provide a framework for building a shared, common PSET system, making extensive use of open learning approaches and distance education methodologies;
ii. set out guiding principles and specific objectives for the implementation of open learning in the PSET system that will guide the decision-making and activities of government, PSET institutions, the staff that work in them and the learners learning in the PSET system;
iii. provide a high level strategy for implementing open learning approaches in the PSET system in a structured, integrated manner;
iv. identify instruments and mechanisms for steering the PSET system towards increasing access and quality through the incremental adoption of open learning approaches and through appropriate monitoring, evaluation and quality assurance; and
v. provide a framework for co-operation and collaboration among the DHET, institutions and skills providers to implement open learning approaches in an organised and systematic way.

1.4 Policy development processes

In February 2013 the DHET developed a *Concept Note: Open Learning in Post-School Education and Training* to provide a vision for the future delivery of open learning in the PSET system that would be sustainable and meet the needs of a wide range of learners from the vocational and continuing education and training sector and the university sector, as well as the needs of NEET youth. The concept note created a common understanding of open learning for the PSET system, and served as the starting point for the development of this policy framework.

The DHET initiated a consultative process to elaborate on the understanding of open learning and related terms; propose pilot initiatives to embed open learning principles within the existing PSET system; and identify related policy implications for Adult Education and Training (as it was then) including community education and training (CET); Technical and Vocational Education and Training (TVET) colleges; Skills Development; University Education and Career Development Services.

Workshops were held with key stakeholders to discuss the vision and principles of open learning in the South African context, and to identify large-scale education and training needs at a provincial and national level,

possible ways of responding to these needs, and whether programmes could be designed which would address these needs while incorporating the principles of open learning. Participants included, among others, representatives of non-governmental organisations, academic institutions, the Department of Basic Education (DBE) and DHET, and Sector Education and Training Authorities (SETAs). A University sector seminar and two TVET college seminars were convened to discuss key challenges in these sectors, and to identify critical success factors and elements to be included in open learning in South Africa.

Emanating from this consultation process, a *Concept Framework for an Open Learning System in Post-School Education and Training in South Africa* was presented to the DHET. This document made a number of recommendations which shaped subsequent policy in the 2014 *White Paper for Post-school Education and Training*, and in this Policy Framework.

Based on the conceptual framework and policy recommendations made in the *Concept Framework for an Open Learning System in Post School Education and Training in South Africa*, as well as the outcomes of a Socio-Economic Impact Assessment (SEIAS) done on the viability of a policy framework, the DHET developed a draft *Open Learning Policy Framework for Post-school Education and Training*.

The draft policy framework was extensively consulted within the DHET, and with the DBE, institutions, and various organisations.

1.5 Evidence-based policy development

This policy was developed by integrating experience, judgement and expertise with the best available external evidence from research. A widely consultative approach and the SEIAS methodology were included that represents a more rigorous, rational approach that gathers, critically appraises and uses high quality research evidence to inform policymaking and professional practice.

Evidence used:

i. Understanding of the policy environment (national and international context);
ii. Appraising the likely effects of policy changes, choosing between different policy options and subsequently assessing their impacts (SEIAS methodology);
iii. Demonstrating the links between strategic direction, intended outcomes and policy objectives, to show the clear lines of argument and evidence between current practice and the aims outlined in the policy (theory of change);
iv. Determining how to meet the strategic goals or intermediate objectives (strategic objectives and implementation strategy); and
v. Influencing institutions, partnerships and stakeholders to achieve and implement policy goals (implementation strategy).

1.6 Structure of the policy framework

The policy framework is organised into six sections, namely an introduction; the conceptual framework; the strategic intent; monitoring and evaluation; the implementation strategy and the concluding statement.

The conceptual framework provides a definition and explanation of the concept 'open learning', and distinguishes it from concepts and terms with which it is frequently conflated or associated. It also outlines the principles that underpin open learning in the PSET system. Sections follow on international trends, agreements and treaties relevant to open learning, and on the legislative and policy context in South Africa.

The document furthermore sets out the policy framework's strategic intent. The DHET's vision of open learning for post-school education and training is presented, followed by the theory of change underpinning the means for achieving that vision as they are set out in the policy framework. Aligned with the 2014 White Paper, it then identifies five strategic objectives based on the central goal of creating an enabling environment for the implementation of open learning in PSET. It also emphasises the importance of advocacy and communication.

Within the context of the DHET's monitoring and evaluation framework, this policy framework then outlines the instruments for monitoring and evaluating the implementation of open learning.

The high level implementation strategy addresses the co-ordination needed to ensure the sound and sustained implementation of open learning; formulates the policy instruments and steering mechanisms to be used in implementation; and mandates the formation of a National Open Learning Forum (NOLF). Finally brief descriptions on institutional implementation, funding, and the evaluation and review of the policy framework are provided.

2. Conceptual Framework

The South African Government affirms its commitment to opening the doors of learning and removing unnecessary barriers to education and training for everyone, especially those who have been marginalised in the past. One of the ways to achieve this is to apply open learning approaches in PSET.

2.1 Open learning concepts

2.1.1 Defining open learning

Adhering to the 1995 *White Paper on Education and Training* definition, and the definition outlined in the *White Paper for Post-school Education and Training*, this policy framework sees open learning as:

> '... an **approach** which combines the principles of learner-centeredness, lifelong learning, flexibility of learning provision, the removal of barriers to access learning, the recognition for credit of prior learning experience, the provision of learner support, the construction of learning programmes in the expectation that learners can succeed, and the maintenance of rigorous quality assurance over the design of learning materials and support systems'.

Open Learning enables many people to take advantage of cost-effective and meaningful, quality education and training opportunities throughout their lives. The DHET will strive to make this possible through acknowledging the diversity of learning contexts of learners in South Africa; reducing barriers to learning; sharing expertise, knowledge, and resources; and increasing access to diverse learning opportunities.

2.1.2 Open learning principles

The key open learning principles underpinning this policy framework are:

i. learners are provided with opportunities and capacity for lifelong learning;
ii. learning processes focus on the learners and contexts of learning, build on their experience, and encourage active engagement leading to independent and critical thinking;
iii. learning provision is flexible, allowing learners to increasingly determine where, when, what and how they learn, as well as the pace at which they will learn;
iv. learners have access to learning opportunities, and unnecessary barriers to access have been removed. This includes providing free access to learning materials; access to cost-effective value-added services such as learning support, tutoring and counselling; and cost-effective registration and assessment opportunities;
v. prior learning and experience is recognised wherever possible;
vi. arrangements for credit transfer and articulation between qualifications facilitate further learning;
vii. providers create the conditions for a fair chance of learner success through learner support, contextually appropriate resources and sound pedagogical practices; and
viii. open learning is embedded in, enhances and expands the current education and training system (programmes and qualifications), and is not an add-on or a second-best to the current system. It can, however, also provide learning opportunities for non-formal learning.

These principles are integrated in the strategic objectives of this policy framework and are not addressed individually.

2.1.3 Open learning and diverse modes of provision

Internationally and in South Africa, there is a tendency to conflate or equate open learning with distance education, e-learning, online learning or blended learning and other terminology.

Open learning is not a synonym for distance education. The term 'distance education' describes a collection of modes of delivery for the provision of structured learning in which the learner and the educator[1] do not have to be in the same place at the same time for learning to take place. It provides techniques of educational design and provision that when used appropriately can be open insofar as they can provide better chances of success to vastly more people who would otherwise not be able to access learning programmes, and at greatly reduced cost once initial expenditure has been covered.

The DHET does not advocate the use of concepts that integrate open learning and distance education such as 'open distance learning' or 'Open and Distance Learning' (ODL). These have created a misperception that distance education is inherently 'open'. This is a challenge, not only because poor distance education practice can easily close opportunities of actual learning, but equally because it incorrectly assumes that only distance education strategies are open. In campus-based education and training, blended learning combines various forms of e-learning with more traditional methods such as lectures enabling students to access a diverse range of educational experience, and to pursue part of their studies at a time and place of their own choosing.

Another term that is sometimes used is 'resource-based learning' that only refers to learning which actively involves a range of resources (both human and non-human) in the learning process. This also includes the use of electronic (online and offline) technologies, and in specific information and communication technologies (ICT) in the learning process. This policy framework noted the misconception that e-learning or the structured use of electronic technology itself provides a truly open system.

Although the use of ICT has opened up learning and teaching in many ways, open learning does not necessarily mean e-learning or technology-enhanced learning. In situations where access to internet connectivity or devices is severely limited, it may make sense to open access to learning opportunities via non-electronic means such as print media. Furthermore, the employment of sophisticated e-learning technology, especially programmes that are fully online, will *exclude* many learners who lack access to the necessary devices and/or reliable internet connectivity. Thus although online learning can potentially accommodate different ways and styles of learning (making for greater accessibility), and enable the construction of a potentially richer learning environment, it simply does not equate to open learning.

While all the learning modalities mentioned above (distance education, resource-based learning, e-learning, online learning and blended learning) are important *vehicles* for open learning, none of them should be *equated* with open learning, and open learning has no conceptual value as a synonym for any of them. Rather, it is a

[1] 'Educator' is used in a general context and include teachers, lecturers, and instructors. When the document refers specifically to PSET, the word 'lecturer' is used that include also the instructors in practical components and skills development programmes.

general approach to education and training based on a set of open learning principles. When the term 'open learning' is used in this policy framework, it refers to any education and training (mode) which follows open learning principles, and is not specific to any particular mode of delivery.

2.1.4 Open learning as an ideal

As a principle-based concept, open learning presents an ideal or goal rather than an absolute, all-or-nothing imperative. Thus, in the context of this policy framework, learning programmes and courses cannot for the most part be fully 'open'. Most importantly, open learning should not be considered as an add-on to existing education and training offerings, or seen as a second-best option, but should be recognised as a principled approach to learning which has the capacity to transform teaching, learning and access to education and training in quite radical ways, whatever mode is used.

2.1.5 Access, flexibility, quality and success

Open learning is fundamentally about access and success, with flexibility of provision contributing to expanded access, and quality of provision contributing to improved student success. Its aim is that more learners should have better access to learning opportunities throughout their lives, including access to quality learning materials and learner support. It furthermore focuses on better throughput, and higher success rates. In addition, and crucially in developing countries like South Africa, open learning can contribute substantially to cost-efficient provision to the benefit of both the education fiscus and learners.

On one hand open learning is focused on *removing barriers* to access created by various factors such as geographic distance from educational campuses, timetable scheduling that is incompatible with people's working lives or family responsibilities, unaffordable fees, alienating pedagogic practices, lack of access to technology, lack of physical educational infrastructure, and discrimination on the basis of gender, age, race, ethnicity, social class, language or disability.

More flexible provision allows learners more scope to determine where, when, what and how they will learn, as well as the pace at which they will learn and whether they wish to acquire certification at the conclusion of a course. In addition, open learning recognises formally assessed prior experience and learning (not necessarily academic learning) as parallel to formal education in qualification admission requirements, and encourages arrangements for credit transfer and articulation between qualification programmes in order to facilitate lifelong learning.

At the same time, open learning is also focused on the need for the learners who benefit from wider access to learning opportunities to be successful in pursuing those opportunities; thus open learning is focused on providing education and training of the highest possible quality. In some senses this emphasis on quality is an extension of the access principle, placing the learner at the centre of the teaching and learning process, and building accessibility into the very design of programmes, courses and learning materials. In providing learner support (in-text, via phone or any other platform, online or face-to-face), sound open learning practice takes full cognisance of the individual learner's context and needs. This focus on the learner, on access, on success and on

quality should extend to the design of learning text itself, of the graphic material and experiential activities, where these elements are re-thought with the learner and his/her context in mind, and are imaginatively constructed to eliminate the barriers commonly created by alienating presentation.

2.1.6 Cost efficiency

While the four priorities outlined above are the essential foci of open learning, the emphasis on extending access to learning opportunities also has the potential to contribute to cost efficiency, with benefits for both national education expenditure and learner alike. Operational and ongoing costs may be kept low, both through economies of scale (in cases where enrolment numbers are substantial and expenditure on additional physical infrastructure is unnecessary or limited) and by making use of open education resources (OER) and open licensing (see section 3.2.5).

However, it must be noted from the outset that the motive of cost efficiency needs to be viewed in context. Cost-benefit ratios and economies of scale in open learning are complex rather than absolute, and should not be taken for granted. The possible necessity of putting in place expensive technological infrastructure, and the need for collaboration in developing the high-quality courses and learning materials which produce not only deeper and more satisfying learning, but also higher success rates, usually result in considerably higher levels of initial expenditure than more traditional approaches. However, this expenditure may diminish over time in the case of large-enrolment courses and programmes as economies of scale have an incremental effect.

2.2 International trends

The next section briefly describes current international trends in open learning. These should be read against the complex background of the poverty and exclusion from resources and facilities experienced by many in the townships, informal settlements and rural villages of South Africa, as well as the relative privilege, cultural capital and access to facilities experienced by the middle class. It should furthermore be read in the context of fundamental rights and transformational issues of access, non-discrimination, redress of inequalities, equality and equity.

2.2.1 Expanded access through open learning

Worldwide, governments are facing a growing demand for expanded access to post-school education and training, equity of provision, cost-effectiveness and improved quality of teaching and learning. Throughout the developing world populations are increasing, and globally (including in more developed countries) rising unemployment and changes in employment patterns and the organisation of work, as well as an increasing trend towards lifelong learning, are driving up the demand for affordable post-school education and training. Furthermore, knowledge- and service-based economies, today highly dependent on ICTs and automation, and accompanied by high rates of de-skilling and re-skilling, are increasingly dominant in both developed and developing countries. All of these factors tend to increase the social demand for qualification upgrades, re-skilling and other forms of lifelong re-education and training, over and above the demand pressures resulting from population growth and an inability on the part of many young school-leavers to find employment.

In the face of increasing pressure for expanded access to post-school education and training, many governments have turned, or are turning to open learning approaches, devising ways to make learning opportunities available to larger numbers of learners, particularly those who have been excluded in the past. In so doing their aim is also to find cost-efficient options as the costs of post-school education and new educational infrastructure escalate. In effect, many are looking to distance education, and more recently to specifically online learning, as ultimately cost-effective means to cross-subsidise their campus-based programmes.

2.2.2 Developments in Information and Communication Technologies

At the same time, the rapid pace of development in ICT opens up new ways to make learning more flexible, accessible and in many cases, more effective and more satisfying. If access is to be extended to as many as possible, then technologies that extend availability to more potential learners, even if not to all, need to be utilised.

2.2.3 Learning content management systems

Worldwide, educational and training institutions, and many national governments, have established learning management systems (LMSs) to manage the large volumes of student data resulting from massive enrolments, and to track learners' progress, allow student-to-lecturer and student-to-student communication. In most cases, LMSs are integrated with learning content management systems (LCMSs), which enable lecturers, instructional designers and course/materials developers (as well as students, when this is encouraged) to create, store, manage, adapt and re-use e-learning content.

2.2.4 Use of open educational resources

A trend promising to change the face of education and training is the proliferation in the use of open educational resources (OER), open education licensing policies and OER repositories in both school and post-school education and training, often driven by public policy and facilitated by the extensive use of ICT in materials development.

2.2.5 Blended learning

Blended learning is becoming increasingly common in both contact and distance modes, drawing on best practices in both online and face-to-face methods. In contact mode situations, this is often combined with a flipped classroom approach in which typically, short video lectures are viewed or readings done by students at home before class, while 'lectures' are devoted to discussions or structured activities. Such innovations require a change in the mindset of lecturers and institutions, rather than vast expenditure.

2.2.6 Massive Open Online Courses

A conspicuous trend in the past decade has been the proliferation of courses which are freely open to anyone with access to the internet, or at relatively limited cost if some form of certification is involved. These Massive Open Online Courses (MOOCs) provide access to a vast array of free courses available on the Internet, in many

cases by reputable international institutions. Many of these courses include links to relevant open access databases containing bibliographic and other information of particular value to more ambitious learners, post-graduate learners and course developers. An increasing volume of research on assessing and assuring quality in MOOCs points to the validity of this quality assurance, as well as to the positive impact of at least some MOOCs in terms of cost-effective delivery and quality.

While debate continues regarding the efficacy of MOOCs to promote quality learning experiences, especially at undergraduate level, a MOOC could provide an opportunity for institutions to secure high quality learning content and activities which might be implemented as part of a mediated course. There is an increasing need to develop national policies affording credit recognition for successfully completed MOOCs offered by accredited institutions. In many cases however, the content of MOOCs is not available under an open licence, being available only to individuals learning for the duration of the course offering.

Studies done on MOOCs in developing countries demonstrate that they are not only well accepted, but also that the population of MOOC learners in these countries is more diverse than in developed countries, and is largely composed of low- and middle-income students. It also finds that students in developing countries are also much more likely to complete an online course and obtain formal certification than their counterparts in the developed world.

2.2.7 New types of open institutions

To overcome financial barriers to access, new types of open institutions are emerging which make extensive use of digital technologies. Such institutions aim to increase access to education through reducing costs by making use of open source software, free content licensing and the open web. Courses are fully online and learners who meet admission criteria are able to register worldwide. Course forums, online study forums, collaborative discussions and peer-to-peer engagement are extensively used, with assessment and examinations completed online.

2.2.8 Cross-institutional collaboration

Networks of institutions are formed, sharing courses and freely offering them online for learners worldwide. Partner institutions in such networks provide affordable ways for learners to gain academic credit towards qualifications from recognised institutions. Such cross-institutional collaboration supports innovation and growth in technological infrastructure, contains costs, and increases access to, and the quality of, education.

2.2.9 Emphasis on active learning approaches

Another welcome trend is the growing emphasis in higher education on deeper learning approaches, engaging students in critical thinking, problem-solving, collaboration, and self-directed learning. Project-based learning, challenge-based learning and inquiry-based learning are fostering more active learning experiences inside and outside the classroom.

2.2.10 Recognition of prior learning and credit accumulation and transfer

Recognition of prior learning and credit accumulation and transfer are not new processes in education and training. However, the advent of open learning with its emphasis on extending access, and new learning opportunities such as MOOCs, are generating renewed interest in these means of achieving admission to, or advanced standing in, academic programmes through the assessment of prior learning, or learning by means other than conventional courses.

2.2.11 Digital badges

Digital badges are a relatively new form of recognition of learning achievement. These are a form of online recognition of a skill achieved, or a project, course or programme element successfully completed, even if a full qualification is never pursued. They provide a visible motivation for the learner, and can be displayed in any digital format, used for recognition of learning that has been achieved, and shared in applications for employment or to study further. This innovation resonates with the trend towards learners opting for informal learning, purpose-driven learning, just-in-time learning and learning packaged in small units.

2.2.12 Popularity of non-formal and informal learning

In addition to learning that is formally accredited and managed under the auspices of departments of education, or college or university administrations, non-formal learning and informal learning are gaining in popularity. Non-formal learning refers to a type of learning offered by institutions that does not have a formal credential or certification as an outcome. Informal learning by contrast is not managed by an institution at all, but is rather managed by the individual learner. LCMSs are increasingly being used to produce 'curated content' for informal learning – information that is sorted, verified and presented as learning that is accessible, meaningful, engaging and relevant to learners' needs.

The current trend towards informal learning is a consequence of the evolution of a range of tools and services characterised by greater interactivity, collaboration among internet users and content providers, extensive network connectivity (often through mobile devices), and sophisticated communication technologies. Instead of passively downloading content off the Internet, users themselves take an active role in generating web-based content. Learners are able to compile their own curriculum and digital learning materials, and form social learning networks or learning communities.

2.2.13 Mobile technologies

The most significant technological advance is the widespread use of smartphones and other mobile devices that place enormous computing power in the user's hands. Increasingly, a majority of young students are expressing their preference for mobile learning: educational software, material and communication that are designed specifically for such mobile devices.

'Bring Your Own Device' is a learning concept related to mobile technologies that opens up learning inside and outside the classroom. Institutional policies allow students to bring their own mobile devices with them into the

classroom or other learning environments, where they are able to use these to connect to the institution's network and learning systems, and to communicate with other students and peers.

The above trends contribute significantly to current changes in how teaching and learning are taking place (pedagogy), what is being learnt and what learners are choosing to learn (content), and how learners interact with the teaching and learning environment (technology). This policy framework acknowledges these trends and their relevance for the South African PSET system.

2.3 Legislative and policy context in South Africa

This section gives a short synopsis of the current legislative and policy environment in place to regulate and direct open learning in South Africa. Open learning is ultimately aligned with the following right set out in the *Constitution of the Republic of South Africa* (Act 108 of 1996): 'Everyone has the right (...) to further education, which the state, through reasonable measures, must make progressively available and accessible.'

2.3.1 White Paper on Education and Training (1995)

The *White Paper on Education and Training* (1995), which laid the foundation for the new Education and Training System in South Africa, affirmed the Government's commitment to opening up learning and removing barriers to education for those who had been disadvantaged by South Africa's past. Based on the principles of access, equity, quality, equality and redress, it called for the adoption of open learning principles in order to meet the increasing need for expansion and quality provision in the system. It formulated the definition of open learning adopted by the *White Paper for Post-School Education and Training* (2014), as well as this policy framework. It also called for the establishment of a National Open Learning Agency (NOLA) that would work with the then Department of Education to promote open learning in education and training, develop an open learning system for South Africa and explore 'the capacity of existing institutions which might form part of the national open learning system'.

2.3.2 White Paper for Post-School Education and Training (2014)

The *White Paper for Post-School Education and Training* (2014) supports the development of a PSET system based on open learning principles, where quality learning environments are constructed which take account of student context and use the most appropriate and cost-effective methods and technologies.

In the White Paper the DHET commits to build an expanded, effective and integrated PSET system. In chapter 7, 'Open Learning through Diverse Modes of Provision', the DHET commits itself to working towards a PSET landscape based on open learning principles, and to broadening models of educational provision so that people have easier access to meaningful opportunities throughout their lives. This undertaking includes building a network of educational institutions supported by learning support centres and appropriate technology, collaborating in the development of learning materials, and committing to the development and use of OER. It also supports the intention to use digital technology where appropriate to enhance access, improve communication and generally optimise student engagement.

The 2014 White Paper envisages e-learning being incorporated into different modes of provision, including face-to-face, as digital technology becomes more accessible in South Africa. It is thus committed to collaboration with the Department of Telecommunications and Postal Services and the Department of Science and Technology, to facilitate increased bandwidth and reduced costs for educational purposes. Further mechanisms to build capacity for staff and students to use technology effectively, will also be supported.

This policy framework is aimed at taking further the policy outlined in the 2014 White Paper, in particular the mandate set out in Chapter 7 of that document.

2.3.3 Higher education legislation and policies

Section 38.1 of the Higher Education Act (Act No 101 of 1997) supports collaboration and partnerships in higher education between public universities. In alignment with the Act, the *Policy for the Provision of Distance Education in South African Universities in South African Universities in the Context of an Integrated Post-School System* signals the intent of the DHET to draft a policy on partnerships and collaboration that will likely also formalise opportunities for institutions to collaborate on the offering of programmes, that in itself open up learning.

White Paper 3 on the Transformation of the Higher Education System (2007) promoted the development of a flexible learning system, including distance education and resource-based learning, built on open learning principles. It mandated increasing student enrolments based on open learning and distance education, with particular emphasis on women. Furthermore, this White Paper required the then Department of Education to support the development of a national network of centres of innovation in course design and development, as this would enable the development and franchising of well-designed, quality and cost-effective learning resources and courses, building on the expertise and experience of top quality scholars and lecturers in different parts of the country.

As in the *White Paper for Post-School Education and Training* (2014), the *Policy for the Provision of Distance Education in South African Universities in the Context of an Integrated Post-School System* (2014) recognises the impact of ICT on the provision of education in the higher education sector, and supports the creation of an enabling environment for appropriate integration of ICT, and the expansion of distance education provision in an orderly manner in which access and quality issues are at the forefront.

Though its focus is only on universities, it highlights open access to higher education opportunities for those who cannot attend traditional campus-based provision, the need for quality assurance to ensure that distance education provision offers a reasonable chance of success, and the potential of distance education to lower costs per student by amortising curriculum design, materials development and some teaching costs across larger numbers of learners and by obviating the need for continuing investment in physical infrastructure. Among its key provisions are promoting the development and use of Open Educational Resources (OERs), and an undertaking to work towards every post-school student having reasonable access to affordable connectivity.

It is important to note that while this policy framework recognises the utilisation of multiple delivery options, the higher education system for public universities continues to differentiate simply between contact and distance provisioning for funding purposes, thus the policy proposes a more nuanced funding system.

In the wider national policy context, the Council on Higher Education (CHE) published in 2014 the *Distance Higher Education Programmes in a Digital Era: Programme Accreditation Criteria and Good Practice Guide*, which makes a significant contribution to our understanding of the implications of using ICT in support of both distance and classroom-based education, and provides clear and detailed guidance in the carefully thought-out choices that course and materials designers must make when employing ICT in support of learning.

2.3.4 Technical and Vocational Education and Training legislation and policies

In order to reach the 2030 NDP target of 2.5 million enrolments set for Technical and Vocational Education and Training (TVET) colleges, the DHET has to rethink how institutions work, the long-term impact of technological advancements, and how TVET colleges need to structure themselves around increasing the employability of their students by considering additional, technology-based means of education and training delivery.

The Continuing Education and Training Act (Act No 16 of 2006) commits to 'ensure access to basic adult education, further education and training and the workplace through continuing education and training by persons who have been marginalised in the past such as women, the disabled, and the disadvantaged'. It further commits to 'provide optimal opportunities for learning, the creation of knowledge and the development of intermediate- to high-level skills, in keeping with international standards of academic and technical quality.' The act furthermore emphasises the provision of opportunities for life-long learning.

The traditional way of providing education and training through face-to-face modalities is not sustainable in the current resource-constrained environment. Thus sustainable, alternative open learning approaches and methodologies such as distance education and online learning have to be considered.

White Paper 4: A Programme for the Transformation of Further Education and Training (1998) commits to the development and expansion of high-quality, flexible, innovative Further Education and Training (FET) (now TVET) institutions, based on the principles of open learning and responsiveness to the needs and demands of all learners of 15 or over. Open learning approaches and a system increasingly orientated towards lifelong learning and responsiveness to the needs of learners and communities, would widen participation, promote equity and social mobility, and improve the quality of life of our people.

This White Paper envisages an open learning philosophy and programme-based approach to provision encouraging institutional diversity, the use of multiple sites of learning and the growth of 'virtual' institutions: 'Learning will take place in the workplace, at community facilities and in learners' private homes. Some learners will use the Internet and other technologies to access learning via a network of institutions, who might be located very far apart and who need have no formal, centralised organisation or structure.'

2.3.5 Community Education and Training legislation and policy

The Continuing Education and Training Act (Act No 16 of 2006), as described above, also has relevance to Community Education and Training (CET) colleges.

The *White Paper for Post-School Education and Training* (2014) describes CET colleges as a new type of institution that will be provided with adequate infrastructure so as to be responsive to the need of local communities, including empowering communities to embrace technology effectively to access the world of work and to embark on life-long learning.

The *National Policy on Community Education and Training Colleges* (2014) provides a framework for the provision of a diverse range of programmes, including different modalities for delivery. In the long term, online programmes are going to be one of the critical modes of provision for delivery of community education and training programmes.

2.3.6 Skills development and workplace-based training

The Human Resources Development Convention, 1975 (No. 142), and Recommendation 2004 (No. 195) encourage the development of education, training and lifelong learning, including policies that promote and sustain public and private investment in the infrastructure needed for the use of information and technology in education and in specific in training.

The Skills Development Act (Act No 97 of 1998) requires that learners have access to high quality and appropriate education and training, and to skills development opportunities accessible in a work-integrated approach. It emphasises the relevance of education in the workplace and learning 'on the job'. Open learning approaches, and specifically technology-enhanced learning, open a world of simulations and real world applications to support and reinforce theoretical training. The Act also provides clear directives to the Sector Education and Training Authorities (SETAs) regarding their function of providing education and training opportunities.

According to the National Skills Development Strategy (NSDS) III, people have to be capacitated and empowered to create their own opportunities in developing sustainable livelihoods. Online methodologies provide the opportunity to the entrepreneur to learn while earning his/her livelihood.

2.3.7 Registration of qualifications and accreditation of programmes

With the promulgation of the National Qualifications Framework Act (Act No 67 of 2008), three Quality Councils (QCs) were established to ensure the accreditation of qualifications within their respective sub-frameworks. Any qualification, regardless of mode of provision, has to be registered on the NQF through the standard established processes. The QCs are also responsible for the quality assurance processes relevant to their respective sub-frameworks and the institutions which deliver their qualifications.

The quality assurance regime has a responsibility to consider how to ensure that programmes and courses offered using open learning approaches and related methodologies have the same structure of quality assurance as other means of provision.

2.3.8 Transfer of credits

The DHET published the Articulation Policy (No 373, Government Gazette No 39867, 30 March 2016) to provide purposes, principles and recommendations to inform the articulation practices of role-players in the PSET system. It facilitates the access, progression and mobility of students between and within the three sub-frameworks of the NQF.

The South African Qualifications Authority (SAQA) has already developed a Policy for Credit Accumulation and Transfer within the National Qualifications Framework (2014), which is binding on the three Quality Councils and on institutions, as per the NQF Act (Act No 67 of 2008). This policy must also be tested against the offering of open learning approaches and related methodologies, and *vice versa*. The policies which exist, such as the Credit Accumulation and Transfer (CAT) policy, are enabling, but the implementation of these policies tends to be hampered by entrenched attitudes.

2.3.9 Recognition of prior learning and articulation

With the introduction of 'open learning' approaches in programmes and courses from national and registered international institutions, companies and organisations, the implementation of RPL has become more urgent than ever, to enable students to be acknowledged for what has been learnt through such programmes or courses, or through any other system, irrespective of the mode of provision.

The Minister has published the *RPL Co-ordination Policy* (No 381, Government Gazette No 39876, 31 March 2016), which is a clear statement and indicator that supports and recognises the need to open access to education for students, and acknowledges that RPL is an important component of addressing this need. SAQA has published the *National Policy for the Implementation of the Recognition of Prior Learning* (2014), which provides for the operational implementation of RPL by the three QCs, professional bodies and education and training institutions. The three QCs will need to align their RPL policies within these policy frameworks.

Many institutions have policies on RPL for admission to, and advanced standing within, a qualification. Candidates entering a programme, who have completed online courses, should be provided access through RPL.

2.3.10 Quality assurance mechanisms

The QCs have the executive responsibility for quality assurance in education and training, and the promotion thereof. They develop and implement a system of quality assurance for education and training, including programme accreditation, institutional audits, quality promotion and capacity development, standards development and the implementation of the relevant Qualifications Sub-Framework. The QCs also have a responsibility to ensure that online course and programme offerings through various blended learning and delivery methodologies should be accredited in order to promote quality education and training in South Africa.

2.3.11 Technology-enhanced learning, and information and communication technologies

The *White Paper on e-Education* (2004), which addressed e-learning for the school and post-school sectors, saw ICT and e-learning as critically important tools in the struggle against poverty, underdevelopment and

marginalisation (p 10), and drew attention to the inequalities between those with access to ICT and those with little or no access. Developments in ICT would create access to learning opportunities, remove barriers to learning, redress inequalities, improve the quality of learning and teaching, and deliver lifelong learning – all principles of open learning. In addition this White Paper saw e-Education as more than developing computer literacy and the skills needed to operate various types of ICT; it needed to support larger systemic, pedagogical, curricular and assessment reforms that would facilitate improved education and advance higher order thinking skills. e-Learning would not replace teachers, but would rather enhance the quality and reach of their teaching if it was thoughtfully selected and integrated into educational planning and management.

2.3.12 Cross-border education

Because the development of the internet and associated telecommunication avenues affords almost instant access to a huge amount of information, the way is open for formal learning programmes and other learning resources to be distributed on a global scale. Unfortunately, it also opens the way for opportunistic purveyors of dubious information as well as those who unscrupulously exploit the unwary.

Open learning greatly increases the possibility of cross-border offerings, both for the offering of programmes and courses to South African students by providers outside South Africa, and for the provision of courses and programmes beyond South Africa's borders by South African institutions. Although online programme offerings have to be seen as a viable mode of provision, the provision in South Africa by private and foreign institutions or companies must be regulated in accordance with South African law. Likewise, programme and courses offered outside of South Africa's borders by South African-based institutions must be properly regulated by the appropriate bodies in South Africa.

In the *White Paper for Post-School Education and Training* (2014), the DHET commits to supporting the international exchange of research, scholarship, academics and students, as well as academic partnerships between South African and other universities.

According to *the Policy for the Provision of Distance Education in South African Universities in the Context of an Integrated Post-School System* (2014), the DHET is in a process of developing an agreed framework of principles and guidelines for action by all bodies and institutions in South Africa concerned with offering and receiving cross-border university education, and offering joint degrees within a range of diverse partnership models. It is further recommended that cross-border education be aligned to the new policy on internationalisation of higher education.

2.3.13 Gaps and duplication

The DHET acknowledges that there are gaps and duplication in the legislative and policy environment when specifically looking at open learning. The DHET will carefully analyse the environment, make recommendations for streamlining legislation and policies, and address the gaps that exist.

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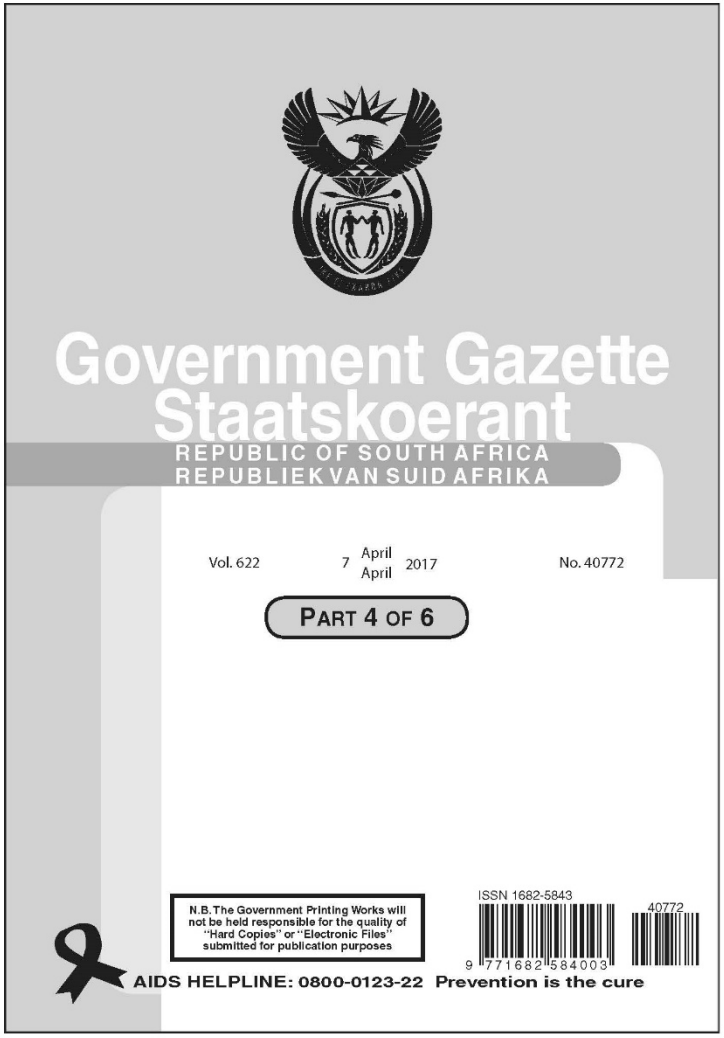

3. Strategic intent

3.1 Vision and outcomes espoused in the policy framework

The DHET's vision is a South Africa in which we have a differentiated and fully-inclusive post-school education and training system that allows South Africans to access relevant, quality post school education and training, in order to fulfil the economic and social goals of participation in an inclusive economy and society. In line with the DHET's vision, open learning has four outcomes:

i. open learning principles are progressively harnessed in all PSET institutions;
ii. ICT is used as an enabler for teaching and learning in PSET;
iii. high quality, shared teaching and learning resources are increasingly available as OER; and
iv. learners in the PSET system are provided with an efficient open learning system with viable options for learning.

Therefore the overarching open learning policy goal is to support the development and expansion of a post-school education and training sector based on open learning principles, which will complement rather than replace traditional classroom/campus-based provision. The policy framework steers the sector towards making increasing use of cost-effective modalities conducive to open learning, in the interests of increased *access* (translating into increased enrolments) and increased *success* (translating into improved throughput, success rates and employability), without sacrificing learning quality. These modalities should be used in ways that are responsive to the contexts of the learner and the workplace, in as many disciplines, programmes and courses as possible.

The policy framework mandates the setting up of a network of educational institutions, complemented by a network of learning support centres enhanced by internet connectivity for learners and staff. These networks will make available a wide range of learning opportunities to potential learners, closer to their homes and at times and dates appropriate to their individual circumstances. It will also make more efficient use of existing infrastructure, make well-researched, high-quality open education resources (or OER) nationally available, and lay increasing emphasis on independent study as preparation for subsequent lifelong learning.

3.2 Strategic objectives of the policy framework

The strategic objectives direct the DHET to the implementation of open learning approaches in the PSET system.

3.2.1 Develop an enabling environment for open learning provision in PSET

The DHET will take forward the current transformation of distance education in South Africa within the context of open learning as rapidly as possible. This embraces a range of elements including:

i. a model for open learning that ensures increased access to high quality programmes that are cost-effective and give learners a fair chance of success;
ii. a policy environment conducive to open learning;
iii. ICT used in a progressive and effective way to support open learning;

iv. an assessment and examination regime that ensures integrity and credibility, especially for TVET and CET colleges, and that accommodates open learning contexts;
v. recognition of prior learning, articulation and quality assurance in an open learning context; and
vi. diverse funding strategies supporting open learning across the PSET system.

These elements are spread across the strategic objectives of this policy framework.

(a) Address legislation, policy and practice

According to the National Education Policy Act (No. 27 of 1996) the Minister is empowered and mandated to determine national education policy as well as institutional policies in accordance with the provisions of the Constitution and this Act. This policy framework is the first attempt to provide an overarching policy environment conducive to open learning at national and institutional levels.

The Minister has already published a policy statement on the provision of distance education in universities. However, the legislative and policy environment across the PSET system supporting broader open leaning approaches is uneven and gaps, inconsistencies and duplication exist.

The DHET will:

i. develop an open learning model for PSET;
ii. do an environmental scan of legislation, policies and practices in the PSET system and identify gaps, inconsistencies and duplication related to open learning;
iii. complete the legislative and policy environment that will guide and standardise the provision of open learning across the entire PSET system;
iv. embed open learning in the national quality assurance system for PSET. This includes the revision and implementation through the QCs, of the quality standards for distance education published in *A Distance Education Quality Standards Framework for South Africa* in 1996;
v. use open learning approaches to recognise prior learning and facilitate articulation where gaps exist, in particular taking account of non-formal learning such as that recognised by means of digital badges;
vi. initiate the establishment of key structures for the successful implementation of open learning;
vii. initiate research and development on open learning, help build a network of public and private open learning institutions and practitioners, and facilitate their efforts to translate open learning principles into effective practice;
viii. stimulate ongoing debate around open learning and related issues among all people involved in education; and
ix. monitor and evaluate the application of open learning approaches and distance education methodologies.

(b) Standardise quality assurance across post-school education and training

Quality assurance is an imperative across PSET, irrespective of the mode of delivery. Quality assurance of open learning approaches and related modalities are not different from the quality assurance of any institution,

qualification, programme or course. The same principles and activities apply, regardless of the mode of delivery. However, the DHET, SAQA and the three QCs have to accommodate new ways of teaching and learning such as massive online open courses (MOOCs) and e-learning in their quality assurance practices.

The DHET will work with the three QCs to assist institutions in the implementation of quality open learning, including the adaptation of quality assurance mechanisms for open learning. These measures will complement the normal monitoring and assessment roles and activities of the QCs in the PSET sector, including institutional audits and programme accreditation. Common indicators will be developed and agreed on to measure and report on the progress in the achievement of open learning in PSET.

This mechanism will also be used to make recommendations on how to improve the implementation of open learning in PSET institutions. Rather than developing discrete measures of quality for open learning practices, the generic core criteria and other instruments used in audit and accreditation processes will be augmented by additional guidelines specific to these forms of learning (as has already been done for universities in the CHE's *Distance Higher Education Programmes in a Digital Era: Good Practice Guide and Accreditation Criteria*).

(c) Develop and establish a national open learning system

Traditional institutional-based, face-to-face methodologies will not be able to respond to the expansion of the PSET system envisaged in the 2014 *White Paper for Post-School Education and Training*. Furthermore, the costs associated with traditional teaching and learning pose a significant barrier to learners that want to enter, or are in the system. An environment for open learning has to be created by organising multiple options and distributed provision of learning opportunities, enabling learners to succeed who would otherwise be unable to participate in the PSET system.

The development of a National Open Learning System (NOLS) is key to increasing access to learning opportunities for South Africans.

The NOLS is a system that:

i. contains high quality, self-directed, interactive learning materials (online or offline) that enable learners to select and complete modules, including robust formative assessment;
ii. tracks learner progress and achievement;
iii. recognises prior learning, and identifies gaps in learners' knowledge or skills prior to doing a module;
iv. makes available post-assessments for evaluating attainment of learning outcomes and obtaining recognition of learning (in the form of digital badges);
v. links to learner support such as telephone/online support, ICT support and support centres providing a supportive 'home' for distance learners;
vi. links to institutions to enable practical learning and assessments;
vii. links to workplaces to enable work-integrated learning; and
viii. prepares learners for formal assessment such as examinations and trade tests to obtain qualifications.

It will furthermore provide opportunities for the collaborative development, use and re-use of interactive learning materials available as open educational resources.

The DHET will develop the NOLS.

Programmes and courses will be made systematically available through the NOLS, based on the needs and priorities of the PSET system. The DHET's branches will be actively involved through a NOLS Steering Committee in identifying priorities, developing funding mechanisms and monitoring the implementation of the NOLS.

The DHET, through collaboration with PSET institutions, experts, industry, entities and associations/formations will develop learning opportunities with high quality open learning materials that will be made available as OER on the NOLS.

Materials and courses on the NOLS will:

i. systematically and coherently cover the requirements of the identified qualifications, especially the newly registered National Occupational Qualifications;
ii. be activity-driven to encourage the active engagement of learners in their own learning;
iii. be designed to promote independent study;
iv. build in a range of learner support mechanisms, and where appropriate include opportunities to interact with fellow learners and, where possible, with staff;
v. include regular formative and summative assessment;
vi. be quality assured from the outset, including experimental trialling; and
vii. be made available through open licensing as OER.

Any institution will be able to use, adopt or adapt these materials for any mode of not-for-profit provision.

Learners will be able to progress through programmes and courses on the NOLS, their prior learning will be recognised, their learning will be recorded, and they will be prepared for registration and formal assessment at a relevant institution for obtaining a formal qualification if this is their wish.

3.2.2 Apply open learning approaches in PSET institutions

Current provision in PSET institutions is limited, and is not able to respond to demands for increased access to a diverse range of education and training opportunities due to infrastructure and resource constraints. Therefore current PSET institutions have to apply flexibility in their modes of provision.

(a) Institutionalise open learning

Diversity of provision is seen in the 2014 *White Paper for Post-school Education and Training* as a strategic enabler to improve access to, and success in, learning across the PSET system. The deployment of open learning approaches and related modalities in PSET institutions cannot be left to chance in the hope that it will happen. It is important for the DHET and PSET institutions to share the same understanding of open learning and how it applies to teaching and learning.

The DHET, together with institutions, will develop and implement an Open Learning Communication Strategy that will promote open learning, and enable PSET institutions not only to understand its nature and value within their institutions, but also to build capacity in the application of open learning approaches. This includes stimulating continuing debates on the use of the media and assuming responsibility for the development of a specific media-related policy.

An effective open learning environment requires the use of teaching and learning strategies that incorporate quality self-directed and learner-centred learning as part of the pedagogical design. PSET institutions therefore have to grapple with issues such as the active engagement of students, appropriate learning resources to support more independent learning, the development of staff to enable effective teaching and learning through online provisioning, support for students, appropriate technologies and media, and assessment strategies with a strong emphasis on timeous, formative feedback.

Although some PSET institutions have already implemented open learning approaches at various levels, there is a need for continuous professional development. This includes understanding the basics of open learning, change management, effective and appropriate pedagogy, and the development of high quality, self-directed learning materials and courses, learner support and assessment.

It is necessary for the DHET and institutions to provide leadership in the development of appropriate management, administration, teaching and learning to bring about change and apply open learning approaches.

Institutions will:

i. critically review and improve their current modus operandi to increase access to quality provision within a resource-constraint environment; and
ii. report on implementation within existing monitoring and evaluation frameworks and tools.

The DHET will:

i. support institutions in the development of a review and improvement model; and
ii. together with institutions, invest in professional development programmes in various aspects of open learning, including distance education delivery and course design using open education resources.

(b) Adopt diverse modes of delivery

The *White Paper for Post-School Education and Training* (2014) acknowledges that to date, conceptions of how learning programmes are designed and delivered have tended to be restricted to a choice between face-to-face (classroom-based) programmes and programmes offered at a distance. Increasingly there is a need to consider mixed-mode and blended programme delivery, with the 'mix' being determined by the needs and the contexts of learners as well as the requirements of the curriculum.

Institutions have to have a contextual understanding of the needs of different learners, and the benefits and demands of different modes of delivery. Institutions will give careful consideration to mixed-mode and blended programme delivery, and apply it within their own context.

The DHET will provide support to institutions in implementing a diverse range of delivery modes.

(c) Establish a network of high quality providers

The successful and cost-effective implementation of open learning approaches requires sharing and collaboration within a network of institutions. According to the *White Paper for Post-School Education and Training* (2014), the DHET expects that institutions will collaborate in sharing infrastructure, learning resources and staff capacity in order to improve access, quality and cost-effectiveness of provision. This includes groups of institutions collaboratively developing and delivering programmes. Such a network will provide a wide range of learning opportunities to more students, but also allow for students to study closer to their homes, and at times appropriate to their contexts. Other advantages include the development and availability of well-researched, high quality national learning resources (made available as OER – see Section 3.2.5), and more efficient use of existing infrastructure.

The DHET expects institutions to offer a limited range of programmes in order to ensure that economies of scale enable them to be delivered at significantly lower cost than face-to-face alternatives, without compromising quality. Measures such as Programme and Qualification Mix (PQM) planning will be put in place across the PSET system to address unnecessary duplication of public provision in some areas at the expense of a lack of provision in others.

PSET institutions are expected to collaborate in:

i. sharing experience and expertise;
ii. developing and delivering programmes;
iii. developing and sharing infrastructure, learning resources and ICT;
iv. establishing or supporting learning support centres; and
v. mentoring learning centre personnel.

The DHET will support institutions to collaborate within and across sectors (universities, TVET and CET colleges, skills providers and industry), in designing, developing and providing programmes, including professional development in course design, materials development and administration/management required in open learning.

In specific the DHET will establish collaboration networks to develop open learning courses and materials for TVET and CET college lecturers that can be offered by different universities.

3.2.3 Create a post-school distance education landscape based on open learning principles

The *White Paper for Post-School Education and Training* (2014) states that: 'The DHET will work toward creating a post-school distance education landscape based on open learning principles. This landscape will complement the traditional campus-based provision.'

Distance education provision has to rise to the multiple challenges of:

i. providing greater access (in terms of both numbers and diversity);
ii. offering students a reasonable expectation of turning access into success;
iii. providing courses or programmes of proven quality; and

iv. ensuring that these are also affordable.

Therefore the DHET supports the offering of distance education in PSET institutions in an integrated, planned and systematic way.

Work still needs to be done in terms of:

i. using distance education methodologies for TVET and CET colleges;
ii. exploring ways to accommodate practical and work-based learning components for distance education students, particularly in TVET and CET, and particularly where adequate or suitable facilities are lacking on campus or in the particular vicinity;
iii. improving throughput and success in distance education;
iv. providing adequate support to distance education learners;
v. developing an assessment and examination regime which accommodates distance education contexts, especially for TVET colleges; and
vi. building the capacity of PSET institutions to administer, manage, offer and support distance education.

(a) Implement sectoral models for distance education provision in PSET

Distance education is widely used in planned and coordinated ways in universities. Higher Education has an implementation policy for distance education, includes it as part of their PQM planning, and reports on the application of distance education methodologies annually. It focuses primarily on steering mechanisms viz. planning, funding arrangements and quality assurance. Similar arrangements do not exist for TVET and CET colleges, or private higher education institutions and colleges.

The DHET will:

i. develop a distance education model and policies for TVET and CET colleges;
ii. initiate the establishment of key structures for the successful implementation of distance education; and
iii. participate in the development of infrastructure (administration systems, learner support centres and ICT) necessary for the successful implementation of programmes across the PSET sector using distance education methods.

(b) Support distance learners

One of the fundamental principles of open learning is the provision of learner support. Most learners require extensive support in their learning endeavours as well as engagement with experts and peers in order to be successful. The mere act of making learning materials available does not in itself constitute an open learning opportunity. In South Africa, with its particular legacy of unequal access to learning opportunities and quality teaching and learning materials, the need for comprehensive learner support is particularly critical.

Student support covers four elements, namely academic support, counselling support, administrative support and ICT/technology support:

i. Academic support includes a wide variety of instructional methods, educational services or educational resources provided to learners to help them accelerate their learning progress, catch up with their peers,

meet learning standards, or generally succeed in their learning endeavours, such as face-to-face tutorials, telephonic support, remedial interventions and library services. In TVET and CET colleges particular support should be given in key subject areas such as Mathematics and foundational programmes;
ii. Counselling support includes career guidance, study skills and computer skills training and assistance for students facing crisis situations and adjustment issues;
iii. Administrative support includes timely, accurate and accessible information to assist the learning process;
iv. ICT/technology support includes access to technology and directions for using essential tools like email and chat.

The DHET expects PSET institutions to pay particular attention to the provision of adequate student support in addressing open learning approaches and distance education methodologies. Specific attention will be given to learner support centres. Government, institutions and community-based organisations have already established a variety of multi-purpose centres of various kinds in local communities that can immediately serve as sites for learner support or provision of distance education programmes. These could provide educational, administrative and logistical support, as well as access to digital and online materials, including access to the NOLS and online library services. They could also be used for contact sessions, particularly in the evenings, over weekends and during school holidays, as well as for supervised assessment in compliance with regulations governing summative assessment in TVET.

Existing and new centres will form a network of learner support centres across the country. The DHET will, together with institutions, develop a sound business model for learner support centres.

Strategic partnerships will be established to extend provision of centres in strategic localities remote from, or under-served by, PSET institutions.

Inter-institutional co-operation in the facilitation of learner support, coupled with sharing high quality resources, is particularly important when implementing distributed learning. Such co-operation will be fostered.

The functionality of selected public libraries can be extended at minimal cost to establish learning support centres on their premises, and in some cases librarians could be re-trained to staff such extended institutions, offering assistance in activities such as writing skills, group learning and co-operative learning.

Internet connectivity and bandwidth are particularly lacking in vast areas of rural South Africa. The establishment of a network of ICT-enabled learning support centres will play an essential role in bringing reliable internet connectivity to a growing number of learners, opening up an array of open and online education and training to many who would otherwise be deprived of it.

(c) Assure quality of cross-border distance education

The development of the internet and associated telecommunication avenues opens the way for formal and informal learning courses/programmes to be distributed on a global scale. Learners can access courses/programmes from international providers, and South African institutions can participate globally.

Unfortunately, this globalisation of learning also opens the way for opportunistic purveyors of dubious courses/programmes, as well as those who unscrupulously exploit the unwary.

The *White Paper for Post-School Education and Training* (2014) sees the regulation of cross-border distance education programmes as being 'as important as any regulation that occurs within our borders', and commits to supporting the international exchange of research, scholarship, academics and students, as well as academic partnerships between South African and other universities. According to the *Policy for the Provision of Distance Education in South African Universities in the Context of an Integrated Post-School System* (2014), the DHET is in a process of developing an agreed framework of principles and guidelines for action by all bodies and institutions in South Africa concerned with offering and receiving cross-border university education, and offering joint degrees within a range of diverse partnership models. This framework will be extended to include TVET and CET colleges.

The DHET will continue to pursue and honour inter-governmental agreements designed to curb fraudulent or inferior distance education at source, and to ensure that providers of cross-border education meet acceptable criteria and are subjected to suitable quality assurance supervision in their home countries.

The DHET will ensure that:

i. cross-border education and training regulations are in place, transparent and enforced;
ii. full, clear and correct information is available to learners;
iii. qualifications are transparent, and institutions co-operate fully in verifying qualifications and disqualifying fraudulent documents;
iv. effective quality assurance processes are in place; and
v. DHET and distance education providers maintain a collegial dialogue on the subject locally and internationally.

The DHET, SAQA and the three QCs undertake to review the existing mechanisms aimed at ensuring that providers of cross-border education and training meet acceptable criteria and guidelines for cross-border distance education.

3.2.4 Improve access to information and communication technology as an enabler for distance education

The globalised world has already reached the stage where ICT are virtually indispensable for meaningful participation in modern life, including in education and training. Institutions are making increasing use of modern ICT to develop and offer learning programmes. However, reliable connectivity and access to maintained and compatible ICT are extremely unequal across the population, and institutions are not optimally collaborating and sharing ICT infrastructure.

According to the National Integrated ICT Policy White Paper (2016) the South African Government's goal is to 'ensure (that) everyone, regardless of who they are (therefore all PSET learners), where they live or their social or economic standing, can benefit from the opportunities offered by ICT, either on an individual or shared basis'.

Recent increases in the availability of bandwidth, cloud services and affordability of end-user mobile devices such as laptops, tablets and smartphones encourage the hope that this goal may be attainable. To extend this sort of infrastructure to all PSET learners remains a challenge.

The *National Integrated ICT Policy White Paper* (2016) provides for innovative funding strategies, including the implementation of an e-Rate (a discount of at least 50% on Internet services provided) to public TVET and CET colleges and higher education institutions, as well as the establishment of a Digital Development Fund (Digital-DF) to 'extend access to digital government services, including e-education programmes. This could include support for extending access through public "hot spots" via public entities.'

In the 2014 *White Paper for Post-school Education and Training*, the DHET expresses its intension to improve ICT access by:

i. developing an integrated ICT plan that will provide strategic direction for the improvement of equitable access to and use of appropriate technology across the post-school education and training system;
ii. prioritising collaboration with the Department of (Telecommunication and Postal Services) Communications and other government departments and stakeholders to facilitate increased bandwidth and reduced costs for educational purposes, with particular emphasis on reaching those in more remote areas;
iii. engaging with stakeholders to negotiate easier access to and reduced costs for Internet-enabled devices;
iv. bidding for funds to ensure that a comprehensive, enabling ICT infrastructure is put in place for all post-school institutions, particularly providers of distance higher education; and
v. facilitating the shared establishment and management of ICT-enabled, networked learning support centres in areas where home-based provision is likely to be difficult in the short to medium term.

In order to remain relevant and to accommodate the increasing demands of modernisation, institutions have to maximise the use of appropriate digital technology; collaborate and share infrastructure; embrace OER and the sharing of materials and resources; and build staff capacity in the use of ICT for teaching and learning.

The DHET and institutions will work towards affordable/free broadband connectivity on-campus for all learners and staff.

The DHET will:

i. review and align the ICT legislative and policy environment in support of the PSET system;
ii. develop an integrated ICT plan for the PSET system that is aligned to the national e-Skills Plan and the *National integrated ICT Policy White Paper* (2016) of the Department of Telecommunication and Postal Services (DTPS);
iii. work with the Department of Science and Technology (DST) and DTPS to extend the South African National Research and Education Network (SANREN) into all public TVET and CET colleges and higher education institutions to provide broadband access to all PSET institutions and campuses;
iv. work collaboratively with the PSET community so that staff and learners in public PSET institutions have access to affordable mobile devices;

v. develop a strategy to support TVET and CET colleges with expertise to develop, manage and maintain campus and institutional ICT infrastructure;
vi. enable the development of institutional, inter-institutional and learner support centre ICT policies and plans (aligned to national policies) with appropriate financing strategies. These polices also include user security and protection of personal information (according to the Protection of Personal Information Act (Act No 4 of 2013) policies; and
vii. facilitate the professional development of managers, administrators, support personnel and lecturers in the use of ICT for teaching and learning as well as the management of ICT for teaching and learning.

3.2.5 Make high quality, shared teaching and learning resources available as open educational resources

The effectiveness of open learning is mainly based on the provision of high quality teaching and learning resources across the system. In order to make this endeavour cost-efficient, the collaborative development and sharing of well-designed, quality teaching and learning resources as OER is paramount in open learning. One of the critical success factors to this end is the adoption of an effective resource development model and related policies for the PSET system.

Open Licences have been developed to ensure that copying and sharing happen within a structured legal framework that is more flexible than the traditional 'all rights reserved' status of copyright. This allows for more flexible use, re-use and adaptation of materials for local contexts and learning environments, while still allowing authors to have their work acknowledged.

The DHET supports investing in the design and development of high quality learning resources as a strategy for increasing, and assuring the quality of, provision in the entire PSET system.

The DHET will:

i. develop, in consultation with stakeholders, an enabling policy environment for the development, use and distribution of OER;
ii. facilitate the process of collecting and compiling available OER in the PSET sector, including all publicly initiated and funded PSET materials, in repositories to serve the PSET system;
iii. provide support for the production and sharing of learning materials as OER in institutions in the PSET system. In particular, all materials developed by the DHET and institutions through public and donor funding will be made available as OER;
iv. invest in materials development and ensure that high quality teaching and learning resources will progressively be made freely available as OER to use, re-use and repurpose. To this end the DHET will develop a materials development model that will make use of content experts in institutions, academia and industry (where appropriate), coupled with experts in materials design and development;
v. consider adopting open standards for materials produced by government, agencies and institutions receiving government support for developing publications, to ensure full access to and use/sharing of resources, spanning both research and educational publications;

vi. develop an appropriate licensing framework for use by the DHET and institutions within an overarching policy framework of intellectual property rights and copyright in the PSET system;
vii. contribute to raising awareness of key OER issues. These could include writing up and sharing case studies of good practice to support implementation efforts, assisting stakeholders to understand issues around Intellectual Property Rights (IPR), open licencing, quality in OER, and how IPR are being challenged and reshaped by the rapid digitisation and online sharing of information and resources;
viii. consider the development of OER as one of the priorities for recognising staff excellence in PSET institutions; and
ix. support the sustainable development and sharing of quality learning and teaching materials.

3.3 Advocacy and communication

As recognised in the strategic objectives of the policy framework (see 3.2.2a), all facets of open learning have to be advocated and communicated within and beyond the PSET system in order to make effective use of open learning approaches to increase access to, and improve the quality of, PSET offerings in cost-efficient ways.

The DHET will develop, in consultation with stakeholders, an open learning advocacy and communication strategy at national level.

Institutions, as part of their implementation, will also embark on extensive advocacy and communication of open learning, firstly internally (management, administration, staff), and to learners, prospective learners, parents and the broader community.

The DHET and institutions will work together to ensure that everyone understands the advantages and the implications of open learning and its related areas.

4. Monitoring and evaluation

As a principle-based approach, open learning is in itself difficult to quantify and therefore to monitor and evaluate its implementation. The evidence for open learning manifests itself in the extent to which the principles which constitute open learning (see paragraph 2.1.2) are being implemented. Open learning is further manifested in specific modalities of provision such as distance education, technology-enhanced learning, online learning and blended learning.

However, evidence-based decision making has become an indispensable practice universally because of its role in ensuring efficient management of population, economic and social affairs. Policy improvement cannot bear fruit without systematic and consistent measurement of the inequality gap.

The DHET is committed to the implementation of the open learning principles, and data on its implementation will be collected and aggregated in order to monitor and evaluate the systemic implementation of open learning in the PSET system.

4.1 Monitoring and evaluation instruments

The DHET, within the first two years of implementation of this policy framework, will initiate the process of developing an Open Learning Implementation Index and an Open Learning Review and Improvement Model (OL-RIM), open learning indicators as well as a standardised process of collecting and reporting on progress. Through these two instruments, the implementation of open learning in institutions will be monitored and evaluated.

4.1.1 Open learning indicators

Open learning indicators will be developed and monitored within existing monitoring and evaluation frameworks and tools such as the regulations governing reporting of higher education institutions, Higher Education Act (Act No 101 of 1997), section 41 read with section 69, as published in Government Gazette No. 37726 Notice No 464 of June 2014. This will enable the DHET to receive reports from public universities. Currently universities are reporting annually to the DHET as prescribed by the Regulations for Reporting by Public Higher Education Institutions.

Open Learning performance indicators will be included as part of the governance and teaching and learning indicator process.

The same process will apply to public TVET and CET colleges. In terms of Section 12(1) of the CET Act (Act No 16 of 2006), College Councils are encouraged to establish special sub-committees. One of the sub-committees will be an Open Learning Sub-Committee that will support and monitor implementation of open learning at each college. TVET and CET colleges will follow a similar integrated reporting mechanism to that used by universities to report annually on national action plans on social inclusion.

The DHET and institutions will develop open learning indicators and monitor them within existing monitoring and evaluation frameworks and tools where they exist. Where indicators, frameworks and tools do not exist,

the DHET will develop such indicators, frameworks and tools in order to have a uniform monitoring system across the PSET system.

4.1.2 Open Learning Implementation Index

In order to realise the implementation of open learning in institutions, it is important that inequalities between institutions with regard to open learning be measured. An Open Learning Implementation Index (OLII) will be developed for measurement of the implementation of open learning in institutions. This index will provide a high-level quick scan of the level of implementation, with the explicit purpose of managing government performance more inclusively. It is a new concept and a pioneering initiative with no international comparison.

This index will be calculated and reviewed annually. There is a need to embark on the production of an analytical summary that reveals unique challenges and opportunities. This analytical work also enhances intellectual debates that are critical for policy review and interventions.

The OLII is not a substitute for the monitoring and evaluation frameworks that exist in PSET institutions, and should be embedded in the Government-Wide Monitoring and Evaluation System.

The DHET will initiate the development of an Open Learning Implementation Index (OLII) that will measure implementation of open learning in institutions.

4.1.3 Open learning review and improvement model

In the medium to long term, the effectiveness of the enabling environment that has been created will be constantly monitored and reported. The OLII will be used to develop an Open Learning Review and Improvement Model (OL-RIM).

The OL-RIM will respond to two realities, viz. the increasing emphasis on increased access to PSET, quality of PSET offerings, articulation and recognition for studies, and the high cost of conventional approaches to external quality assurance.

The OL-RIM will be designed to be high in effectiveness and low in cost, targeting decision makers at institutional level. The model has to be suitable for all PSET institutions of all types and sizes. It will be a self-administered approach which supports the institution in reviewing itself, with the recommended option of getting the institutional findings verified by a quality professional or even a panel of verifiers.

The DHET will initiate the development of an Open learning Review and Improvement Model (OL-RIM) that will support institutions in reviewing themselves in terms of open learning implementation.

4.2 Monitoring the implementation of the policy framework

The above processes and instruments will also be used to monitor and evaluate the implementation of the policy framework. Systemic indicators will be identified to report on the PSET system's progress. It must be realised that the implementation of open learning is not a goal in itself; rather it addresses the bigger systemic issues of access, success, quality and cost.

5. Implementation

5.1 High level implementation strategy

A high level Implementation Strategy for Open Learning in the PSET system has been developed based on the strategic objectives in 3.2, the advocacy and communication outlined in 3.3, and the monitoring and evaluation framework outlined in 4. The implementation strategy outlines implementation over the short term (2018/9), Medium Term (to align it with the Medium Term Strategic Framework of Government: 2019/20 – 2021/2) and Long Term (up to 2030). The implementation strategy is only indicative, and a detailed implementation plan will be developed once the policy is published.

5.1.1 Develop an enabling environment for open learning provision in PSET

Objectives	Activities	Responsibility	Short Term 2017/8 – 2018/9	Medium Term 2019/20 – 2021/2	Long Term 2022 onwards
(a) Address legislation, policy and practice	i. Develop an open learning model for PSET	DHET Institutions Entities SAQA 3 QCs			
	ii. Do an environmental scan of legislation, policies and practices in the PSET system and identify gaps, inconsistencies and duplication related to open learning	DHET			
	iii. Complete the legislative and policy environment that will guide and standardise the provision of open learning across the entire PSET system	DHET			
	iv. Embed open learning in the national quality assurance system for PSET. This includes the revision and implementation through the QCs, of the quality standards for distance education published in 'A Distance Education Quality Standards Framework for South Africa' in 1996	DHET SAQA 3 QCs			
	v. Use open learning approaches to recognise prior learning and facilitate articulation where gaps exist, in particular taking account of non-formal learning such as that recognised by means of 'digital badges'	DHET SAQA 3QCs Institutions			

Objectives	Activities	Responsibility	Short Term 2017/8 – 2018/9	Medium Term 2019/20 – 2021/2	Long Term 2022 onwards
	vi. Establish key structures for the successful implementation of open learning	DHET			
	vii. Initiate research and development on open learning, help build a network of public and private open learning institutions and practitioners, and facilitate their efforts to translate open learning principles into effective practice	DHET Institutions Research Community			
	viii. Stimulate ongoing debate around open learning and related issues among all people involved in education	DHET Institutions Entities SAQA 3 QCs Research Community			
	ix. Monitor and evaluate the application of open learning approaches and distance education methodologies (see 4.1)	DHET Institutions Entities SAQA 3 QCs			
(b) Standardise quality assurance across post-school education and training	i. Assist institutions in the implementation of quality open learning, including the adaptation of quality assurance mechanisms for open learning	SAQA 3 QCs DHET Institutions Entities			
(c) Develop and establish a national open learning system	i. Develop the NOLS	DHET			
	ii. Make programmes and courses systematically available through the NOLS, based on the needs and priorities of the PSET system	DHET Institutions			
	iii. Establish a NOLS Steering Committee	DHET			
	iv. Develop learning opportunities with high quality open learning materials that will be made available as OER on the NOLS	DHET, through collaboration with PSET institutions, experts, industry, entities and associations/formations			
	v. Build in a range of learner support mechanisms	DHET Institutions			

5.1.2 Apply open learning approaches in PSET institutions

Objectives	Activities	Responsibility	Short Term 2017/8 – 2018/9	Medium Term 2019/20 – 2021/2	Long Term 2022 onwards
(a) Institutionalise open learning	i. Develop and implement an Open Learning Communication Strategy to understand open learning, its nature and value within institutions, and to build capacity in the application of open learning approaches (see 3.2.2a, 5.1.6)	DHET Institutions Government Communication and Information Services (GCIS)			
	ii. Provide guidelines for, and engage with institutions on, the development of particular programmes in appropriate modalities reflecting open learning, as well as enrolment planning processes that address national and student needs on the one hand, and institutions' capacity to deliver on the other (see 4.5)	DHET Institutions Entities SAQA 3 QCs SAIVCET			
	iii. Draft guidelines on partnerships and collaboration in open learning (see 5.3)	DHET SAQA 3 QCs			
	iv. Review and improve current *modus operandi* to increase access to quality provision within a resource-constraint environment	DHET Institutions			
	v. Report on implementation within existing monitoring and evaluation frameworks and tools (see 4.1, 5.1.7)	DHET Institutions			
	vi. Support institutions in the development of a review and improvement model (see 4.1.3, 5.1.7)	DHET			
	vii. Invest in professional development programmes in various aspects of open learning, including distance education delivery and course design using open education resources	DHET Institutions			
(b) Adopt diverse modes of delivery	i. Consider mixed mode and blended learning programme delivery and apply it within institutional contexts	Institutions			
	ii. Develop a supporting mechanism to institutions in implementing a diverse range of delivery modes, including draft guidelines on partnerships and collaborations in open learning (see 5.3)	DHET			
(c) Establish a network of high	i. Measures such as Programme and Qualification Mix (PQM) planning will be put in place across the PSET system to address unnecessary	DHET			

Objectives	Activities	Responsibility	Short Term 2017/8 – 2018/9	Medium Term 2019/20 – 2021/2	Long Term 2022 onwards
quality providers	duplication of public provision in some areas at the expense of a lack of provision in others (see 3.2.2c)				
	ii. Collaborate in sharing experience and expertise; developing and delivering programmes; developing and sharing infrastructure, learning resources and ICT; establishing or supporting learning support centres; and mentoring learning centre personnel	DHET Institutions Entities			
	iii. Support institutions to collaborate within and across sectors (universities, TVET and CET colleges, skills providers and industry), in designing, developing and providing programmes, including professional development in course design, materials development and administration/ management required in open learning	DHET			
	iv. Establish collaboration networks to develop open learning courses and course materials for TVET and CET college lecturers that can be offered by different universities	DHET			

5.1.3 Create a post-school distance education landscape based on open learning principles

Objectives	Activities	Responsibility	Short Term 2017/8 – 2018/9	Medium Term 2019/20 – 2021/2	Long Term 2022 onwards
(a) Implement sectoral models for distance education provision in PSET	i. Develop a distance education model for TVET and CET colleges including an implementation policy for distance education in TVET and CET colleges (including private providers); using distance education methodologies for TVET and CET colleges; improving throughput and success in distance education; providing adequate support to distance education learners; adapting the assessment and examination regime, especially for TVET colleges, so that it accommodates distance education contexts; and building the capacity of PSET institutions to administer, manage, offer and support distance education	DHET			
	ii. Initiate the establishment of key structures for the successful implementation of distance education	DHET			
	iii. Participate in the development of infrastructure (administration systems, learner support centres and ICT) necessary for the	DHET			

Objectives	Activities	Responsibility	Short Term 2017/8 – 2018/9	Medium Term 2019/20 – 2021/2	Long Term 2022 onwards
	successful implementation of programmes using distance education methods.				
(b) Support distance learners	i. Develop a sound business model for learner support centres	DHET			
	ii. Form a network of learner support centres across the country, including existing and new centres	DHET Institutions Entities Local Government Government Departments			
	iii. Establish strategic partnerships to extend provision of centres in strategic localities remote from, or under-served by, PSET institutions	DHET Institutions Entities Local Government Government Departments			
	iv. Co-operation in the facilitation of learner support, coupled with sharing high quality resources	DHET Institutions Entities Local Government Government Departments			
	v. Train librarians/centre managers and personnel to offer assistance in activities such as writing skills, group learning and co-operative learning	DHET Institutions Entities Local Government Government Departments			
(c) Assure quality of cross-border distance education	i. Ensure that cross-border education and training regulations are in place, transparent and enforced	DHET SAQA 3 QCs			
	ii. Ensure that full, clear and correct information is available to learners	DHET Institutions SAQA 3QCs			

Objectives	Activities	Responsibility	Short Term 2017/8 – 2018/9	Medium Term 2019/20 – 2021/2	Long Term 2022 onwards
		Professional bodies and associations			
	iii. Ensure that qualifications are transparent and institutions co-operate fully in verifying qualifications and disqualifying fraudulent documents	DHET Institutions SAQA 3QCs			
	iv. Put effective quality assurance processes in place	DHET SAQA 3QCs			
	v. Maintain a collegial dialogue on the subject locally and internationally	DHET Institutions SAQA 3QCs Professional bodies and associations			
	vi. Review the existing mechanisms aimed at ensuring that providers of cross-border education and training meet acceptable criteria and guidelines for cross-border distance education	DHET SAQA 3QCs			

5.1.4 Improve access to information and communication technology as an enabler for distance education

Objectives	Activities	Responsibility	Short Term 2017/8 – 2018/9	Medium Term 2019/20 – 2021/2	Long Term 2022 onwards
(a) Implement sectoral models for distance education provision in PSET	i. Demonstrate that institutions maximise the use of appropriate digital technology; collaborate and share infrastructure; embrace OER and the sharing of materials and resources; and build staff capacity in the use of ICT for teaching and learning	Institutions			
	ii. Review and align the ICT legislative and policy environment in support of the PSET system	DHET			
	iii. Develop an integrated ICT plan that will provide strategic direction for the improvement of equitable access to and use of appropriate technology across the PSET system	DHET DTPS DST			

Objectives	Activities	Responsibility	Short Term 2017/8 – 2018/9	Medium Term 2019/20 – 2021/2	Long Term 2022 onwards
	iv. Extend SANREN into all public TVET and CET colleges and higher education institutions to provide broadband access to all PSET institutions and campuses	DHET DTPS DST			
	v. Engage with stakeholders and the PSET community to negotiate access to Internet-enabled devices at reduced costs	DHET DST DTPS			
	vi. Develop a strategy to support TVET and CET colleges with expertise to develop, manage and maintain campus and institutional ICT infrastructure	DHET			
	vii. Enable the development of institutional, inter-institutional and learner support centre ICT policies and plans (aligned to national policies) with appropriate financing strategies	DHET Institutions Local Government Government Departments			
	viii. Facilitate the professional development of managers, administrators, support personnel and lecturers in the use of ICT for teaching and learning as well as the management of ICT for teaching and learning	DHET Institutions			

5.1.5 Make high quality, shared teaching and learning resources available as open educational resources

Objectives	Activities	Responsibility	Short Term 2017/8 – 2018/9	Medium Term 2019/20 – 2021/2	Long Term 2022 onwards
(a) Make high quality, shared teaching and learning resources available as OER	i. Develop an enabling policy environment for the development, use and distribution of OER including the adoption of an effective resource development model and related policies for the PSET system	DHET			
	ii. Develop a structured legal framework that is more flexible than the traditional 'all rights reserved' status of copyright for the PSET system	DHET			
	iii. Facilitate the process of collecting and compiling available OER in the PSET sector, including all publicly initiated and funded PSET materials, in repositories to serve the PSET system	DHET Institutions			
	iv. Provide support for the production and sharing of learning materials as OER in institutions in the PSET system	DHET Institutions			

Objectives	Activities	Responsibility	Short Term 2017/8 – 2018/9	Medium Term 2019/20 – 2021/2	Long Term 2022 onwards
	v. Develop a materials development model making use of content experts and experts in materials design and development	DHET Institutions			
	vi. Invest in materials development and ensure that high quality teaching and learning resources will progressively be made freely available as OER to use, re-use and repurpose	DHET			
	vii. Adopt open standards for materials produced by government, agencies and institutions receiving government support for developing publications, to ensure full access to and use/sharing of resources, spanning both research and educational publications	DHET			
	viii. Develop an appropriate licencing framework for use by the DHET and institutions within an overarching policy framework of intellectual property rights and copyright in the PSET system	DHET			
	ix. Raise awareness of key OER issues (these could include writing up and sharing case studies of good practice to support implementation efforts, assisting stakeholders to understand issues around IPR, open licencing, quality in OER, and how IPR are being challenged and reshaped by the rapid digitisation and online sharing of information and resources	DHET Institutions Professional Bodies Associations			
	x. Develop OER as one of the priorities for recognising staff excellence in PSET institutions	DHET			
	xi. Develop a sustainable model for the development and sharing of quality learning and teaching materials	DHET			

5.1.6 Advocacy and communication

Objectives	Activities	Responsibility	Short Term 2017/8 – 2018/9	Medium Term 2019/20 – 2021/2	Long Term 2022 onwards
(a) Ensure that all facets of open learning have to be advocated and communicated within and	i. Develop and implement an Open Learning Communication Strategy to understand open learning, its nature and value within institutions, and to build capacity in the application of open learning approaches (see 3.2.2a and 3.3)	DHET Institutions Other stakeholders			
	ii. Embark on extensive advocacy and communication of open learning, firstly within their own institution (management, administration,	Institutions			

Objectives	Activities	Responsibility	Short Term 2017/8 – 2018/9	Medium Term 2019/20 – 2021/2	Long Term 2022 onwards
beyond the PSET system	staff) and to learners, prospective learners, parents and the broader community (see 3.3)				

5.1.7 Monitoring and evaluation

Objectives	Activities	Responsibility	Short Term 2017/8 – 2018/9	Medium Term 2019/20 – 2021/2	Long Term 2022 onwards
(a) Ensure that open learning implementation is monitored	i. Develop an Open Learning Implementation Index	DHET Institutions			
	ii. Support institutions in the development of an Open Learning Review and Improvement Model (OL-RIM) (see 4.1.2)	DHET Institutions			
	iii. Develop open learning indicators as well as a standardised process of collecting and reporting on progress (frameworks and tools)	DHET Institutions			
	iv. Report on implementation within existing monitoring and evaluation frameworks and tools (see 4.1)	DHET Institutions			

5.2 Co-ordination mechanisms

The DHET, through the Directorate: Open Learning, will provide strategic leadership in the implementation of open learning in the PSET system, working with PSET institutions. The DHET will devise deliberate steps to build and maintain a cohesive and efficient NOLS with its associated content/learning management system that reflects open learning principles as far as is appropriate for each type of need experienced by post-school learners. DHET will work with other government departments, agencies, organisations and institutions to carefully plan, communicate, implement, monitor and evaluate open learning in the PSET system.

In the short term (2018/9 – 2020/21), the DHET will work closely with institutions to develop and implement instruments to assist institutions in the increasing implementation of open learning. These include the establishment of networks of open learning providers, open learning courseware designers and materials developers, and learning support centres, as well as a PSET Open Learning Forum.

5.2.1 Policy instruments and steering mechanisms to be used in implementation

Existing mechanisms of institutional planning, funding arrangements and quality assurance will be used to create an enabling environment for the uptake of open learning, and to steer the entire post-school sector in a way that will encourage and stimulate the increasing use of open learning in distance, face-to-face contact and mixed modes of delivery. These steering mechanisms will be employed to encourage, incentivise and support institutions to increase and improve access to learning opportunities, removing as many barriers to such access as possible, and to assist institutions to construct high quality learning environments which take account of the learners' contexts and employ technology appropriately and efficiently.

5.2.2 The South African Institute for Vocational and Continuing Education and Training

The South African Institute for Vocational and Continuing Education and Training (SAIVCET) will be instrumental in providing necessary and appropriate support for the realisation of open learning and distance education in the TVET and CET college sectors. The Further Education and Training Colleges Amendment Act (Act No 1 of 2013), Sec 43B (b) and (c) directs SAIVCET to 'assist and support the Minister in the development of distance education and training, including open learning' and to 'assist and support colleges in the development of learning, teaching and assessment materials'. It also assigns the functions of research, innovation, promotion of dialogue and professional development to SAIVCET.

SAIVCET will therefore:

i. develop an open learning and distance education model for TVET and CET colleges, including means of accommodating practical and work-based components for distance education students;
ii. upgrade the technical knowledge and pedagogical skills of existing staff in TVET and CET colleges in open learning;
iii. provide a forum for experts to develop open learning materials for TVET and CET college programmes;
iv. advise the Minister on open learning and distance education in TVET and CET colleges;

v. initiate research on open learning and distance education in TVET and CET colleges, and the college system as a whole;
vi. promote dialogue and the co-ordination of open learning and distance education in TVET and CET colleges;
vii. promote RPL through open learning; and
viii. monitor and evaluate the application of open learning approaches and distance education methodologies in TVET and CET colleges.

5.2.3 National Open Learning Forum

In order to support institutions in the implementation of open learning, the DHET will establish a National Open Learning Forum (NOLF) to:

i. provide overall direction for open learning implementation in the country;
ii. determine priorities for open learning implementation in the country;
iii. advise the PSET system on implementation of open learning; and
iv. drive the national advocacy and communication strategy for open learning.

This forum will establish, on a needs basis, sub-structures to drive and promote specific areas within open learning such as OER and open licencing; quality assurance and learner support, to name a few.

5.3 Institutional implementation

The DHET, in collaboration with other entities and organisations such as SAQA, QCs and SAIVCET, will provide guidelines for, and engage with institutions on, the development of particular programmes in appropriate modalities reflecting open learning, as well as enrolment planning processes that address national and student needs on the one hand, and institutions' capacity to deliver on the other. These guidelines, together with historical data on student success and throughput rates, will influence decisions about the desirability and hence recognition of programmes of particular types, designations and modes of provision. Public institutions' PQMs and enrolment plans must be approved by the DHET prior to applications for programme accreditation through the relevant quality assurer.

Institutions may enter into partnerships to facilitate the provision of support for open learning. The obligations of such partners must be clearly spelled out. The DHET will draft guidelines on partnerships and collaborations in open learning. It is imperative that institutions have met all the quality assurance requirements of the relevant QC, and thereby take full responsibility for the quality of the learning programmes in question.

Provision of open learning will also necessitate appropriate staffing arrangements and the professional development of managerial and administrative as well as academic staff.

5.4 Funding

The implementation of the policy framework will be part of the core activities of the DHET and institutions, and therefore be incorporated in the funding allocation for institutions. The DHET will determine funding norms and provide guidelines for funding open learning. The DHET will ensure that the funding of open learning, and of

distance education provision in specific, is based on empirical evidence of the relative costs of different modes of provision.

Open learning initiatives driven by the DHET such as the NOLS will be funded initially through the European Union Sectoral Support Programmes Budget. Funding has been secured for the implementation of the initial and second phases of the Open Learning initiative, up to 2025.

Measures will be taken early in implementation of the policy framework to ensure that open learning policies and practices gain a firm foothold in a number of TVET and CET colleges and universities, that initially limited open learning programmes and other initiatives are well-managed and sustained, and that the momentum toward further development and innovation is maintained.

Some of the DHET's strategic funding priorities will be to:

i. modify the relevant budgetary frameworks and funding norms to recognise the importance and status of open learning, including the development of quality OER;
ii. raise awareness of key open learning and OER issues;
iii. review the funding formula which assumes a neat and obvious division between contact and distance education;
iv. fund continued technical infrastructure development in order to allow for increased and enhanced access to programmes;
v. support the sustainable development and sharing of quality learning materials as OER; and
vi. review National Student Financial Aid Scheme (NSFAS) funding in order to facilitate the appropriate support of learners availing themselves of open and distance learning opportunities.

The DHET accepts that the although open learning and distance education may be accompanied in the long term by financial advantages accruing from expanded enrolments and relatively low expenditure on new physical infrastructure, the initial costs of establishing the necessary ICT networks, software and other infrastructure, in addition to the heavy cost of course and materials development for quality self-directed learning, tend to outweigh any shorter-term cost benefits. Integrated budget planning and carefully monitored and reviewed expenditure will therefore be needed.

5.5 Reviewing the policy framework

As outlined in paragraph 3.5, the developed instruments will be used to monitor the implementation of the policy framework over a period up to 2030 to align it with the goals of the *White Paper for Post-School Education and Training* (2014). The policy will be reviewed every five years after implementation commences.

5.6 Effective date of the policy

The policy will come into effect on the date of publication in the Government Gazette.

6. Conclusion

As pressure mounts, at times dramatically, for increased access to affordable post-school education and training in a context of fiscal stress and global economic uncertainty, many South Africans look to e-learning, online learning, distance learning and open learning to provide at least partial solutions. Although they often overlap in practice, each of these forms of education has in itself a different type of contribution to make.

Open learning has the potential to open up new avenues of access to learning, and to make learning a more engaging and intrinsically rewarding experience for those who can have sustained access to it. Distance education is well-known for increasing the educational reach of institutions, and for providing learning opportunities to many who would otherwise be deprived of formal learning. Like distance education, open learning focuses directly on making access to learning a primary goal, and may use the benefits of e-learning and online learning to achieve this end. Open learning, however, is driven by a concern for social justice and therefore motivated by the need for redress, equity in access to opportunity, flexibility and choice, and by an equal concern for quality and real success in learning.

All of these forms of education need to be carefully planned, selected and implemented with pedagogic effectiveness and appropriateness in mind as the first consideration, and not as an afterthought subordinate to the need for a healthier balance sheet, or to the desire to be known for being equipped with the most up-to-date technological aids.

APPENDIX I: DHET Distance Education Policy

GOVERNMENT NOTICE

DEPARTMENT OF HIGHER EDUCATION AND TRAINING

No. 535 **7 July 2014**

POLICY FOR THE PROVISION OF DISTANCE EDUCATION IN SOUTH AFRICAN UNIVERSITIES IN THE CONTEXT OF AN INTEGRATED POST-SCHOOL SYSTEM

I, Dr Bonginkosi Emmanuel Nzimande, MP, Minister of Higher Education and Training, hereby publish the *Policy for the Provision of Distance Education in South African Universities in the Context of an Integrated Post-school System* as set out in the Schedule as policy in terms of section 3 of the Higher Education Act, 101 of 1997.

The *Policy for the Provision of Distance Education in South African Universities in the Context of an Integrated Post-school System* should be read in conjunction with other policy documents affecting public universities in South Africa and is part of a broader focus on building the capacity of the post schooling system. The policy however, focuses primarily on university education because of its unique features. Since the current infrastructure within the South African university sector cannot accommodate the needed expansion, distance education would make a significant contribution to the required growth in the sector.

The Policy provides a statement for the provisioning and expansion of quality distance education at higher education institutions. It includes an overview of the policy context, describes the distinctiveness and purpose of distance higher education, and identifies mechanisms for steering distance education and for creating an enabling environment for quality distance provisioning.

Dr Bonginkosi Emmanuel Nzimande, MP
Minister of Higher Education and Training
Date: 27/06/2014

Policy for the Provision of Distance Education in South African Universities

in the context of an integrated post-school system

May 2014

Policy for the Provision of Distance Education in South African Universities

Contents

Preamble to policy

The development of this policy has taken place in the context of two important factors: the development and release of the White Paper on Post-School Education and Training with its imperative to expand the system dramatically; and increasing, but by no means ubiquitous, penetration and affordability of information and communication technologies (ICT) across South Africa. Both factors have a seminal impact on the provision of distance education in the public and private university sector.

This policy has benefitted from the engagement of many interested parties on the Draft Policy Framework published for public comment in the Government Gazette (nr. 35391) of 29 May 2012.

While the DHET recognises the growing impact of ICT on the provision of distance education, it is concerned that increasing use of terms such as 'blended', 'flexible' and 'mixed' provision covers too wide a range of possibilities and that in the use of such terms, the unique possibilities and challenges of distance education provision are often overlooked.

The DHETwishes to retain focus on distance education provision as a distinct subset of provision because of the potential of distance provision to:

1. Open access to post-schooling education opportunities for those who cannot or who chooses not to attend traditional campus-based provision.
2. Lower costs per student by amortising curriculum design, materials development and some teaching costs across larger numbers of students and by obviating the need for continuing investment in physical infrastructure.

However, access is not meaningful unless it offers a reasonable chance of success and therefore the quality assurance of distance education provision and attention to improving retention, pass rates and throughput remain critical.

Distance education provision needs to rise to the triple challenge of providing greater access (1) (in terms of both numbers and diversity), in ways that offer a reasonable expectation of turning access into success in courses or programmes of proven quality (2) that are also affordable (3).

The key provisions of this policy statement are:

1. Providing a system wide definition for what constitutes distance education provision
2. Supporting well-managed growth in quality distance education provision, including in institutions other than UNISA
3. Ensuring that distance education provides not only opportunities for access but also a reasonable chance of success
4. Ensuring that distance education provision is funded based on empirical evidence of relative costs of different modes of provision
5. Strengthening capacity to evaluate distance education provision and hence to regulate who can offer accredited distance programmes

6. Promoting the development and use of Open Educational Resources (OERs)
7. Creating an enabling environment for appropriate integration of ICT to enhance distance education provision in both public and private universities as well as other post-schooling institutions. In particular, the DHET will work to ensure that every post schooling student has reasonable access to affordable connectivity

This policy statement replaces the stipulations regarding distance education provision included in the 2002 document: *Approved Academic Programmes for Universities and Technikons: 2003 – 2006*.

1 Scope and purpose of this policy

1.1 This policy, seeks to resolve areas of uncertainty and provide strong support for the progressive development of South African university distance education as an indispensable and integral component of our national post-school education system.

1.2 It should thusbe read in conjunction with other policy documents affecting universities in South Africa including the following:

- The *White Paper for Post-School Education and Training: Building an expanded, effective and integrated post-school system* approved by Cabinet on 20 November 2013
- *Higher Education Qualifications Sub-Framework* (CHE 2013)
- *Ministerial Statement on the management and utilisation of Teaching Development Grants* (2013)
- Decisions that emanate from the *Report of the Ministerial Committee for the Review of the Funding of Universities*
- Policy statements that will emanate from a *Policy on Partnerships and Collaborations*(in process)

1.3This policy is part of a broader focus on building the capacity of the post-school system but focuses primarily on **university education** because of its unique features.

1.4 The 2013 *White Paper for Post School Education and Training* envisages greater collaboration between the University sub-system and the Technical and Vocational Education and Training (TVET) and Community College sub-system, especially in the provision of programmes at the NQF Level 5 interface, at NQF level 6, hence utilising more flexible forms of provision to increase access and articulation.

1.5The DHET recognises that there is now *growing convergence* of the ways in which traditionally face-to-face and traditionally distance education institutions offer their programmes, largely on account of the increasing use of ICT.Earlier higher education policy documents have proposed a simple continuum of education provision with two imaginary poles, one representing provision purely at a distance and the other purely face-to-face. Where particular provision was placed on the continuum depended on various proportions of face-to-face contact and other types of learner support, including print and other learning material, telephone conferencing,and support via ICT.

1.6Due to the increasing use of ICT, however, the continuum has been refined and isnow more usefully portrayed as a two dimensional figure which illustrates the increasing variation possible in designing learning programmes. So, for example, point A represents a distance programme that is offered using a variety of media but which does not involve use of the internet whereas point D represents a distance programme that is offered fully online for learners remote from the campus. Institutions will need to make strategic decisions about the most appropriate mode of provision and degree of ICT integration appropriate for particular learning needs and student cohorts. This may well change over time as illustrated by B. The grid also recognises that it is possible also to offer a largely online course in campus-based computer labs (point E) for both full-time and part-time students. The size of the circles might also approximate the scale of provision. Thus point C

represents a large scale programme in which economies of scale might be possible (requiring careful consideration of how large scale student support will be managed) whereas point A represents a small scale programme (in which costs per student for provision will likely be higher).

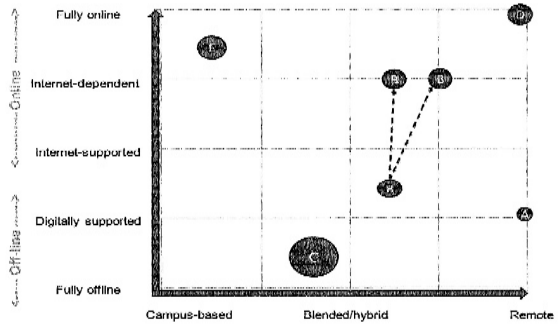

Figure 1: Provision grid

1.7The requirements in this policy refer to practices towards the right-hand side of Figure 1 in which it is assumed that students will rarely, if ever, be in the same physical location at the same time as their lecturer. This has profoundly different implications for student and staff roles and also for what facilities and resources need to be put in place and maintained.

1.8Notwithstanding the growing varieties of provision, the realities of funding in the short to medium term as well as a concern to differentiate provision in order to address quality issues, particularly for remote students,mean that the DHET will continue to distinguish between 'contact' and 'distance' provision for the foreseeable future.

1.9There is therefore need for a single definition of 'distance education' that will apply across all statutory and regulatory bodies. Taking cognizance of the finding from the South African Survey of Student Engagement[1] that, on average, contact undergraduatestudents spend 40% of their time involved in scheduled campus-based activities, for the purposes of this discussion, the term 'distance education' therefore refers to provision in which students spend 30% or less of the stated Notional Learning hoursin undergraduate courses at NQF Levels 5 and 6, and 25% or less in courses at NQF Level 7and initial post-graduate courses at NQF Level 8, in staff-led, face-to-face, campus-based structured learning activities.

[1]Strydom, J. F. &Mentz, M. 2010. *South African Survey of student Engagement – Focusing the Student Experience on Success through Student Engagement*. Pretoria: CHE.

1.10While the DHET will require provision based on open learning principles (as reflected in Section 7 of the *White Paper for Post-School Education and Training*), the focus of this policy is on distance education provision. Distance education provision is well-placed to give practical expression to open learning principles, but in and of itself is not synonymous with open provision.

2 The policy context

The need for a specific policy on distance education at this time is indicated by four contextual factors as discussed below.

2.1 Importance of distance education in the university sub-system

2.1.1 In recent years, distance education has formed a vital part of the university sub-system, contributingapproximately 40% of headcount students and approximately 30% of FTE students. It has provided extensive opportunity to those students who were unable, or wished not, to participate in campus-based and fixed time study, including provision of access for those who experience a range of barriers to learning.

2.1.2 Furthermore, distance education has played an important role in providing discrete modules which have allowed students at contact institutions to complete their studies without needing to register for a whole semester or year of additional campus-based study.

2.1.3 The further development of distance provision needs to be guided within the broad goals of policy – ongoing transformation of the universityeducation, and increasing access and success, particularly for non-traditional students.

2.2 Technological needs and opportunities

2.2.1 Recent years have seen extensive development in the availability and affordability of ICT in South Africa. There is now a massive opportunity to utilise the affordances of technology to improve the quality of distance provision, particularly with regard to increasing student engagement generally and forcommunication with and support of remote students in particular. In addition, it has become essential for universities to have prepared their graduates for meaningful participation in a digital world.

2.3 Need for further expansion

2.3.1 Given the growing demand for universityeducation and international evidence that distance education can, under certain conditions, provide high quality educational opportunity more cost-efficiently and cost-effectively than traditional face-to-face provision, it seems logical to expand distance education provision in an orderly manner in which access and quality issues are at the forefront.

2.3.2 The move into distance provision should be a strategic one with appropriate planning and resourcing and not a process of drifting into such provision due to pressures, such as the increasing use of ICTs, in ways that do not provide adequate attention to important quality issues enumerated below.

2.4 Quality matters

2.4.1Student throughput rates in distance universityprovisionhave tended to be lower than desired, at the programme level in particular, and there have been examples in the past of large enrolments in programmes of low quality that do not develop the expected graduate competences and which do not address national needs.

2.4.2 The DHET recognises the following as key quality issues in the provision of distance education: the need for investment in programme design specifically for distance provision; appropriate learning resources to support more independent learning; development of staff to enable effective teaching and learning through distance provisioning. ongoing proactive decentralised communication and support for remote and widely distributed students; and decentralised assessment strategies with a strong emphasis on formative feedback to encourage active engagement and retention.

2.4.3Therefore distance provision,whilstan important instrument for expanding access to university study, must be complemented by improved national and institutional planning and programme design and increased support systems, especially for underprepared school leavers who have no experience of learning at a distance.Institutions need to demonstrate that they have or will put in place support systems appropriate for the needs of the target audience. The quality assurance processes of the Council on Higher Education (CHE) will be essential to ensuring that these requirements are met.

2.4.4The need,assessment and quality assurance for experiential training also need to be clearly stipulated. The different curriculum models used by the professional councils, the Quality Committee for Trades and Occupations(QCTO) and the Sector Education and Training Authorities (SETAs), and the CHE will determine Work Integrated Learning (WIL) modalities for different qualification types. The implementation of these will need to be carefully articulated by providers to ensure that students are not only able to qualify, but that quality assurance systems ensure suitable learning occurs at the appropriate depth and level.

3 The contribution and purpose of distance university education

Distance education is a mode of provision based primarily on a set of teaching and learning strategies (or educational methods) that can be used to overcome spatial and/or transactional distance between educators and students. It avoids the need for students to discover the curriculum by attending classes frequently at a set venue and for long periods. Rather, it aims to create a quality learning environment using an appropriate combination of different media, tutorial support, peer group discussion, and practical sessions.

The roles of distance education in the South African university system arethus viewed as:

3.1 Providing access to students for whom – either because of work commitments, personal social circumstances, geographical distance, or poor quality or inadequate prior learning experiences, traditional, full-time contact education opportunities are either inappropriate or inaccessible. Distance education can increase the flexibility of provision in structure, duration and timing but programmes need to be designed appropriately for different purposes and target audiences.

3.2 Seeking to expand access to educational provision to significantly larger numbers of students, through shifting patterns of expenditure to achieve economies of scale by amortizing identified costs (particularly investments in course design and development andin effective administrative systems) over time and large student numbers and even across providers.

3.3 Providing low enrolment niche programmes that have a high impact and are required by small numbers of students across the country, for example in nanotechnology. The rationale for offering such programmes, and the nature of the provision, will need to be carefully scrutinized and agreed to in enrolment planning and programme accreditation procedures as part of a national PQM planning strategy. Very stringent criteria in terms of the national interest should be formulated.

3.4 Offering outstanding modules for students at contact institutions who require one or two modules to complete the necessary requirements for proceeding to their next year of study,or to complete their qualifications.

3.5 Along with all other provision, distance education should find improved ways to recognise prior learning (RPL) as a part of this opening of access and to guide students into appropriate learning pathways without the necessity of always starting a new programme from the beginning.

4 Steering mechanisms

The existing steering mechanisms of institutional planning, funding arrangements and quality assurancewill be used to steer the university education sub-system in a way that will enable distance education to fulfil its wide-ranging roles, while simultaneously stimulating transformation and innovation of distance education practice to one in which students are properly engaged and supported in the learning process.

4.1 Planning

4.1.1 The DHET will provide guidelines for, and engage with institutions on, the development of appropriate Programme and Qualifications Mixes (PQMs) as well as enrolment planning processes that address national needs on the one hand and institutions' capacity to deliver on the other. These discussions, together with historical data on student success and throughput rates, will influence decisions about the desirability and hence recognition of programmes of particular types, particular designations and in particular modes of provision. Public providers' PQMs and enrolment plans must be approved by the DHET prior to applications for programme accreditation through the relevant quality assurer. Public universities would also need to demonstrate that they align with the priority roles identified in 3 above.

4.1.2 While this policy confirms UNISA as the dedicatedpublic provider of distance education in South Africa, it supports other institutions, both public and private, inoffering distance programmes provided they motivate such programmes in terms of their mission and profile, demonstrate their carrying capacity to offer such programmes and provided the programmes meet the required quality

standards in relation to delivery, including academic development support for under-prepared students, stipulated by the quality assurer. These requirements also apply to UNISA.

4.1.3 Institutions may enter into partnerships to facilitate the provision of support for distance education students. The obligations of the partners must be clearly spelled out. The DHET will draft a policy on *Partnerships and Collaborations*. It is imperative that the institution that awards the qualification has met all the quality assurance requirements of the institution and that it thereby takes full responsibility for the quality of the learning programme leading to the qualification.

4.1.4This policy signals a firm intent to use the throughput rates of cohorts of students as a measure of the efficiency and effectiveness of distance education, as well as success rates. In future, all institutions will be required by the DHET to track and report on student performance at programme level by cohort in terms of number accepted, percentage who completed in minimum time (the key indicator for contact providers taking cognisance that this might be different for full- and part-time students);percentage who completed in two times minimum time (the key indicator for distance providers) and percentage who completed in three times minimum time (the preferred upper limit for distance education,beyond which the coherence of a 'programme' of study could be called into question). Mid-term reviewreports should include the percentage of student cohorts still in process. Institutions will continue to monitor success rates at module/course level. This data will be taken into account when institutions engage with the DHET in PQM and enrolment planning and when they submit programmes for accreditation or re-accreditation.

4.1.5Related to the above, there should be a closer correlation between graduate output from contact and distance provision. The system as a whole should seek the means to increase the proportion of students successfully completing the programmes for which they have enrolled. However, in general, distance education students are expected to proceed more slowly through their studies. Therefore a success rate of less than 60% at the level of modules/courses, and a cohort throughput rate of less than 25% within three times the minimum time for completion of a qualification[2], tracked over a three year period, will be reasoned as cause for concern and indicative of the need either for a major re-design orwithdrawal of the programme from the PQM.

4.3 Funding arrangements

4.3.1 Given the pressures on the university sector budget, the DHET is committed to exploit the potential of large-scale provision to reduce per student costs. However, this must not be at the expense of quality. The DHET is therefore committed to the funding of quality distance provision in the public sector based on empirical evidence of costs in relation to that of contact provision.

4.3.2 Given the expected increasing use of ICTs, quality assurers responsible for the accreditation processes in an institution will need to demonstrate that the institution has an understanding of the costs involved, from an infrastructure as well as from the perspective of the use of appropriate ICTs

[2]A target of 35% throughput (as distinct from a graduation rate) is suggested as achievable in distance education by studies commissioned by the CHE in 2004 and submissions for Nadeosa Excellence Awards. The target of 25% is set as a realistic next goal.

for different purposes and target audiences, so that quality can be assured and programme offerings will be sustainable.

4.3.3 Specific funding arrangements for distance provision, including the possible utilisation of teaching development grants, will be articulated in any revised funding framework, emanating from the*Ministerial Review for University Funding*for education provision more generally.

4.4 Quality assurance

4.4.1 The DHET will liaise with therelevant quality councils as well as professionalcouncils to strengthen the quality of distance programmes.

4.4.2 This policy requires the Higher Education Quality Committee (HEQC) of the CHE and the QCTO to ensure they become fully equipped to evaluate new distance programmes.This is particularly important given the priority applications of distance education. This policy reaffirms the current HEQC requirement that programmes moving to a new mode of delivery need to be re accredited. In particular, it is believed that a move from contact-based forms of provision requiring regular participation in scheduled on-campus activities (typically involving 30% or more of notional learning time) to 'distance' forms of provision (as defined in Section 1) constitutes a new programme offering subject to re-accreditation.

4.4.3 This policy statement also reaffirms the minimum requirements for quality distance education provision as required by the National Association for Distance Education and Open Learning in South Africa(NADEOSA), with emphasis on those areas identified in Section 2.4. Itsupports the current CHE process of reviewing the existing criteria and processes to align with the latest international trends in distance provision and in particular the increased use of ICTs.In particular, in order for programmes that are internet and technology dependent to be approved and accredited, the pedagogic assumptions underpinning the use of the technology and how the uneven readiness of staff and students will be addressed must be explained.

4.4.4 In order to turn access into a reasonable chance of success, continued research into the factors affecting drop out, stop out and failure rates needs to take place and be acted upon. Evidence of such investment in student tracking and reflexive practice must support applications for programme accreditation.It is required that institutions establish systems that make provision for student tracking, the identification and support of at-risk students and the monitoring of throughput cohort analyses differentiated by level, type and CESM category. This includes institutions reviewing large enrolment modules and tracking separately students registered for both whole programme and single module purposes. This could also be an important area of focus for the CHE.

4.4.5 It is required that institutions develop a sustained programme to ensure that students have appropriate expectations and are aware of their rights regarding distance education provision.Therefore, in submitting programmes for accreditation, institutions will be required to make a compelling case that the form of provision is fit for purpose, will be appropriately resourced, addresses developmental priorities, does not needlessly duplicate and is both affordable and sustainable.

4.4.6 Institutions have an obligation to ensure provision of an appropriate learning environment for those students who have been accepted into university education programmes and must provide evidence they have implemented measures to ensure all students a reasonable chance to complete their studies successfully.

5 Creating an enabling environment for expanded distance education

In line with the vision expressed in the *White Paper for Post-School Education and Training*, a strategic priority is to break down functional silos thereby enabling individuals to traverse from learning to work and from work to learning throughout their lives. Another key priority is to expand and diversify education and training provision in the post-schoolsystem. An important component of such an expansion and diversification would involve access to alternative programmes that are offered through more flexible forms of delivery, including distance education and technology-supported learning. The formation of the DHET in 2009 facilitates a structured interface between University Education, the Technical and Vocational Education and Training (TVET) Colleges, the Sector Education and Training Authorities (SETAs), Community Colleges and other education and training institutions, including private providers, so that they may interact with one another in producing the knowledge and skills on which our society depends. Thus any investment in establishing an enabling environment for the implementation of distance education programmes in university education will be maximised bytheir use in strengthening other post-school provision as well.

Creating an enabling environment puts the emphasis on national infrastructure, approaches and system requirements that will support the expansion of quality distance education across the board – in university education, in national post-schoolinterventionsand foundational programmes and also for possible non-formal uses. In this respect, the following issues are of strategic importance.

- Collaborative development of shared high quality learning programmes and resources and use of OER
- Improved access to and use of appropriate technology
- Supporting a wider range of post-school study options
- Technological infrastructure for post schoolprovision
- Shared learning and support centres.

5.1 Improved access to and use of appropriate technology

5.1.1 In a developing context like South Africa, where internet penetration is still only significant in urban areas, the use of technologies appropriate for learning purpose, target audience and context becomes imperative. Universities should be careful to link the use of supporting ICT,if relevant, to improving quality and the realities of students' contexts of learning, taking particular cognisance of the readiness of and access for remote students.

5.1.2 The DHET is committed to ensuring equitable access to appropriate technology and this policy affirms the stipulations and processes outlined in section 7.4 of the *White Paper for Post-School Education and Training*(2013).

5.2 Collaborative development of high quality learning programmes and resources and use of OER

5.2.1 High quality learning resources are integral to high quality distance education and a growing reliance on resource-based learning among universities generally is noted.

5.2.2To avoid unnecessary duplication and to encourage increased quality by opening learning resources to public scrutiny, the DHET will pursue the adoption or adaptation, in accordance with national needs, of an appropriate Open Licensing Framework, such as the Creative Commons, for use by all university stakeholders, within an overarching policy framework on intellectual property rights and copyright in university education. In particular, in line with the Unesco Paris Declaration on OER of 2012, learning resources developed partly or wholly using public funds administered by the DHET will be published under an open licence that encourages their use and adaptation for re-use. The DHET will advocate similar practices in other Government Departments.

5.2.3 Teaching Development Grants will be utilised to encourage collaborative development and use of OERs.

5.3 Supporting a wider range of post school study options

5.3.1 There is need for greater collaboration between government ministries, universities and other role-players in the post school system to pro-actively identify and address current and future needs and to encourage appropriate collaborative curriculum and learning resource development in areas which have a large and sustained need for newly qualified participants. All programmes will need to incorporate foundational competence in appropriate literacy, numeracy and ICT skills that offer students a reasonable chance of success.

5.3.2 In particular, there is a need for collaborative development of a national set of vocational and generally formative programmes targeted at South Africa's burgeoning unemployed/not-in-education and training youth, designed to enable them to become financially productive and socially invested members of society. This initiative would be most appropriately located at the TVET/Community College/HET interface and indicates the need for collaboration across these sectors.

5.3.3 National task teams will be established to identify and develop programmes and resources collaboratively that will address specific national development needs, and make available the resources under an appropriate open licence. These task teams will involve university and further public education institutions, other government initiatives such as the e-skills institute and willing representatives of civil society,

5.4 Shared learning and support centres

5.4.1 The government remains committed to the development of Multi-Purpose Community Centres (MPCC) and in the past eight years have established some 35 such centres that can and should be used also as sites of learning support for university education students. In addition, existing schools, colleges and university campuses, as well as the decentralised support centres established by

institutions such as UNISA and North West University, are and should continue to be used as centres for the support of universitydistance students and others as appropriate.

5.4.2 A comprehensive network of such centres has the potential to be a shared resource for the post-school/university education sector and cooperation between institutions in establishing, staffing, equipping and running such centres is encouraged.

5.4.3 With increasing access to wireless connectivity and mobile technology, it islikely that in the medium to long term the emphasis of student support will shift from centreand contact-based approaches to on-line web-based approaches. The relative balance of investment in new centres and the upgrading of existing centres and investment in ensuring access of all university education students to mobile. connected technology needs to be carefully planned at a systemic level. This includes the development of technological infrastructure for the post school system.Building an enabling ICT infrastructure (for example extending the South African National Research Network - SANReN -to ensure that all universities, TVET colleges and community colleges are connected and then extending initiatives like education roaming (Eduroam) so that registered students can access the internet for learning purposes wherever they happen to be) will require significant initial investment. However, its maintenance costs could well be covered in part by savings from the current expensive and cumbersome distribution and communication systems.

6 Cross-border distance university education

6.1 The need for regulation

6.1.1 The DHET has taken the view that university education is a public good whose provision in South Africa by foreign institutions or companies must be regulated in accordance with South African law to ensure that acceptable standards are maintained, students are protected and the democratic transformation of South African university education is sustained. Inter-governmental agreements designed to curb fraudulent or inferior distance university education at source are the best available safeguard since they commit signatory states to ensure that providers of cross-border education meet acceptable criteria and are subjected to suitable quality assurance supervision in their home countries.

6.2 Code of conduct for South African providers

6.2.1 South African providers offering cross-border services must uphold standards at least as rigorous as they are required to observe at home. This includes making adequate provision for practicals and work integrated learning where appropriate. This does not preclude the value of sharing South African developed OERs with other countries – especially where these are released under an open licence that permits adaptation.

6.2.2The DHETis in a processof developing an agreed framework of principles and guidelines for action by all bodies and institutions in South Africa concerned with offering and receiving cross-border university education, and offering joint degrees within a range of diverse partnership models.

7 Conclusion

7.1 Distance education is an appealing and flexible option particularly for mature and mid-career students, and not least for students with disabilities which make access to contact education difficult or impossible.

7.2 As the pressure on full-time undergraduate places increases, many first-time students also choose distance education because admission requirements are not always so strict, tuition fees are usually lowerand they can avoid the costs of travel and living away from home. However, if access for these students is to result in a reasonable chance of success, there must be adequate investment in appropriate levels and kinds of student support. The DHET will expect accreditation bodies to pay particular attention to the provision of adequate student support in programmes targeted at new school leavers.

7.3 The development of this policy has benefited from the combined expertise and advice of the university education community. As the policy is implemented the DHET looks forward to continuing this challenging and productive collaboration.

List of acronyms

CHE	Council on Higher Education
DHET	Department of Higher Education and Training
FTE	Full-Time Equivalent
HE(T)	Higher Education (and Training)
HEI	Higher Education Institution
HEMIS	Higher Education Management Information System
HEQC	Higher Education Quality Committee
ICT	Information and Communication Technology
DHET	Ministry of Higher Education and Training
NADEOSA	National Association for Distance Education and Open Learning in South Africa
NQF	National Qualifications Framework
ODL	Open (and) Distance Learning
OER	Open Educational Resource/s
PQM	Programme and Qualification Mix
QCTO	Quality Committee for Trades and Occupations
RPL	Recognition of Prior Learning
SAQA	South African Qualifications Authority
SETAs	Sector Education and Training Authorities
TVET	Technical and Vocational Education and Training
UNISA	University of South Africa
WIL	Work Integrated Learning

Glossary

Blended learning refers to the provision of structured learning opportunities using a combination of contact, distance, and/or ICT supported opportunities to suit different purposes, audiences, and contexts.

Distance education is a mode of provision based primarily on a set of teaching and learning strategies (or educational methods) that can be used to overcome spatial and/or transactional distance between educators and students. It avoids the need for students to discover the curriculum by attending classes frequently and for long periods. Rather, it aims to create a quality learning environment using an appropriate combination of different media, tutorial support, peer group discussion, and practical sessions.

Institutions opting for distance education as a mode of delivery need to establish systems and processes for *decentralised* distribution of learning resources, communications, learner and learning support, as well as formative and summative assessment.

The term 'distance education' as a mode of provision therefore refers to provision in which students spend 30% or less of the stated National Learning hours in undergraduate courses at NQF Levels 5 and 6, and 25% or less in courses at NQF Level 7 and initial post-graduate courses at NQF Level 8, in staff-led, face-to-face, campus-based structured learning activities.

Mode of provision refers to the dominant mix of methods by which institutions mediate their curricula. In a *single mode* institution, all courses and programmes are mediated either by distance or contact-based methodologies; in a *dual mode* institution courses and programmes may be mediated by either distance- or contact-based methods and often equivalent forms of the same course or programme may be offered in either mode; in a *mixed mode* institution, all courses and programmes involve a mix of methods associated traditionally with distance- and contact-based provision with the blend of methods varying from context to context. However, individual programmes will be accredited either as content or distance provision.

Open (and) distance learning (ODL) refers to the use of distance education methods to support the realisation of open learning purposes and principles. Omission of the "and" as in Open Distance Learning implies that ALL distance programmes offered are based on open learning principles.

Open learningtypically involves making provision to support a wider range of student choices regarding access, curriculum, pacing, sequencing, learning modes and methods, assessment and articulation. Students studying through ODL approaches typically take longer to complete their studies as they need to balance study and other commitments. Guiding students towards making informed choices based on workload, and the assumption that completion of a course or programme of study will typically take twice as long to complete is an important feature of responsible ODL practice; as is trying to assist students not to take longer than three times minimum time to complete for the sake of coherence and the complications arising from curriculum renewal processes.

Open Content is content that is licensed in a manner that provides users with the right to use the content in more ways than those normally permitted under the law and at no cost to the user. This is of particular importance at the post-graduate level where the "learning" materials are mostly primary sources and journal articles. This term, which is more encompassing than OER (see below), allows for other resources such as open data and open access journals to be considered as Open Content to which students and lecturers ideally will have access.

Open Educational Resources (OER) are educational resources (including curriculum maps, course materials, textbooks, streaming videos, multimedia applications, podcasts, and any other materials that have been designed for use in teaching and learning) that are freely available for use by educators and students without an accompanying need to pay royalties or licence fees. OER is not synonymous with online learning or technology-supported learning. Openly licensed content can be produced in any medium: text, video, audio, or computer-based multimedia.

Provider means a registered institution which offers learning programmes that culminate in specified National Qualifications Framework (NQF) standards and/or qualifications and manages the assessment thereof.

Post-school, in the South African context, refers to provision of educational opportunities to all people who have left school as well as for those who have never been to school. It includes education and training for out-of-school youth and includes institutions offering second chance learning, TVET Colleges, Community Colleges and education and training offered by the SETAs, Universities of Technology and Universities, private providers as well as other training colleges and institutes.

Qualification means a planned combination of learning outcomes which has a defined purpose or purposes, and which is intended to provide qualifying students with specified applied competence and a basis for further learning; it also means the formal recognition of the achievement of the required number and type of credits and such other requirements as may be determined by the South African Qualifications Authority (SAQA).

Quality,according tothe Higher Education Quality Committee (HEQC), refers to the interrelated demonstration of fitness of and for purpose, value for money and contribution to social transformation in line with the intent and values of the Constitution of the Republic of South Africa.

Quality management entails a number of elements of institutional planning and action to address issues of quality. These include institutional arrangements for quality assurance, support, development and monitoring.

Recognition of prior learning (RPL) involves formal identification, assessment and acknowledgement of the full range of a person's knowledge, skills and capabilities acquired through formal, informal or non-formal training, on-the-job or life experience.

Standard means registered statements of desired education and training outcomes and their associated assessment criteria.

Technology-supported learning refers to structured learning opportunities mediated through software applications using digital resources (usually combinations of text, audio and visual/video files) and communication, and accessed through a range of fixed or mobile hardware devices. Such learning provision may be on-line and synchronous (e.g. real-time conferencing), on-line and asynchronous (e.g. text based discussion forum) or off-line (e.g. interactive or resource based CD/DVD/flash drive). ICT can support learning in contact, blended and distance programmes.

Work-based education/work-integrated learning (WBE/WIL) is a component of a learning programme that focuses on the application of theory in an authentic, work-based context. It addresses specific competences identified for the acquisition of a qualification which relate to the development of skills that will make the learner employable and will assist in developing his/her personal skills. Employer and professional bodies are involved in the assessment of experiential learning, together with academic staff. Distance methods may usefully be used in providing a structured WBE/WIL experience within a larger learning programme; the provision of WBE/WIL, and the need for placement, mentoring, support, supervision and assessment present particular challenges for large scale distributed distance education provision and require special attention in the planning, resourcing and monitoring of programmes offered in distance mode.

APPENDIX J: Pilot Study Responses

PILOT STUDY RESPONSE

PN	Technology literacy and aptitude							Internal DUT Support						Policies and procedures				Ease of use						Software User Friendliness					Functionality						Time				Training and Development			
	B14	B15	B16	B17	B18	B19	B20	C21	C22	C23	C24	C25	C26	D27	D28	D29	D30	E31	E32	E33	E34	E35	E36	F37	F38	F39	F40	F41	G42	G43	G44	G45	G46	G47	H48	H49	H50	H51	I52	I53	I54	I55
1	1	2	2	1	1	1	3	2	2	2	2	2	2	3	2	2	1	1	1	1	1	1	1	2	3	2	1	4	2	2	1	1	1	2	2	3	2	3	1	1	1	1
2	1	1	1	1	2	2	4	2	2	2	2	1	1	2	2	1	1	1	1	1	1	2	2	2	2	2	2	4	2	1	1	1	1	1	4	4	1	4	1	3	2	2
3	1	1	1	1	1	1	5	2	2	2	5	2	4	2	2	2	2	1	1	1	1	1	1	1	2	1	4	5	4	1	1	1	1	1	1	1	5	2	2	4	2	2
4	1	1	3	3	2	2	4	2	2	2	2	2	1	2	2	2	2	1	2	2	2	2	2	2	2	2	2	4	2	2	2	2	2	2	4	3	2	4	2	4	3	2
5	1	2	3	2	3	3	2	1	3	3	4	3	2	2	4	3	3	1	1	2	3	2	2	4	3	4	3	3	4	4	2	3	2	2	5	5	2	4	3	4	4	4
6	1	2	x	1	3	1	2	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	5	2	1	1	1	1	1	5	5	1	3	1	1	1	2
7	5	5	5	5	5	3	3	3	3	x	3	4	3	3	3	4	3	4	2	2	3	5	2	2	3	2	2	4	2	3	3	2	2	2	2	2	5	2	4	2	3	3
8	2	2	3	2	2	2	4	4	2	2	2	2	2	2	3	3	4	2	2	2	3	2	4	2	2	3	3	3	4	3	2	3	2	3	2	2	3	2	4	4	2	4
9	1	1	2	1	4	2	3	2	2	2	2	2	2	2	2	2	2	1	3	2	3	1	2	2	2	3	3	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2
10	1	1	1	1	1	2	2	2	2	3	2	2	2	3	1	1	1	1	1	2	2	2	2	2	2	2	3	4	2	1	1	1	3	3	3	3	3	4	3	2	3	2
11	1	1	1	1	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
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13	1	1	1	1	1	1	5	1	2	2	1	2	1	2	2	2	1	1	2	3	2	2	2	2	2	2	2	5	2	2	2	1	2	2	4	4	2	5	4	4	2	2
14	1	4	3	1	1	4	2	4	4	3	3	4	3	3	2	4	4	2	4	4	4	4	2	4	3	3	2	4	3	2	3	2	2	2	5	5	1	4	1	3	3	2
15	1	1	2	1	1	2	4	4	4	4	3	3	3	4	4	4	4	2	2	3	4	1	3	2	4	4	3	4	4	3	4	2	2	4	5	4	2	4	5	x	4	4
16	1	1	1	1	3	1	4	1	1	1	1	2	2	1	2	1	2	1	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	2	2	2	2	2	1	1	1	2
17	1	2	2	1	1	1	4	1	2	1	1	2	1	3	3	2	2	1	1	1	2	3	3	1	2	2	1	5	1	1	1	1	1	1	4	2	2	3	1	4	2	2

PN = Participant number
B14 till I55 = Question numbers as per the questionnaire Likert scale X = No response received for this question

APPENDIX K: Pilot study data analysis report

Reliability Statistics

The two most important aspects of precision are **reliability** and **validity**. Reliability is computed by taking several measurements on the same subjects. A reliability coefficient of 0.60 or higher is considered as "acceptable" for a newly developed construct.

The table below reflects the Cronbach's alpha score for all the items that constituted the questionnaire.

RELIABILITY
/VARIABLES=B14 B15 B16 B17 B18 B19 B20
/SCALE('ALL VARIABLES') ALL
/MODEL=ALPHA.

Reliability Statistics

Cronbach's Alpha	N of Items
.748	7

RELIABILITY
/VARIABLES=C21 C22 C23 C24 C25 C26
/SCALE('ALL VARIABLES') ALL
/MODEL=ALPHA.

Reliability Statistics

Cronbach's Alpha	N of Items
.940	6

RELIABILITY
/VARIABLES=D27 D28 D29 D30
/SCALE('ALL VARIABLES') ALL
/MODEL=ALPHA.

Reliability Statistics

Cronbach's Alpha	N of Items
.922	4

RELIABILITY
/VARIABLES=E31 E32 E33 E34 E35 E36
/SCALE('ALL VARIABLES') ALL
/MODEL=ALPHA.

Reliability Statistics

Cronbach's Alpha	N of Items
.922	6

RELIABILITY
/VARIABLES=F37 F38 F39 F40 F41
/SCALE('ALL VARIABLES') ALL
/MODEL=ALPHA.

Reliability Statistics

Cronbach's Alpha	N of Items
.717	5

RELIABILITY
/VARIABLES=G42 G43 G44 G45 G46 G47
/SCALE('ALL VARIABLES') ALL
/MODEL=ALPHA.

Reliability Statistics

Cronbach's Alpha	N of Items
.954	6

RELIABILITY
/VARIABLES=H48 H49 H50 H51
/SCALE('ALL VARIABLES') ALL
/MODEL=ALPHA.

Reliability Statistics

Cronbach's Alpha	N of Items
.512	4

RELIABILITY
/VARIABLES=I52 I53 I54 I55
/SCALE('ALL VARIABLES') ALL
/MODEL=ALPHA.

Reliability Statistics

Cronbach's Alpha	N of Items
.860	4

The reliability scores for all sections exceed the recommended Cronbach's alpha value. This indicates a degree of acceptable, consistent scoring for these sections of the research.

Factor Analysis: KMO and Bartlett's Test

Factor Analysis

KMO and Bartlett's Test : All of the conditions are satisfied for factor analysis. That is, the Kaiser-Meyer-Olkin Measure of Sampling Adequacy value should be greater than 0.500 and the Bartlett's Test of Sphericity sig. value should be less than 0.05.

```
FACTOR
  /VARIABLES B14 B15 B16 B17 B18 B19 B20
  /MISSING LISTWISE
  /ANALYSIS B14 B15 B16 B17 B18 B19 B20
  /PRINT INITIAL KMO EXTRACTION ROTATION
  /CRITERIA MINEIGEN(1) ITERATE(25)
  /EXTRACTION PC
  /CRITERIA ITERATE(25)
  /ROTATION VARIMAX
  /METHOD=CORRELATION.
```

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.638
Bartlett's Test of Sphericity	Approx. Chi-Square	68.837
	df	21
	Sig.	.000

Rotated Component Matrix[a]

	Component		
	1	2	3
B14	.937	.188	.003
B15	.748	.134	.488
B16	.848	.136	.407
B17	.934	.186	.009
B18	.370	.824	-.245
B19	.054	.874	.365
B20	-.155	-.049	-.914

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 6 iterations.

```
FACTOR
  /VARIABLES C21 C22 C23 C24 C25 C26
  /MISSING LISTWISE
  /ANALYSIS C21 C22 C23 C24 C25 C26
  /PRINT INITIAL KMO EXTRACTION ROTATION
  /CRITERIA MINEIGEN(1) ITERATE(25)
  /EXTRACTION PC
  /CRITERIA ITERATE(25)
  /ROTATION VARIMAX
  /METHOD=CORRELATION.
```

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.788
Bartlett's Test of Sphericity	Approx. Chi-Square	81.108
	df	15
	Sig.	.000

Component Matrix[a]

	Component
	1
C21	.839
C22	.940
C23	.919
C24	.831
C25	.904
C26	.861

Extraction Method: Principal Component Analysis.
a. 1 components extracted.

```
FACTOR
  /VARIABLES D27 D28 D29 D30
  /MISSING LISTWISE
  /ANALYSIS D27 D28 D29 D30
  /PRINT INITIAL KMO EXTRACTION ROTATION
  /CRITERIA MINEIGEN(1) ITERATE(25)
  /EXTRACTION PC
  /CRITERIA ITERATE(25)
  /ROTATION VARIMAX
  /METHOD=CORRELATION.
```

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.748
Bartlett's Test of Sphericity	Approx. Chi-Square	51.353
	df	6
	Sig.	.000

Component Matrix[a]

	Component
	1
D27	.822
D28	.901
D29	.959
D30	.919

Extraction Method: Principal Component Analysis.
a. 1 components extracted.

```
FACTOR
  /VARIABLES E31 E32 E33 E34 E35 E36
  /MISSING LISTWISE
  /ANALYSIS E31 E32 E33 E34 E35 E36
  /PRINT INITIAL KMO EXTRACTION ROTATION
  /CRITERIA MINEIGEN(1) ITERATE(25)
  /EXTRACTION PC
  /CRITERIA ITERATE(25)
  /ROTATION VARIMAX
  /METHOD=CORRELATION.
```

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.834
Bartlett's Test of Sphericity	Approx. Chi-Square	67.457
	df	15
	Sig.	.000

Component Matrix[a]

	Component
	1
E31	.887
E32	.891
E33	.879
E34	.857
E35	.788
E36	.798

Extraction Method: Principal Component Analysis.
a. 1 components extracted.

```
FACTOR
  /VARIABLES F37 F38 F39 F40 F41
  /MISSING LISTWISE
  /ANALYSIS F37 F38 F39 F40 F41
  /PRINT INITIAL KMO EXTRACTION ROTATION
  /CRITERIA MINEIGEN(1) ITERATE(25)
  /EXTRACTION PC
  /CRITERIA ITERATE(25)
  /ROTATION VARIMAX
  /METHOD=CORRELATION.
```

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.704
Bartlett's Test of Sphericity	Approx. Chi-Square	42.698
	df	10
	Sig.	.000

Rotated Component Matrix[a]

	Component	
	1	2
F37	.886	-.084
F38	.918	.161
F39	.920	-.251
F40	.738	-.169
F41	-.087	.988

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 3 iterations.

```
FACTOR
  /VARIABLES G42 G43 G44 G45 G46 G47
  /MISSING LISTWISE
  /ANALYSIS G42 G43 G44 G45 G46 G47
  /PRINT INITIAL KMO EXTRACTION ROTATION
  /CRITERIA MINEIGEN(1) ITERATE(25)
  /EXTRACTION PC
  /CRITERIA ITERATE(25)
  /ROTATION VARIMAX
  /METHOD=CORRELATION.
```

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.774
Bartlett's Test of Sphericity	Approx. Chi-Square	96.929
	df	15
	Sig.	.000

Component Matrix[a]

	Component
	1
G42	.812
G43	.924
G44	.916
G45	.951
G46	.895
G47	.909

Extraction Method: Principal Component Analysis.
a. 1 components extracted.

```
FACTOR
  /VARIABLES H48 H49 H50 H51
  /MISSING LISTWISE
  /ANALYSIS H48 H49 H50 H51
  /PRINT INITIAL KMO EXTRACTION ROTATION
  /CRITERIA MINEIGEN(1) ITERATE(25)
  /EXTRACTION PC
  /CRITERIA ITERATE(25)
  /ROTATION VARIMAX
  /METHOD=CORRELATION.
```

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.751
Bartlett's Test of Sphericity	Approx. Chi-Square	39.418
	df	6
	Sig.	.000

Component Matrix[a]

	Component
	1
H48	.952
H49	.944
H50	-.537
H51	.867

Extraction Method: Principal Component Analysis.
a. 1 components extracted.

```
FACTOR
  /VARIABLES I52 I53 I54 I55
  /MISSING LISTWISE
  /ANALYSIS I52 I53 I54 I55
  /PRINT INITIAL KMO EXTRACTION ROTATION
  /CRITERIA MINEIGEN(1) ITERATE(25)
  /EXTRACTION PC
  /CRITERIA ITERATE(25)
  /ROTATION VARIMAX
  /METHOD=CORRELATION.
```

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.801
Bartlett's Test of Sphericity	Approx. Chi-Square	26.794
	df	6
	Sig.	.000

Component Matrix[a]

	Component
	1
I52	.809
I53	.796
I54	.885
I55	.903

Extraction Method: Principal Component Analysis.
a. 1 components extracted.

It is noted that the variables that constituted all but 2 sections, loaded perfectly along a single component. This means that the statements that constituted these sections perfectly measured what it set out to measure.

Sections F (Software user-friendliness) and B (Technology literacy and aptitude) split into multiple components. This means that the respondents identified sub-themes.

APPENDIX L: Letter to research office of the pilot study

Monday, 28 March 2017

Dear Members of IREC

Report on the pilot study (ethics clearance number IREC 088/16)

I, Sharitha Dhebideen (student number 19351340), am currently registered for the Master of Information and Communications Technology (MICT) offering. Ethical clearance was received on 24 August 2016 as per the 1st letter attached. Clearance was given subject to piloting the data collection instrument and obtaining the gatekeeper's permission in order to continue with the main study. The gatekeeper's permission letter is as per the 2nd letter attached.

A pilot study was conducted to test the validity and reliability of the questionnaire. This study was conducted between the 13th and 24th of March 2017. The following procedure was followed:

1. The total population was identified
2. A sample size of 40 percent of the population was adopted with 10 percent of the sample to be used in the pilot study
3. The population was listed in a Microsoft Excel spreadsheet, as obtained from the DUT MIS department.
4. The Microsoft Excel RANDBETWEEN function was used to randomly select the participants for the pilot study group.

The data from the responses was captured using Microsoft Excel and handed to a statistician for analysis. The analysis report from the statistician, received on 28th of March 2017, confirmed that the instrument is valid and reliable and that the variables perfectly measured what it set out to measure. Cronbach's alpha and factor analysis were used to test the validity and reliability of the questionnaire. No questions in the Likert scale type items needed to be changed.

Changes made to the questionnaire after conducting the pilot:

- 3 delivery methods were used to test the reliability of the delivery of the instrument. Using an on-line delivery method did not allow the participant the option to sign and return the consent form. The following phrase was added to the questionnaire to cater for this shortfall: "By completing this survey you hereby give consent to participate in this study (ethics clearance number IREC 088/16).
- The values for the Likert scale did not appear on question 23. This was corrected.
- Typographical errors were corrected.
- Some participants indicated that the ranges used in some questions were too broad. The ranges were adjusted accordingly
- The values for the Likert scale (strongly agree, agree, neutral, disagree, strongly disagree) was added at the beginning of each theme/section.

All the changes listed above were made as per the 3rd document attached. Please contact myself or my supervisor, Dr. D. Heukelman, for further information or enquiries.

Thank you

Sharitha Dhebideen
Student number: 19351340
sharithad@dut.ac.za

Supervisor: Dr. D. Heukelman
deleneh@dut.ac.za

-

APPENDIX M: Letter from research office for FULL APPROVAL to conduct the research

Institutional Research Ethics Committee
Research and Postgraduate Support Directorate
2nd Floor, Berwyn Court
Gate 1, Steve Biko Campus
Durban University of Technology

P O Box 1334, Durban, South Africa, 4001

Tel: 031 373 2375
Email: lavishad@dut.ac.za
http://www.dut.ac.za/research/institutional_research_ethics

www.dut.ac.za

6 April 2017

IREC Reference Number: **REC 80/16**

Mrs S Dhebideen
35 Dahlia Road
Umkomaas
4170

Dear Mrs Dhebideen

Creating a framework for promoting perceptions of ease of use for eLearning

The Institutional Research Ethics Committee acknowledges receipt of your final data collection tool for review.

We are pleased to inform you that the questionnaire has been approved. Kindly ensure that participants used for the pilot study are not part of the main study.

In addition, the IREC acknowledges receipt of your gatekeeper permission letter.

Please note that FULL APPROVAL is granted to your research proposal. You may proceed with data collection.

Yours Sincerely,

Professor J K Adam
Chairperson: IREC

DUT DURBAN UNIVERSITY OF TECHNOLOGY
2017 -04- 06
INSITUTUTIONAL RESEARCH ETHICS COMMITTEE
P O BOX 1334 DURBAN 4000 SOUTH AFRICA

-

APPENDIX N: Responses from the main study

RESPONDANT NUMBER	Demographics and research questions													Technology literacy and aptitude										Internal DUT Support						Policies and procedures				Ease of use						Software User Friendliness						Functionality						Time				Training and Development				
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	B14	B15	B16	B17	B18	B19	B20	C21	C22	C23	C24	C25	C26	D27	D28	D29	D30	E31	E32	E33	E34	E35	E36	F37	F38	F39	F40	F41	G42	G43	G44	G45	G46	G47	H48	H49	H50	H51	I52	I53	I54	I55
1	4	2	5	4	1	1	1	2	2			1	1	1	1	3	1	2	2	3	2	3	3	3	3	2	3	3	2	2	2	2	2	3	2	3	3	2	2	4	3	3	2	2	2	2	3	3	2	2	2	4	4	3
2	4	2	5	4	3	1	3	2	2				1	3	3	3	3	4	4	2	4	2	2	2	2	2	3	2	2	2	3	3	3	4	3	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	4	4	3	3
3	3	2	5	1	3	1	3			2		1	1	2	2		2	3	3	3	3	3	2	2	2	2	3	2	2		2	2	2	3		3	2	2	2	2	2	2	2	4	4	3	3					4	4	4	4
4	3	2	2	3	3	1	1	2	2			3	1	2	2	2	2	2	2	4	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	4	2	2	2	2	2	2	3	3	3	3	4	4	3	2
5	1	1	5	2	1	1	1	3	1	2		2	1	1	1	2	1	2	1	5	3	2	3	3	3	3	2	2	2	1	1	1	1	2	3	2	2	1	1	2	2	2	2	2	1	1	2	2	2	2	2	1	3	2
6	4	1	5	4	1	1	1	3	2			2	1	3	1	3	1	4	4	1	4	3	3	3	2	3	3	3	2	2	2	2	3	4	2	3	4	4	4	3	3	3	2	2	4	4	2	4	4	1	2	4	4	4	4
7	6	1	5	4	1	1	1	3	2			1	2	2	2	4	2	4				3					3	3	3	3	4	4	3	3																			4	4	4	4
8	5	2	5	2	1	2	1	3	2			1	1	1	1	1	1	3	3	2	2	2	2	2	2	2	3	3	3	3	4	4	4	4	4	4	4	4	4	4	2	4	4	4	4	4	4	4	4	2	3	2	2	3	4
9	1	2	3	1	1	1	3	1	2				1	5	5	5	5	5	3	2	2	4	4	2	5	5	3	3	3	3	4	4	4	4	4	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	3	3	4
10	6		5	2	3	1	1	2	2			3	1	2	2	4	2	2	4	1	4	2	2	2	2	2	2	2	2	2	1	5	2	5	5	5	5	4	2	5	5	5	5	4	4	4	4	5	5	5	5	2	2	3	3
11	6	2	5	5	4	1	3	2	2			3	1	1	1	2	2	2	2	3	3	3	4	3	4	4	4	4	3	2	4	4	3	2	3	3	3	3	3	3	3	2	2	2	2	3	5	4	1	5	2	5	3	2
12	1	2	5	1	3	1	1	2	2			2	1	1	2	3	1	1	1	5	1	3	4	3	4	2	2	1	1	1	1	1	1	1	1	1	2	2	2	5	2	2	1	1	1	1	2	2	3	1	5	5	3	2
13	4	1	2	3	3	1	3	2	2			3	1	1	1	2	1	1	4	3	2	2	2	3	2	3	2	2	2	2	1	2	5	3	2	5	4	5	3	4	2	4	2	4	2	2	4	4	4	1	5	4	4	3	2
14	1	2	2	1	1	1	1	2	2			3	1	2	2	2	2	2	2	3	2	3	2	2	2	2	3	2	2	2	2	2	3	2	2	2	2	3	2	2	2	2	2	2	2	2	2	3	4	2	3	2	2	3	2
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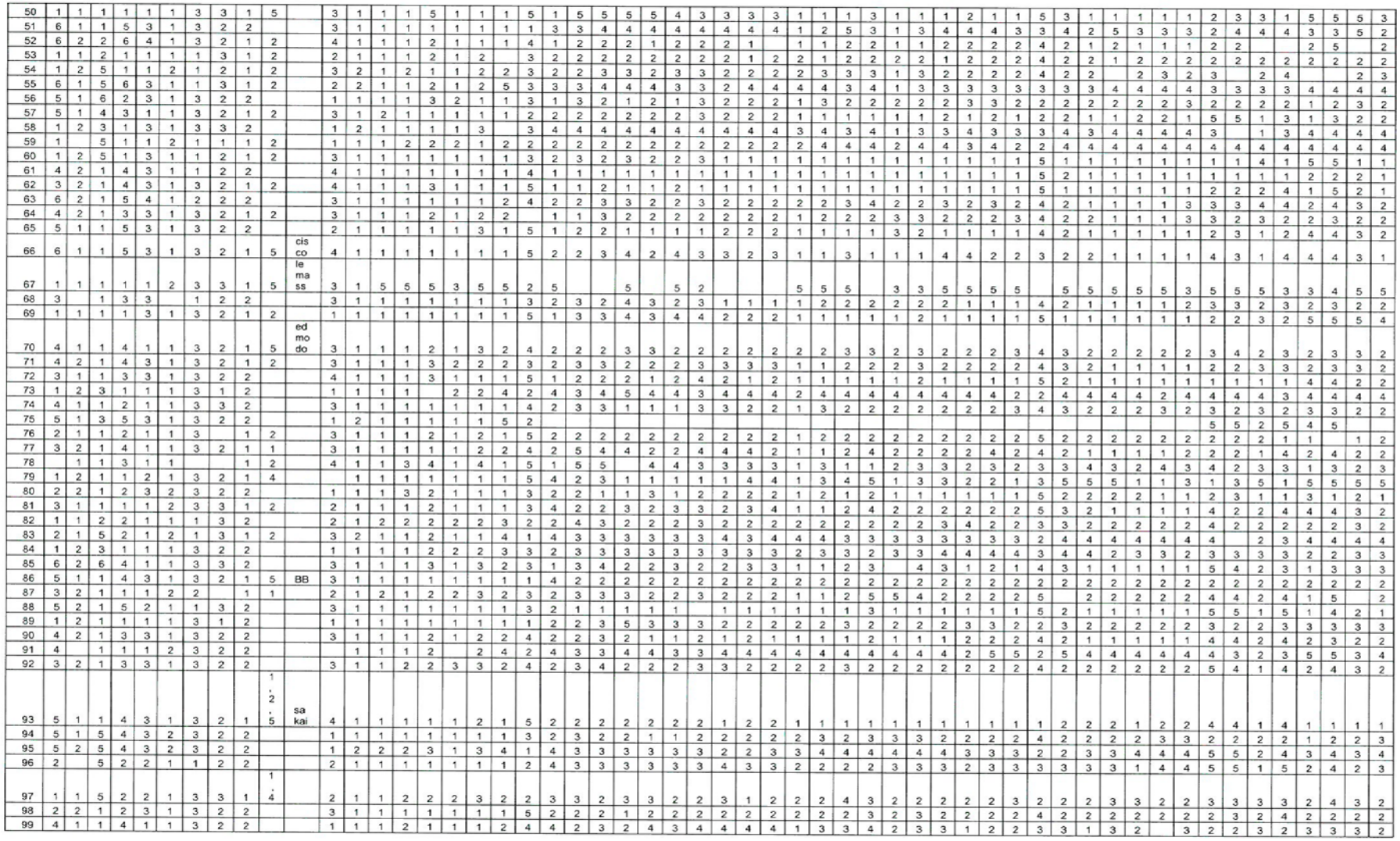

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138	4	1	2	2	3	2	3	2	2			3	1	1	1	1	1	1	1	5	1	1	3	2	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	5	1	1	1	1	1	1	4	3	2	5	1	2	3	1
139	4	1	2	3	3	1	3	2	2			3	1	1	1	1	1	1	1	4	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	5	1	1	1	1	1	1	1	1	4	1	1	1	1	3
140	4	1	4	2	1	2	3	3	2			1	1	1	1	3	2	2	4	3	3	3	3	3	3	3	3	2	2	2	2	4	3	3	2	3	3	3	4	3	3	3	2	4	2	3	3	4	3	3	3	2	3	3	4
141	6	1	2	6	3	1	3	3	1	2		3	1	1	1	2	2	1	1	2	2	2	3	3	1	2	2	2	2	2	2	2	2	3	2	3	3	2	2	3	3	2	2	2	2	2	2	2	3	3	2	3	2	2	2
142	6	1	2	6		1	3	3	1	1.2		4	1	2	3	2	2	2	2	3	3	4	4	4	3	4	3	3	3	3	1	2	3	3	2	3	2	3	3	3	3	4	2	2	2	2	2	5	4	1	3	5	4	3	2
143	4	1	4	2	1	2	3	2	1	2		4	1	1	1	3	2	1	2	3	2	2	2	3	5	5	3	2	5	2	2	2		1	2	2	2	3	3	3	2	2	1	3	2	2	2	3	2	2	2	2	2	2	2
144	6	1	4	6	4	1	3	3	1	2		4	2	1	1	1	1	2	3	2	2	3	3	3	3	3	3	3	3	3	1	3	3	3	3	3	3	2	3	3	3	3	3	5	5	5	5	4	4	2	4	4	4	3	3
145	6	1	4	1	2	1	3	2	2			1	2	1	1	3	2	2	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	4	3	4	4	4	4	4	4	3	3	5	5	5	5
146	5	1	4	4	1	1	1	2	1	2		4	1	1	1	2	1	1	4	4	4	3	3	4	3	3	3	4	3	3	4	3	4	4	4	5	4	4	4	3	2	4	4	4	3	2	3	3	3	3	3	4	4	3	4
147	4	1	4	3	1	1	3	2	2			2	1	1	2	4	2	2	3	4	2	4			3	2	5	4	4	4	2	2	2	3	2	3	3	2	3	4	5	2	2	3	2	3	4	1	3	4	4	5	5	4	3
148	6	1	4	6	4	1	3	2	1	2		3	2	1	1	4	2		3	3	4	2	3	3	4	3	3	3	3	4	4	4			2	3		4				5	5	5	5	5	5	3	3	2					
149	1	1	2	1	1	1	1	1	2			1	2	1	2	1	1	2	3	3	3	2	2	3	3	2	3	1	2	2	3	3	3	2	3	3	3	3	3	3	3	3	3	2	3	2	3	2	2	2	2	3	3	2	3

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150	4	1	4	4	3	1	3	3	1	5	Turn It In as a LMS	3	2	1	1	1	1	1		5		1					1		1		5	5			1													1							
151	6	1	3	6	4	1	3	2	1	1,2		4	1	1	1	1	1	1	1	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	5	1	1	1	1	1	1	4	4	1	3	1	1	1	1
152	5	2	1	5	4	1	3	2	1	2		4	1	1	1	5	1	1	1	5	2	2	4	2	4	2	4	2	4	4	1	1	2	2	1	4	2	4	4	3	4	2	2	2	1	1	1	2	2	4	4	2	4	2	1
153	4	2	2	1	1	1	1	2	1	2		2	1	1	2	2	2	2	2	2	2	2	1	2	2	2	1	1	1	1	1	1	1	1	1	1	2	2	2	2	4	2	2	2	2	2	2	2	2	2	2	4	4	2	2
154	6	1	4	6	3	1	1	3	1	2		3	2	1	1	2	1	1	1	4	2	4	2	4																															
155	2	1	4	2	1	1	3	2	2	2		1		1	1	2	1	1		4	5	3	3	3	3	3	3	3	3	3	4	4	3	3	3		3	3	3	3	3	3	3	3	5	5	5	5	4	3	2	3	5	5	3	5
156	3	2	6	2	4	1	1	2	2			2	1	1	1	2	1	2	2	4	2	2	3	2	3	2	2	2	2	4	1	1	1	2	4	2	2	2	2	2	2	5	2	1	2	1	1	1	4	4	1	4	2	4	2	2

APPENDIX O: Data analysis from the main study

O1 Frequencies

Note: the demographic frequencies are discussed in chapter 4

How many years' experience do you have using any LMS?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	< 1	34	21,8	23,0	23,0
	1 - 2	30	19,2	20,3	43,2
	3 - 5	63	40,4	42,6	85,8
	> 5 (years)	21	13,5	14,2	100,0
	Total	148	94,9	100,0	
Missing	System	8	5,1		
Total		156	100,0		

Do you have students at DUT registered on BB for the subject/module that you teach?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	136	87,2	88,9	88,9
	No	17	10,9	11,1	100,0
	Total	153	98,1	100,0	
Missing	System	3	1,9		
Total		156	100,0		

Mode of study * Nature of the subject I teach Crosstabulation

			Nature of the subject I teach			Total
			Theory	Practical	Theory and Practical	
Mode of study	Part-time	Count	2	0	7	9
		% within Mode of study	22,2%	0,0%	77,8%	100,0%
		% within Nature of the subject I teach	4,3%	0,0%	6,9%	6,0%
		% of Total	1,3%	0,0%	4,7%	6,0%
	Full-time	Count	25	1	68	94
		% within Mode of study	26,6%	1,1%	72,3%	100,0%
		% within Nature of the subject I teach	54,3%	100,0%	66,7%	63,1%
		% of Total	16,8%	0,7%	45,6%	63,1%
	both part-time and full-time	Count	19	0	27	46
		% within Mode of study	41,3%	0,0%	58,7%	100,0%
		% within Nature of the subject I teach	41,3%	0,0%	26,5%	30,9%
		% of Total	12,8%	0,0%	18,1%	30,9%
Total		Count	46	1	102	149
		% within Mode of study	30,9%	0,7%	68,5%	100,0%
		% within Nature of the subject I teach	100,0%	100,0%	100,0%	100,0%
		% of Total	30,9%	0,7%	68,5%	100,0%

O3 Factor Analysis

Communalities		
	Initial	Extraction
I am very comfortable using a PC at work	1.000	.711
I send and respond to emails on a daily basis	1.000	.702
I regularly browse the intranet to find out about DUT related matters	1.000	.644
I regularly browse the internet for personal, work, and study matters	1.000	.650
I am very comfortable using work related applications like ITS and iEnabler	1.000	.597
I am very comfortable using work related applications like BB	1.000	.696
I know what process to follow when I need assistance on BB	1.000	.528
There are policies, procedures and guideline documentation available	1.000	.744
This documentation is easily accessible to all staff to follow when assistance on BB is needed	1.000	.814
Any queries on BB are answered promptly and in time for me to continue with my task	1.000	.795
Contact details for BB support staff are known	1.000	.773
Support staff are ready to assist and available when needed	1.000	.819
There are known policies in place at DUT regarding BB	1.000	.549
Academics (including myself) are aware of procedures to follow regarding the use of BB e.g. How to add my subject/module to BB	1.000	.697
There are known guidelines to follow to add my subject and class and course material to BB	1.000	.805
I follow the guidelines provided to allow the use of BB to aid in my teaching	1.000	.763
I know how to access BB	1.000	.621
I know how to access student submissions on BB	1.000	.696
BB is easy to use	1.000	.712
The adoption on BB has positively changed the way I teach	1.000	.620
I can easily find my way around BB	1.000	.750
Screens are easy on the eyes	1.000	.827
I can understand where to find the things I need	1.000	.762
I can understand the messages I get from BB and can act accordingly	1.000	.785
I know what functionality is available on BB	1.000	.722
I know how to use BB to add my subject material	1.000	.710
I know how to use BB to add my class or a student	1.000	.663
I know how to use BB to add/edit/update course material	1.000	.798
I know how to use BB to put up notifications and due dates	1.000	.807
I know how to respond to students using BB	1.000	.706
There is adequate time during work hours to attend to lectures and BB	1.000	.860
I find the workload between my lectures and the maintenance on BB manageable	1.000	.806
Using BB is not time consuming	1.000	.771
I received training on how to use BB	1.000	.691
I received a training manual on how to use BB	1.000	.719
On-line help on BB is useful and adequate	1.000	.686
I am able to advise my students on how to use BB	1.000	.712

Extraction Method: Principal Component Analysis.

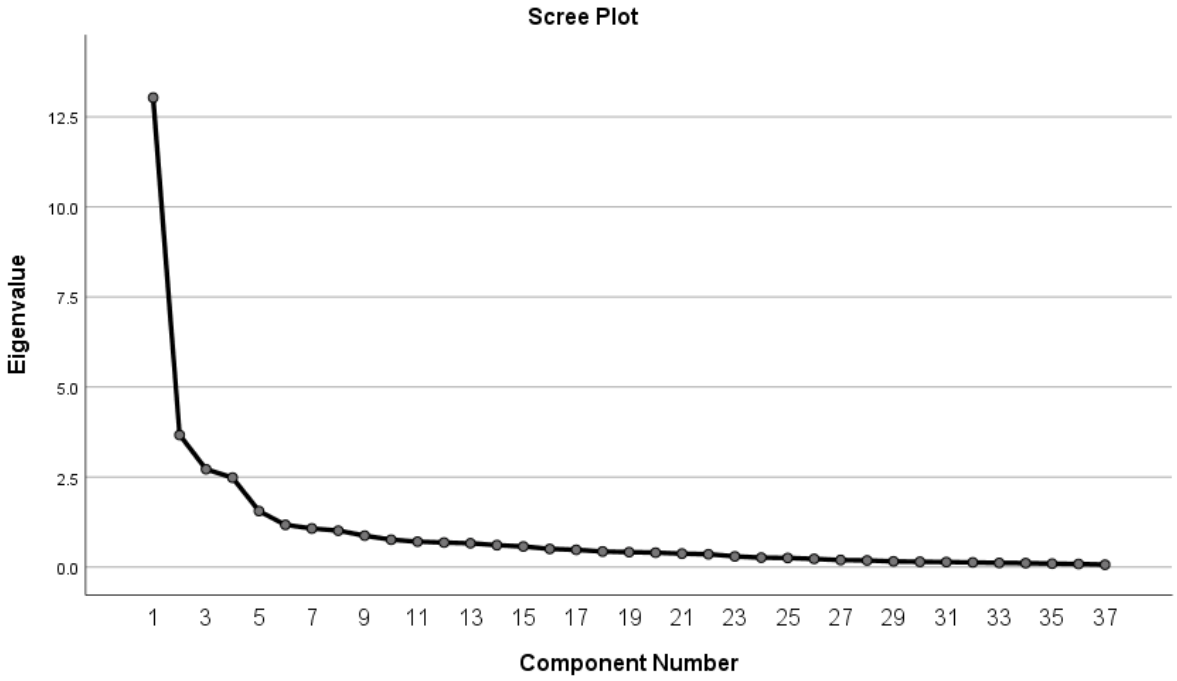
All of the communality values are greater than 0.5.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	13.033	35.223	35.223	13.033	35.223	35.223	9.242	24.979	24.979
2	3.667	9.910	45.133	3.667	9.910	45.133	3.354	9.065	34.043
3	2.718	7.346	52.479	2.718	7.346	52.479	2.867	7.748	41.791
4	2.483	6.710	59.189	2.483	6.710	59.189	2.838	7.671	49.462
5	1.556	4.206	63.394	1.556	4.206	63.394	2.759	7.456	56.918
6	1.172	3.168	66.563	1.172	3.168	66.563	2.061	5.571	62.490
7	1.071	2.896	69.458	1.071	2.896	69.458	2.010	5.433	67.923
8	1.011	2.732	72.190	1.011	2.732	72.190	1.579	4.267	72.190
9	.873	2.358	74.548						
10	.761	2.056	76.604						
11	.706	1.907	78.511						
12	.681	1.840	80.351						
13	.660	1.785	82.136						
14	.608	1.644	83.780						
15	.571	1.543	85.323						
16	.505	1.364	86.687						
17	.479	1.296	87.983						
18	.432	1.168	89.151						
19	.414	1.118	90.269						
20	.400	1.080	91.349						
21	.374	1.010	92.359						
22	.356	.962	93.321						
23	.298	.806	94.127						
24	.264	.713	94.840						
25	.254	.686	95.526						
26	.226	.612	96.138						
27	.196	.530	96.668						
28	.184	.497	97.165						
29	.158	.427	97.593						
30	.147	.398	97.990						
31	.140	.378	98.369						
32	.129	.348	98.717						
33	.116	.314	99.032						

34	.111	.301	99.333						
35	.094	.255	99.587						
36	.086	.234	99.821						
37	.066	.179	100.000						
Extraction Method: Principal Component Analysis.									

The statements loaded along 8 components as indicated by the eigen values (> 1) above.



The scree plot indicates 2 major components.

Component Matrix[a]								
	Component							
	1	2	3	4	5	6	7	8
I am very comfortable using a PC at work	.288	-.030	.641	.231	-.017	.015	.328	-.234
I send and respond to emails on a daily basis	.184	-.037	.792	.084	.052	.080	.139	-.060
I regularly browse the intranet to find out about DUT related matters	.212	.154	.564	.011	.252	.097	-.409	-.126
I regularly browse the internet for personal, work, and study matters	.258	.022	.711	.151	-.067	-.128	-.082	-.162
I am very comfortable using work related applications like ITS and iEnabler	.475	-.013	.554	.183	-.033	.116	.111	.063
I am very comfortable using work related applications like BB	.774	-.171	.191	-.097	-.023	-.093	-.033	.106
I know what process to follow when I need assistance on BB	.656	.148	-.043	-.051	-.214	.043	.127	.089
There are policies, procedures and guideline documentation available	.490	.619	.155	-.062	-.157	.082	-.235	.077
This documentation is easily accessible to all staff to follow when assistance on BB is needed	.470	.649	.012	.020	.019	.074	-.406	-.001

Any queries on BB are answered promptly and in time for me to continue with my task	.437	.600	-.170	.039	.045	-.456	.059	.016
Contact details for BB support staff are known	.474	.549	.041	.052	-.036	-.453	-.034	.184
Support staff are ready to assist and available when needed	.507	.533	.005	.292	.060	-.397	.172	.042
There are known policies in place at DUT regarding BB	.385	.509	.007	.185	-.131	.213	-.165	.132
Academics (including myself) are aware of procedures to follow regarding the use of BB e.g. How to add my subject/module to BB	.459	.361	-.069	.295	-.231	.326	.325	.005
There are known guidelines to follow to add my subject and class and course material to BB	.594	.473	-.221	.119	-.232	.297	.128	-.082
I follow the guidelines provided to allow the use of BB to aid in my teaching	.618	.381	-.265	.022	-.194	.299	.152	-.125
I know how to access BB	.662	-.141	.181	-.142	-.168	-.195	.162	.132
I know how to access student submissions on BB	.670	-.190	.139	-.223	-.158	.051	-.310	.133
BB is easy to use	.795	-.137	-.097	.001	.125	-.001	-.079	-.173
The adoption on BB has positively changed the way I teach	.722	-.109	-.036	-.032	-.177	.049	-.038	-.223
I can easily find my way around BB	.773	-.264	-.180	.009	-.025	-.093	.054	-.194
Screens are easy on the eyes	.709	-.167	-.204	.050	.105	-.224	-.078	-.430
I can understand where to find the things I need	.785	-.135	-.222	.060	-.005	.008	-.039	-.269
I can understand the messages I get from BB and can act accordingly	.779	-.261	-.095	.057	-.082	-.071	-.017	-.292
I know what functionality is available on BB	.775	-.115	-.203	-.158	.083	.037	-.153	-.103
I know how to use BB to add my subject material	.765	-.223	-.056	-.252	-.057	.009	.018	.063
I know how to use BB to add my class or a student	.709	-.275	.023	-.196	.017	.098	-.039	.186
I know how to use BB to add/edit/update course material	.779	-.296	.084	-.188	.006	-.064	.123	.205
I know how to use BB to put up notifications and due dates	.807	-.281	.036	-.115	-.104	-.005	.047	.222
I know how to respond to students using BB	.765	-.242	-.072	-.146	-.025	-.004	-.047	.180
There is adequate time during work hours to attend to lectures and BB	.330	-.311	-.052	.764	.124	-.019	-.105	.202
I find the workload between my lectures and the maintenance on BB manageable	.380	-.326	-.156	.687	.129	.013	-.013	.205
Using BB is not time consuming	.249	-.221	-.209	.771	.122	.018	-.063	.057
I received training on how to use BB	.343	.300	-.039	-.388	.475	-.019	.324	.032
I received a training manual on how to use BB	.262	.236	-.028	-.013	.732	.226	.082	.003
On-line help on BB is useful and adequate	.605	.165	-.059	-.065	.520	.116	.006	-.001
I am able to advise my students on how to use BB	.745	-.143	.039	-.204	.155	.130	.045	.224
Extraction Method: Principal Component Analysis.								
a. 8 components extracted.								

Component Transformation Matrix								
Component	1	2	3	4	5	6	7	8
1	.796	.339	.172	.263	.167	.274	.183	.126
2	-.406	.516	-.009	.577	-.289	-.114	.211	.308
3	-.008	-.191	.916	-.033	-.163	-.235	-.057	.196
4	-.339	.191	.212	.108	.875	.080	-.140	-.017
5	-.109	-.388	.001	.001	.181	.052	.892	.083
6	-.025	.566	.019	-.743	.012	-.181	.234	.197
7	-.033	.267	.217	.066	-.104	-.106	.222	-.897
8	.270	-.063	-.197	.168	.228	-.896	.010	.018

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

Component Score Coefficient Matrix								
	Component							
	1	2	3	4	5	6	7	8
I am very comfortable using a PC at work	-.084	.083	.352	-.025	-.037	.132	.035	-.232
I send and respond to emails on a daily basis	-.024	.014	.318	-.060	-.033	-.032	.053	-.046
I regularly browse the intranet to find out about DUT related matters	-.048	-.122	.137	-.085	.002	.097	.077	.426
I regularly browse the internet for personal, work, and study matters	-.043	-.084	.269	.056	-.025	.118	-.101	.096
I am very comfortable using work related applications like ITS and iEnabler	.017	.074	.221	-.047	.039	-.117	.012	-.032
I am very comfortable using work related applications like BB	.112	-.079	.038	.057	.001	-.075	-.035	.020
I know what process to follow when I need assistance on BB	.065	.137	-.002	.030	-.035	-.094	-.065	-.093
There are policies, procedures and guideline documentation available	.006	.099	-.010	.049	-.051	-.087	-.079	.272
This documentation is easily accessible to all staff to follow when assistance on BB is needed	-.037	.034	-.071	.040	.003	.020	-.016	.413
Any queries on BB are answered promptly and in time for me to continue with my task	-.036	-.107	-.049	.402	-.019	.058	-.011	-.081
Contact details for BB support staff are known	.023	-.139	-.027	.413	.015	-.100	-.082	.007
Support staff are ready to assist and available when needed	-.058	-.056	.052	.376	.063	.012	.012	-.158
There are known policies in place at DUT regarding BB	-.013	.182	-.034	-.028	.062	-.140	-.041	.215
Academics (including myself) are aware of procedures to follow regarding the use of BB e.g. How to add my subject/module to BB	-.051	.385	.077	-.106	.032	-.081	.012	-.201
There are known guidelines to follow to add my subject and class and course material to BB	-.047	.345	-.011	-.100	-.030	.028	-.015	-.042

I follow the guidelines provided to allow the use of BB to aid in my teaching	-.037	.328	-.020	-.124	-.061	.068	.014	-.071
I know how to access BB	.121	-.047	.062	.138	-.049	-.110	-.095	-.166
I know how to access student submissions on BB	.147	-.058	-.051	-.057	-.021	-.099	-.135	.265
BB is easy to use	.011	-.033	-.004	-.037	.010	.195	.059	.059
The adoption on BB has positively changed the way I teach	.014	.076	.031	-.074	-.058	.209	-.095	.022
I can easily find my way around BB	.026	-.017	-.002	.007	-.008	.221	-.024	-.093
Screens are easy on the eyes	-.059	-.114	.010	.059	-.028	.467	-.003	.003
I can understand where to find the things I need	-.015	.034	-.014	-.053	-.002	.283	-.007	.009
I can understand the messages I get from BB and can act accordingly	-.001	-.005	.036	-.027	-.018	.303	-.073	-.029
I know what functionality is available on BB	.053	-.028	-.082	-.057	-.023	.136	.040	.121
I know how to use BB to add my subject material	.126	-.008	-.038	-.024	-.052	-.041	-.014	-.029
I know how to use BB to add my class or a student	.148	-.015	-.041	-.071	.009	-.160	.028	.040
I know how to use BB to add/edit/update course material	.158	-.056	.007	.042	-.003	-.172	.021	-.120
I know how to use BB to put up notifications and due dates	.161	-.009	-.020	.010	.023	-.185	-.048	-.055
I know how to respond to students using BB	.145	-.039	-.071	.002	.024	-.130	-.017	.023
There is adequate time during work hours to attend to lectures and BB	-.001	-.052	-.008	.031	.371	-.116	-.008	.063
I find the workload between my lectures and the maintenance on BB manageable	.012	-.014	-.030	.013	.345	-.124	.027	-.016
Using BB is not time consuming	-.057	.009	-.025	.000	.338	.012	.013	.027
I received training on how to use BB	.007	-.025	.017	.076	-.123	-.053	.380	-.221
I received a training manual on how to use BB	-.066	-.013	.013	-.095	.062	-.022	.500	.029
On-line help on BB is useful and adequate	-.012	-.034	-.014	-.037	.036	.010	.346	.058
I am able to advise my students on how to use BB	.134	.002	-.026	-.059	.012	-.208	.139	-.005

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

Component Score Covariance Matrix

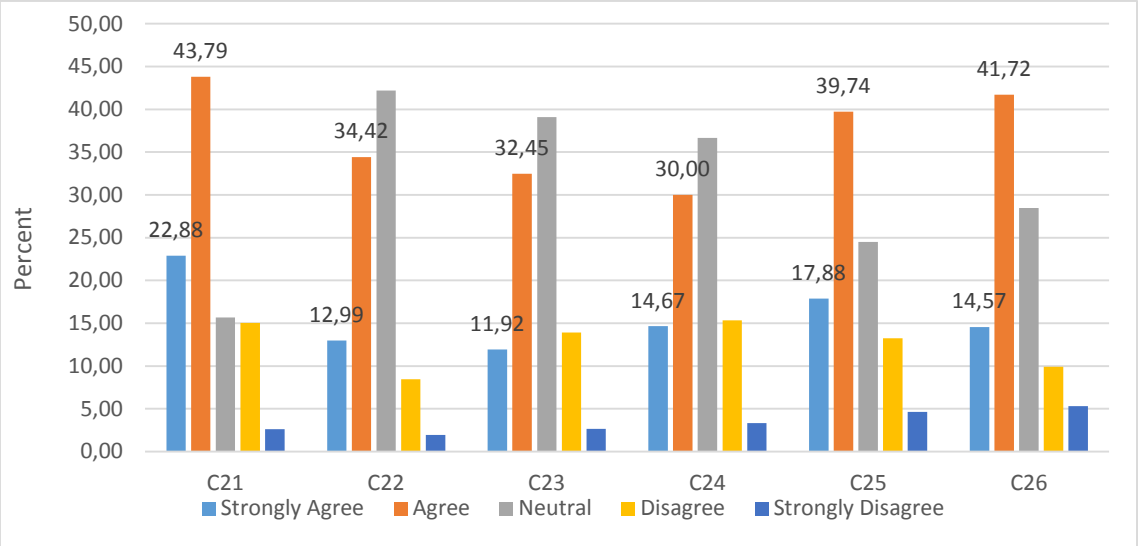
Component	1	2	3	4	5	6	7	8
1	1.000	.000	.000	.000	.000	.000	.000	.000
2	.000	1.000	.000	.000	.000	.000	.000	.000
3	.000	.000	1.000	.000	.000	.000	.000	.000
4	.000	.000	.000	1.000	.000	.000	.000	.000
5	.000	.000	.000	.000	1.000	.000	.000	.000
6	.000	.000	.000	.000	.000	1.000	.000	.000
7	.000	.000	.000	.000	.000	.000	1.000	.000
8	.000	.000	.000	.000	.000	.000	.000	1.000

Extraction Method: Principal Component Analysis.

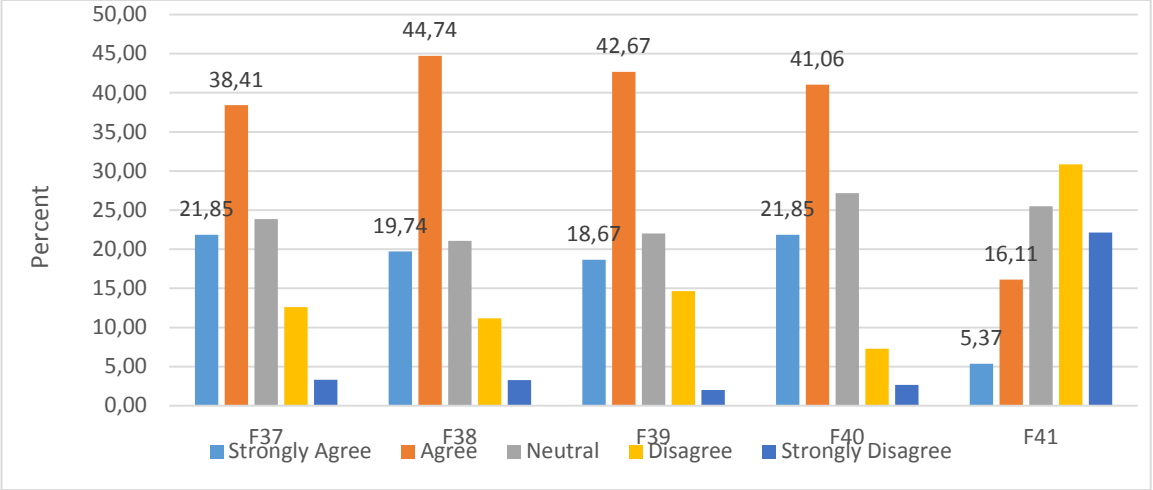
Rotation Method: Varimax with Kaiser Normalization.

O4 Section Analysis

Section C



Section F



O5 Chi-Square tests

		Chi-Square	df	Asymp. Sig.
A1	Age Group	20,471	5	0,001
A2	Gender	0,24	1	0,624
A3	Faculty	58,846	5	0,000
A4	Years of lecturing service at any Higher Educational Institution	18,208	5	0,003
A5	Ethnic Group	82,91	3	0,000
A6	Citizenship	85,5	1	0,000
A7	Nature of the subject I teach	104,745	2	0,000
A8	Mode of study	71,04	2	0,000
A9	I have used other LMSs other than BB	6,2	1	0,013
A10	If you answered 'Yes' to number 9, which other systems have you used?	118,4	5	0,000
A12	How many years' experience do you have using any LMS?	26,757	3	0,000
A13	Do you have students at DUT registered on BB for the subject/module that you teach?	92,556	1	0,000
B14	I am very comfortable using a PC at work	343,679	4	0,000
B15	I send and respond to emails on a daily basis	321,756	4	0,000
B16	I regularly browse the intranet to find out about DUT related matters	86	4	0,000
B17	I regularly browse the internet for personal, work, and study matters	168,381	3	0,000
B18	I am very comfortable using work related applications like ITS and iEnabler	122,581	4	0,000
B19	I am very comfortable using work related applications like BB	83,8	4	0,000
B20	I often require assistance when using IT software	10,039	4	0,040
C21	I know what process to follow when I need assistance on BB	70,366	4	0,000
C22	There are policies, procedures and guideline documentation available	93,143	4	0,000
C23	This documentation is easily accessible to all staff to follow when assistance on BB is needed	69,629	4	0,000
C24	Any queries on BB are answered promptly and in time for me to continue with my task	52,933	4	0,000
C25	Contact details for BB support staff are known	52,543	4	0,000
C26	Support staff are ready to assist and available when needed	67,245	4	0,000
D27	There are known policies in place at DUT regarding BB	96,026	4	0,000
D28	Academics (including myself) are aware of procedures to follow regarding the use of BB e.g. How to add my subject/module to BB	85,333	4	0,000
D29	There are known guidelines to follow to add my subject and class and course material to BB	91,285	4	0,000
D30	I follow the guidelines provided to allow the use of BB to aid in my teaching	90,177	4	0,000
E31	I know how to access BB	148,273	4	0,000
E32	I know how to access student submissions on BB	46,649	4	0,000
E33	BB is easy to use	50,225	4	0,000
E34	I very seldom require assistance on BB	38,967	4	0,000
E35	I support subject content being presented online	101	4	0,000
E36	The adoption on BB has positively changed the way I teach	58,733	4	0,000
F37	I can easily find my way around BB	52,146	4	0,000
F38	Screens are easy on the eyes	73,724	4	0,000
F39	I can understand where to find the things I need	65,4	4	0,000
F40	I can understand the messages I get from BB and can act accordingly	72,543	4	0,000
F41	I find it difficult to use BB	28,483	4	0,000
G42	I know what functionality is available on BB	63,267	4	0,000
G43	I know how to use BB to add my subject material	112,543	4	0,000
G44	I know how to use BB to add my class or a student	32,212	4	0,000
G45	I know how to use BB to add/edit/update course material	82,013	4	0,000
G46	I know how to use BB to put up notifications and due dates	58,172	4	0,000
G47	I know how to respond to students using BB	30,961	4	0,000
H48	There is adequate time during work hours to attend to lectures and BB	22,474	4	0,000
H49	I find the workload between my lectures and the maintenance on BB manageable	33,757	4	0,000
H50	Additional time should be allocated for the housekeeping on BB	63,868	4	0,000
H51	Using BB is not time consuming	16,738	4	0,002
I52	I received training on how to use BB	51,881	4	0,000
I53	I received a training manual on how to use BB	39,533	4	0,000
I54	On-line help on BB is useful and adequate	71,73	4	0,000
I55	I am able to advise my students on how to use BB	45,866	4	0,000

O6 Hypothesis Tests

Pearson Chi-Square Tests

This documentation is easily accessible to all staff to follow when assistance on BB is needed		There are policies, procedures and guideline documentation available			I know what process to follow when I need assistance on BB			I often require assistance when using IT software			I am very comfortable using work related applications like BB			I am very comfortable using work related applications like ITS and iEnabler			I regularly browse the internet for personal, work, and study matters			I regularly browse the intranet to find out about DUT related matters			I send and respond to emails on a daily basis			I am very comfortable using a PC at work			
df	Chi-square	Sig.	df	Chi-square	Sig.	df	Chi-square	Sig.	df	Chi-square	Sig.	df	Chi-square	Sig.	df	Chi-square	Sig.	df	Chi-square	Sig.	df	Chi-square	Sig.	df	Chi-square	Sig.	df	Chi-square	
20	32,642	.022*	20	34,632	0,1	20	28,460	0,52	20	19,060	0,22	20	24,661	0,3	20	22,744	.032*	15	26,573	.005*	20	40,028	0,11	20	28,110	0,43	20	20,521	Age Group
4	16,921	.030*	4	10,704	.035*	4	10,379	0,678	4	2,316	0,14	4	6,973	0,84	4	1,448	0,31	3	3,586	0,33	4	4,649	0,85	4	1,340	0,86	4	1,331	Gender
20	19,245	0,32	20	22,438	0,26	20	23,528	.031*	20	33,347	.000*	20	55,034	0,06	20	30,376	.007*	15	31,624	0,16	20	26,329	0,11	20	27,915	0,26	20	23,664	Faculty
20	10,990	0,49	20	19,477	0,14	20	26,764	0,32	20	22,352	0,38	20	21,251	.034*	20	32,964	0,32	15	16,959	0,2	20	25,052	0,33	20	22,186	0,46	20	20,054	Years of lecturing service at any Higher Educational Institution
12	9,365	0,11	12	18,120	0,44	12	12,084	0,41	12	12,501	0,28	12	14,359	0,35	12	13,268	0,82	9	5,113	0,39	12	12,725	0,47	12	11,675	0,75	12	8,429	Ethnic Group
4	7,669	0,31	4	4,763	0,46	4	3,656	0,09	4	8,058	0,24	4	5,520	.047*	4	9,616	0,81	3	0,951	0,74	4	1,975	0,55	4	3,062	0,39	4	4,099	Citizenship
8	5,997	0,98	8	2,156	0,39	8	8,465	0,93	8	3,035	0,71	8	5,446	0,34	8	8,979	0,98	6	1,120	0,68	8	5,718	0,44	8	7,954	0,33	8	9,159	Nature of the subject I teach
8	9,014	0,34	8	9,036	0,61	8	6,305	0,4	8	8,400	.032*	8	16,851	.002*	8	24,963	.023*	6	14,663	.007*	8	21,037	0,17	8	11,523	0,18	8	11,327	Mode of study
4	4,224	0,16	4	6,513	0,85	4	1,349	.001*	4	19,244	0,09	4	7,968	0,7	4	2,223	0,84	3	0,823	0,22	4	5,747	0,41	4	4,006	0,45	4	3,686	I have used other LMSs other than BB
20	16,597	0,35	20	21,852	0,32	20	22,426	0,53	20	18,951	0,98	20	9,571	0,57	20	18,248	.020*	10	21,132	0,54	20	18,783	.008*	15	31,296	0,89	15	8,768	If you answered 'Yes' to number 9, which other systems have you used?
12	21,558	0,28	12	14,359	.040*	12	21,827	.003*	12	29,839	0,05	12	20,866	0,49	12	11,417	0,42	6	6,033	0,27	12	14,512	0,17	9	12,821	0,39	12	12,762	How many years' experience do you have using any LMS?
4	5,498	0,58	4	2,857	.012*	4	12,883	0,47	4	3,587	.000*	4	30,546	0,68	4	2,333	0,41	3	2,881	0,67	4	2,343	0,74	4	1,980	0,81	4	1,577	Do you have students at DUT registered on BB for the subject/module that you teach?

BB is easy to use			I know how to access student submissions on BB			I know how to access BB			I follow the guidelines provided to allow the use of BB to aid in my teaching			There are known guidelines to follow to add my subject and class and course material to BB			Academics (including myself) are aware of procedures to follow regarding the use of BB e.g. How to add my subject/module to BB			There are known policies in place at DUT regarding BB			Support staff are ready to assist and available when needed			Contact details for BB support staff are known			Any queries on BB are answered promptly and in time for me to continue with my task			
df	Chi-square	Sig.	df	Chi-square	Sig.	df	Chi-square	Sig.	df	Chi-square	Sig.	df	Chi-square	Sig.	df	Chi-square	Sig.	df	Chi-square	Sig.	df	Chi-square	Sig.	df	Chi-square	Sig.	df	Chi-square	Sig.	df	Chi-square	Sig.
20	26,283	0,09	20	29,083	0,73	20	15,852	0,9	20	12,559	0,75	20	15,476	0,9	20	12,547	0,9	20	12,437	.002*	20	43,890	0,34	20	21,960	.012*	20	37,058	.037*			
4	6,579	0,15	4	6,813	0,15	4	6,694	.036*	4	10,282	0,05	4	9,358	0,06	4	9,033	0,12	4	7,319	0,05	4	9,469	0,21	4	5,899	.003*	4	16,176	.002*			
20	23,140	.034*	20	32,920	.009*	20	38,069	0,27	20	23,464	0,42	20	20,586	0,32	20	22,458	0,43	20	20,510	.043*	20	31,993	.025*	20	34,226	.034*	20	33,012	0,51			
20	15,315	0,86	20	13,457	0,7	20	16,335	0,99	20	8,503	0,93	20	11,723	0,86	20	13,392	0,37	20	21,530	0,42	20	20,555	0,4	20	20,967	0,06	20	30,688	0,95			
12	13,173	0,53	12	10,992	0,63	12	9,871	0,3	12	14,025	0,19	12	16,066	0,27	12	14,562	.026*	12	23,254	0,17	12	16,467	.042*	12	21,622	0,14	12	17,406	0,67			
4	3,281	.020*	4	11,709	0,16	4	6,643	0,5	4	3,388	0,36	4	4,358	0,65	4	2,455	0,13	4	7,067	0,06	4	9,238	0,31	4	4,785	0,53	4	3,173	0,1			
8	4,025	0,72	8	5,345	0,91	8	3,368	0,63	8	6,131	0,66	8	5,877	0,65	8	5,968	0,82	8	4,392	0,16	8	11,800	0,76	8	5,012	0,6	8	6,400	0,65			
8	12,990	.041*	8	16,085	0,31	8	9,412	0,38	8	8,532	0,37	8	8,723	0,5	8	7,339	0,24	8	10,388	0,05	8	15,422	0,12	8	12,742	.029*	8	17,096	0,34			
4	4,209	0,38	4	4,186	.047*	4	9,656	0,84	4	1,433	0,36	4	4,392	0,77	4	1,805	0,78	4	1,768	0,78	4	1,774	0,39	4	4,135	0,95	4	0,736	0,38			
20	26,045	0,12	20	27,648	0,37	20	21,431	0,38	15	16,099	0,66	20	16,968	.034*	20	32,993	0,06	20	30,672	.002*	20	43,410	0,09	20	28,981	.008*	20	38,269	0,68			
12	18,785	.001*	12	33,599	.004*	12	29,177	.002*	12	31,597	.031*	12	22,671	0,09	12	19,012	.007*	12	27,496	0,2	12	15,920	.018*	12	24,411	0,09	12	18,862	.043*			
4	24,404	.000*	4	27,262	.000*	4	39,285	.001*	4	18,539	0,39	4	4,109	0,06	4	9,164	0,14	4	6,874	.008*	4	13,813	.021*	4	11,588	.005*	4	15,073	0,24			

I know how to use BB to add my subject material			I know what functionality is available on BB			I find it difficult to use BB			I can understand the messages I get from BB and can act accordingly			I can understand where to find the things I need			Screens are easy on the eyes			I can easily find my way around BB			The adoption on BB has positively changed the way I teach			I support subject content being presented online			I very seldom require assistance on BB			
Sig.	df	Chi-square	Sig.	df	Chi-square	Sig.	df	Chi-square	Sig.	df	Chi-square	Sig.	df	Chi-square	Sig.	df	Chi-square	Sig.	df	Chi-square	Sig.	df	Chi-square	Sig.	df	Chi-square	Sig.	df	Chi-square	Sig.
0,47	20	19,850	0,12	20	27,500	.016*	20	35,802	0,51	20	19,186	0,44	20	20,255	0,83	20	14,110	0,44	20	20,297	0,68	20	16,566	0,78	20	14,877	0,38	20	21,229	0,16
0,51	4	3,306	0,31	4	4,802	0,11	4	7,626	0,22	4	5,751	0,29	4	4,949	0,7	4	2,202	0,63	4	2,595	.001*	4	19,463	.008*	4	13,835	0,59	4	2,833	0,16
.017*	20	35,699	0,7	20	16,254	0,07	20	30,045	.012*	20	37,022	.031*	20	33,378	0,27	20	23,339	0,07	20	30,028	0,14	20	26,865	0,73	20	15,732	.046*	20	31,773	0,28
0,63	20	17,382	0,95	20	10,759	0,29	20	22,914	0,19	20	25,260	0,7	20	16,274	0,47	20	19,838	0,44	20	20,293	0,44	20	20,348	0,71	20	16,046	0,43	20	20,533	0,76
0,24	12	15,080	0,1	12	18,393	0,46	12	11,868	0,2	12	15,727	0,25	12	14,788	0,35	12	13,317	0,51	12	11,258	0,59	12	10,280	0,5	12	11,345	0,22	12	15,395	0,36
.022*	4	11,424	0,39	4	4,145	0,08	4	8,333	0,17	4	6,500	0,06	4	8,954	0,39	4	4,142	0,31	4	4,817	0,07	4	8,763	0,06	4	8,869	0,42	4	3,894	0,51
0,8	8	4,597	0,99	8	1,564	0,88	8	3,717	0,89	8	3,609	0,94	8	2,899	0,63	8	6,149	0,79	8	4,692	0,35	8	8,890	.001*	8	25,823	.006*	8	21,531	0,86
0,23	8	10,496	0,12	8	12,689	0,09	8	13,880	0,28	8	9,853	0,4	8	8,402	0,71	8	5,468	0,75	8	5,035	0,05	8	15,462	0,66	8	5,865	.026*	8	17,400	0,11
0,22	4	5,776	0,57	4	2,954	0,15	4	6,777	.042*	4	9,935	0,14	4	7,018	0,08	4	8,413	0,11	4	7,462	0,34	4	4,568	.044*	4	9,788	0,44	4	3,742	0,38
0,57	20	18,241	0,25	20	23,883	0,63	20	17,375	0,4	15	15,682	0,69	20	16,439	0,92	20	11,975	0,5	20	19,362	0,85	20	13,575	0,8	20	14,534	.050*	20	31,437	0,16
.000*	12	35,563	0,14	12	17,195	.021*	12	23,958	.044*	12	21,473	0,08	12	19,307	.001*	12	34,791	.003*	12	29,857	.017*	12	24,646	.013*	12	25,356	.007*	12	27,451	0,09
.000*	4	36,791	0,05	4	9,302	0,1	4	7,746	.000*	4	22,792	.015*	4	12,318	.016*	4	12,177	.001*	4	18,794	.012*	4	12,884	0,11	4	7,502	0,05	4	9,420	.000*

On-line help on BB is useful and adequate				I received a training manual on how to use BB			I received training on how to use BB			Using BB is not time consuming			Additional time should be allocated for the housekeeping on BB			I find the workload between my lectures and the maintenance on BB manageable			There is adequate time during work hours to attend to lectures and BB			I know how to respond to students using BB			I know how to use BB to put up notifications and due dates			I know how to use BB to add/edit/update course material			I know how to use BB to add my class or a student		
Chi-square	Sig.	df	Chi-square	Sig.	df	Chi-square	Sig.	df	Chi-square	Sig.	df	Chi-square	Sig.	df	Chi-square	Sig.	df	Chi-square	Sig.	df	Chi-square	Sig.	df	Chi-square	Sig.	df	Chi-square	Sig.	df	Chi-square
28,959	0,06	20	30,976	0,05	20	31,104	0,21	20	24,885	0,1	20	28,420	0,42	20	20,690	0,08	20	29,628	0,59	20	17,967	0,41	20	20,870	0,62	20	17,490	0,26	20	23,530
5,609	0,210	4	5,863	0,347	4	4,465	.007*	4	14,177	0,22	4	5,741	0,26	4	5,328	0,607	4	2,711	0,42	4	3,922	.041*	4	9,945	0,14	4	7,000	.029*	4	10,756
28,393	0,55	20	18,593	0,24	20	24,059	0,05	20	31,383	0,92	20	11,939	0,42	20	20,590	0,69	20	16,425	.001*	20	46,721	.000*	20	71,796	.000*	20	68,579	.002*	20	43,455
20,489	0,57	20	18,203	0,12	20	27,670	0,05	20	31,092	0,14	20	26,837	0,7	20	16,320	0,46	20	19,981	0,45	20	20,097	0,59	20	18,027	0,4	20	21,017	0,62	20	17,554
12,643	0,5	12	11,356	0,33	12	13,559	.031*	12	22,649	.017*	12	24,578	.027*	12	23,039	0,22	12	15,487	0,07	12	19,730	.028*	12	23,018	.024*	12	23,415	0,17	12	16,421
2,263	0,88	4	1,190	.015*	4	12,364	0,47	4	3,544	0,21	4	5,834	0,69	4	2,246	0,27	4	5,223	0,45	4	3,696	0,06	4	8,941	.048*	4	9,590	0,15	4	6,785
8,738	0,64	8	6,052	0,58	8	6,639	0,3	8	9,488	0,16	8	11,896	0,96	8	2,569	0,85	8	4,087	0,38	8	8,609	0,23	8	10,515	0,87	8	3,859	0,6	8	6,403
11,509	0,35	8	8,960	0,06	8	15,033	0,62	8	6,250	0,38	8	8,584	0,62	8	6,217	0,41	8	8,285	0,54	8	6,982	0,14	8	12,384	0,17	8	11,542	0,12	8	12,764
6,044	0,988	4	0,328	0,939	4	0,799	0,181	4	6,255	0,38	4	4,173	0,29	4	4,976	0,436	4	3,785	.034*	4	10,385	.007*	4	14,256	0,15	4	6,682	0,458	4	3,631
28,196	0,73	20	15,742	0,51	20	19,123	0,12	20	27,759	0,09	20	28,829	0,23	20	24,246	0,52	20	18,987	0,94	20	11,176	0,99	20	7,666	0,23	20	24,198	0,46	20	19,902
17,149	0,66	12	9,483	0,18	12	16,376	0,21	12	15,570	0,34	12	13,409	0,71	12	8,866	0,87	12	6,873	.003*	12	29,800	.013*	12	25,303	.000*	12	40,205	0,05	12	20,757
11,393	0,38	4	4,198	.023*	4	11,372	0,61	4	2,698	0,52	4	3,261	0,12	4	7,304	0,3	4	4,865	.000*	4	28,642	.000*	4	32,195	.000*	4	40,763	.001*	4	18,295

I am able to advise my students on how to use BB				
Sig.	df	Chi-square	Sig.	df
0,93	20	11,619	0,09	20
0,05	4	9,300	0,23	4
.001*	20	45,756	0,1	20
0,55	20	18,578	0,43	20
.003*	12	30,204	0,4	12
0,14	4	6,940	0,69	4
0,58	8	6,608	0,37	8
0,13	8	12,583	0,17	8
.042*	4	9,882	0,2	4
0,88	20	12,939	0,11	20
.000*	12	44,977	0,14	12
.000*	4	20,041	.022*	4

O7 Correlations: Spearman's rho

I know what process to follow when I need assistance on BB		I often require assistance when using IT software			I am very comfortable using work related applications like BB			I am very comfortable using work related applications like ITS and iEnabler			I regularly browse the internet for personal, work and study matters			I regularly browse the intranet to find out about DUT related matters			I send and respond to emails on a daily basis			I am very comfortable using a PC at work			
Sig.	Correlation	N	Sig.	Correlation	N	Sig.	Correlation	N	Sig.	Correlation	N	Sig.	Correlation	N	Sig.	Correlation	N	Sig.	Correlation	N	Sig.	Correlation	
0.002	.246**	152	0.003	-.237**	150	0.000	.303**	155	0.000	.448**	155	0.000	.416**	154	0.000	.359**	156	0.000	.527**	156		1.000	I am very comfortable using a PC at work
0.112	0.129	152	0.053	-0.157	150	0.002	.249**	155	0.000	.416**	155	0.000	.459**	154	0.000	.428**	156		1.000				I send and respond to emails on a daily basis
0.118	0.128	150	0.508	-0.054	148	0.000	.377**	153	0.000	.413**	153	0.000	.438**	154		1.000							I regularly browse the intranet to find out about DUT related matters
0.051	0.159	151	0.002	-.253**	149	0.000	.372**	154	0.000	.431**	155		1.000										I regularly browse the internet for personal, work, and study matters
0.000	.295**	151	0.001	-.258**	149	0.000	.572**	155		1.000													I am very comfortable using work related applications like ITS and
0.000	.506**	147	0.000	-.415**	150		1.000																I am very comfortable using work related applications like BB
0.000	-.336**	152		1.000																			I often require assistance when using IT software
	1.000																						I know what process to follow when I need assistance on BB
																							There are policies, procedures and guideline documentation available
																							This documentation is easily accessible to all staff to follow when
																							Any queries on BB are answered promptly and in time for me to
																							Contact details for BB support staff are known
																							Support staff are ready to assist and available when needed
																							There are known policies in place at DUT regarding BB
																							Academics (including myself) are aware of procedures to follow
																							There are known guidelines to follow to add my subject and class and
																							I follow the guidelines provided to allow the use of BB to aid in my
																							I know how to access BB
																							I know how to access student submissions on BB
																							BB is easy to use
																							I very seldom require assistance on BB
																							I support subject content being presented online
																							The adoption on BB has positively changed the way I teach
																							I can easily find my way around BB
																							Screens are easy on the eyes
																							I can understand where to find the things I need
																							I can understand the messages I get from BB and can act accordingly
																							I find it difficult to use BB
																							I know what functionality is available on BB
																							I know how to use BB to add my subject material
																							I know how to use BB to add my class or a student
																							I know how to use BB to add/edit/update course material
																							I know how to use BB to put up notifications and due dates
																							I know how to respond to students using BB
																							There is adequate time during work hours to attend to lectures and BB
																							I find the workload between my lectures and the maintenance on BB
																							Additional time should be allocated for the housekeeping on BB
																							Using BB is not time consuming
																							I received training on how to use BB
																							I received a training manual on how to use BB
																							On-line help on BB is useful and adequate
																							I am able to advise my students on how to use BB

I know how to access student submissions on BB			I know how to access BB			I follow the guidelines provided to allow the use of BB to aid in my teaching			There are known guidelines to follow to add my subject and class and course			Academics (including myself) are aware of procedures to follow			There are known policies in place at DUT regarding BB			Support staff are ready to assist and available when needed			Contact details for BB support staff are known			Any queries on BB are answered promptly and in time for me to continue with			This documentation is easily accessible to all staff to follow when assistance on			There are policies, procedures and guideline documentation available			
Sig.	Correlation	N	Sig.	Correlation	N	Sig.	Correlation	N	Sig.	Correlation	N	Sig.	Correlation	N	Sig.	Correlation	N	Sig.	Correlation	N	Sig.	Correlation	N	Sig.	Correlation	N	Sig.	Correlation	N	Sig.	Correlation	N
0.112	0.129	154	0.003	.240**	147	0.797	0.021	151	0.399	0.069	150	0.289	0.087	152	0.266	0.091	151	0.321	0.081	151	0.706	-0.031	150	0.618	0.041	151	0.583	0.045	154	0.079	0.142	153
0.040	.166*	154	0.014	.198*	147	0.850	-0.016	151	0.848	-0.016	150	0.632	0.039	152	0.198	0.105	151	0.802	0.021	151	0.361	0.075	150	0.323	-0.081	151	0.784	0.023	154	0.011	.203*	153
0.026	.181*	152	0.026	.180*	146	0.151	0.119	149	0.100	0.135	148	0.228	0.100	150	0.051	0.160	149	0.072	0.148	149	0.022	.187*	148	0.509	0.055	149	0.002	.254**	152	0.002	.248**	151
0.013	.201*	153	0.004	.232**	146	0.909	-0.010	150	0.247	0.095	149	0.288	0.088	151	0.066	0.150	150	0.172	0.112	150	0.063	0.152	149	0.265	0.092	150	0.176	0.111	153	0.001	.266**	152
0.001	.275**	153	0.001	.278**	146	0.032	.178*	150	0.013	.203*	149	0.001	.273**	151	0.017	.194*	150	0.006	.223**	150	0.021	.188*	149	0.116	0.129	150	0.006	.223**	153	0.000	.308**	152
0.000	.575**	148	0.000	.620**	142	0.000	.388**	145	0.000	.308**	145	0.000	.309**	146	0.000	.289**	147	0.000	.349**	147	0.000	.329**	146	0.000	.318**	147	0.000	.300**	148	0.000	.314**	149
0.005	- .228**	150	0.000	- .377**	144	0.187	-0.111	148	0.110	-0.132	147	0.212	-0.104	149	0.125	-0.126	148	0.027	- .181*	148	0.005	- .227**	147	0.015	- .200*	148	0.283	-0.089	150	0.006	- .224**	150
0.000	.471**	152	0.000	.499**	146	0.000	.540**	149	0.000	.522**	149	0.000	.418**	150	0.000	.334**	151	0.000	.428**	151	0.000	.438**	150	0.000	.428**	151	0.000	.325**	152	0.000	.416**	153
0.000	.302**	153	0.013	.200*	147	0.000	.493**	151	0.000	.517**	150	0.000	.460**	151	0.000	.559**	150	0.000	.436**	151	0.000	.509**	149	0.000	.541**	151	0.000	.703**	154		1.000	
0.000	.319**	150	0.028	.180*	145	0.000	.530**	148	0.000	.563**	148	0.000	.398**	148	0.000	.537**	149	0.000	.492**	150	0.000	.499**	149	0.000	.551**	151		1.000				
0.005	.229**	149	0.000	.289**	144	0.000	.439**	147	0.000	.440**	147	0.000	.349**	147	0.000	.386**	148	0.000	.714**	148	0.000	.642**	150		1.000							
0.001	.268**	151	0.000	.314**	146	0.000	.461**	149	0.000	.513**	149	0.000	.398**	149	0.000	.410**	150	0.000	.727**	151		1.000										
0.002	.253**	151	0.001	.279**	146	0.000	.480**	148	0.000	.517**	148	0.000	.504**	149	0.000	.360**	151		1.000													
0.002	.244**	152	0.007	.217**	146	0.000	.433**	150	0.000	.506**	149	0.000	.465**	152		1.000																
0.000	.291**	150	0.000	.305**	147	0.000	.616**	150	0.000	.609**	150		1.000																			
0.000	.377**	151	0.000	.291**	147	0.000	.817**	151		1.000																						
0.000	.433**	147	0.000	.314**	147		1.000																									
0.000	.601**	154		1.000																												
	1.000																															

I know how to use BB to add my subject material			I know what functionality is available on BB			I find it difficult to use BB			I can understand the messages I get from BB and can act accordingly			I can understand where to find the things I need			Screens are easy on the eyes			I can easily find my way around BB			The adoption on BB has positively changed the way I teach			I support subject content being presented online			I very seldom require assistance on BB			BB is easy to use			
Sig.	Correlation	N	Sig.	Correlation	N	Sig.	Correlation	N	Sig.	Correlation	N	Sig.	Correlation	N	Sig.	Correlation	N	Sig.	Correlation	N	Sig.	Correlation	N	Sig.	Correlation	N	Sig.	Correlation	N	Sig.	Correlation	N
0.077	0.144	150	0.287	0.088	149	0.195	-0.107	151	0.005	.228**	150	0.132	0.124	152	0.146	0.118	151	0.036	.170*	150	0.021	.189*	150	0.075	0.146	151	0.002	.250**	151	0.024	.184*	154
0.008	.216**	150	0.443	0.063	149	0.952	-0.005	151	0.140	0.121	150	0.589	0.044	152	0.456	0.061	151	0.207	0.103	150	0.222	0.100	150	0.315	0.083	151	0.034	.173*	151	0.109	0.131	154
0.003	.240**	148	0.007	.222**	147	0.929	0.007	149	0.005	.227**	148	0.021	.190*	150	0.005	.227**	149	0.101	0.135	148	0.016	.198*	149	0.095	0.137	149	0.033	.175*	149	0.097	0.136	152
0.011	.208*	149	0.203	0.105	148	0.197	-0.107	150	0.008	.216**	149	0.042	.167*	151	0.005	.229**	150	0.175	0.111	149	0.015	.199*	149	0.042	.167*	150	0.001	.277**	150	0.004	.231**	153
0.000	.321**	149	0.002	.250**	149	0.582	-0.045	151	0.000	.348**	150	0.001	.265**	151	0.006	.221**	151	0.001	.271**	149	0.001	.281**	149	0.000	.319**	151	0.000	.333**	151	0.002	.249**	153
0.000	.572**	146	0.000	.523**	145	0.002	-.257**	147	0.000	.636**	146	0.000	.562**	148	0.000	.548**	147	0.000	.631**	147	0.000	.577**	145	0.000	.501**	146	0.000	.531**	146	0.000	.620**	148
0.000	-.384**	147	0.000	-.371**	146	0.000	.369**	148	0.000	-.437**	147	0.000	-.395**	149	0.000	-.432**	148	0.000	-.444**	147	0.000	-.344**	147	0.000	-.422**	147	0.000	-.406**	147	0.000	-.367**	150
0.000	.482**	150	0.000	.539**	149	0.000	-.307**	151	0.000	.452**	150	0.000	.427**	152	0.000	.356**	151	0.000	.467**	150	0.000	.485**	149	0.000	.359**	150	0.000	.433**	150	0.000	.509**	152
0.000	.312**	149	0.000	.352**	149	0.144	-0.120	150	0.005	.230**	149	0.001	.262**	151	0.016	.196*	150	0.004	.234**	149	0.000	.321**	149	0.001	.276**	151	0.001	.270**	150	0.001	.263**	153
0.000	.338**	148	0.000	.399**	148	0.206	-0.104	149	0.002	.257**	148	0.000	.336**	150	0.002	.248**	149	0.001	.261**	148	0.000	.360**	147	0.002	.254**	149	0.000	.302**	148	0.000	.338**	150
0.000	.284**	147	0.000	.328**	146	0.066	-0.153	148	0.000	.331**	147	0.000	.304**	149	0.000	.338**	148	0.000	.302**	148	0.000	.304**	146	0.005	.232**	147	0.005	.229**	147	0.000	.359**	149
0.000	.348**	149	0.000	.348**	149	0.018	-.193*	150	0.002	.256**	149	0.000	.308**	151	0.000	.310**	150	0.002	.256**	149	0.000	.293**	148	0.009	.215**	150	0.029	.179*	149	0.001	.270**	151
0.001	.279**	149	0.000	.330**	149	0.023	-.187*	150	0.000	.304**	150	0.000	.341**	151	0.000	.372**	150	0.000	.367**	149	0.000	.328**	149	0.009	.214**	149	0.025	.183*	149	0.000	.342**	151
0.027	.181*	148	0.007	.223**	147	0.177	-0.112	149	0.019	.193*	148	0.002	.253**	150	0.021	.189*	149	0.002	.247**	148	0.001	.259**	148	0.040	.169*	149	0.021	.188*	149	0.000	.284**	152
0.000	.304**	147	0.000	.309**	147	0.052	-0.161	148	0.000	.369**	147	0.000	.433**	149	0.001	.280**	148	0.000	.388**	148	0.000	.366**	146	0.000	.314**	149	0.002	.252**	148	0.000	.343**	150
0.000	.412**	147	0.000	.505**	147	0.004	-.235**	148	0.000	.392**	147	0.000	.495**	149	0.000	.357**	148	0.000	.402**	148	0.000	.474**	147	0.000	.310**	149	0.000	.316**	148	0.000	.424**	151
0.000	.477**	144	0.000	.542**	145	0.008	-.218**	145	0.000	.462**	145	0.000	.468**	146	0.000	.393**	145	0.000	.516**	145	0.000	.522**	145	0.000	.341**	146	0.000	.333**	145	0.000	.457**	147
0.000	.634**	150	0.000	.439**	149	0.000	-.363**	151	0.000	.565**	150	0.000	.549**	152	0.000	.511**	151	0.000	.569**	150	0.000	.471**	150	0.000	.424**	151	0.000	.423**	151	0.000	.584**	154
0.000	.670**	150	0.000	.580**	149	0.001	-.270**	151	0.000	.558**	150	0.000	.537**	152	0.000	.508**	151	0.000	.598**	150	0.000	.520**	150	0.000	.389**	151	0.000	.489**	151	0.000	.661**	154
0.000	.586**	148	0.000	.651**	148	0.000	-.359**	150	0.000	.652**	149	0.000	.711**	150	0.000	.651**	150	0.000	.694**	148	0.000	.540**	147	0.000	.408**	150	0.000	.609**	151		1.000		
0.000	.405**	148	0.000	.497**	149	0.009	-.212**	150	0.000	.509**	149	0.000	.516**	150	0.000	.415**	150	0.000	.505**	148	0.000	.523**	147	0.000	.396**	151		1.000					
0.000	.503**	147	0.000	.386**	147	0.020	-.192*	148	0.000	.520**	148	0.000	.430**	149	0.000	.405**	148	0.000	.446**	147	0.000	.629**	150		1.000								
0.000	.555**	148	0.000	.549**	147	0.000	-.326**	149	0.000	.585**	148	0.000	.568**	150	0.000	.506**	149	0.000	.631**	150		1.000											
0.000	.637**	149	0.000	.689**	149	0.000	-.360**	151	0.000	.716**	150	0.000	.739**	151	0.000	.737**	151		1.000													
0.000	.619**	150	0.000	.607**	149	0.000	-.302**	151	0.000	.721**	150	0.000	.781**	152		1.000																	
0.000	.617**	148	0.000	.672**	149	0.000	-.377**	150	0.000	.792**	150		1.000																				
0.000	.663**	149	0.000	.625**	149	0.000	-.309**	151		1.000																							
0.000	-.331**	147	0.001	-.280**	149		1.000																										
0.000	.685**	150		1.000																													
	1.000																																

On-line help on BB is useful			I received a training manual on how to use BB			I received training on how to use BB			Using BB is not time consuming			Additional time should be allocated for the housekeeping on BB			I find the workload between my lectures and the maintenance on BB manageable			There is adequate time during work hours to attend to lectures and BB			I know how to respond to students using BB			I know how to use BB to put up notifications and due dates			I know how to use BB to add/edit/update course material			I know how to use BB to add my class or a student			
Correlation	N	Sig.	Correlation	N	Sig.	Correlation	N	Sig.	Correlation	N	Sig.	Correlation	N	Sig.	Correlation	N	Sig.	Correlation	N	Sig.	Correlation	N	Sig.	Correlation	N	Sig.	Correlation	N	Sig.	Correlation	N	Sig.	Correlation	N
.193*	150	0.539	0.051	151	0.734	0.028	149	0.413	0.068	151	0.842	-0.016	148	0.038	.171*	152	0.020	.189*	152	0.143	0.119	151	0.004	.234**	152	0.003	.238**	151	0.027	.181*	151
0.116	150	0.787	0.022	151	0.056	0.156	149	0.737	-0.028	151	0.053	0.158	148	0.768	0.024	152	0.416	0.066	152	0.195	0.106	151	0.014	.199*	152	0.002	.254**	151	0.006	.221**	151
.279**	148	0.034	.174*	149	0.251	0.095	148	0.561	-0.048	150	0.051	0.160	147	0.624	-0.041	151	0.486	0.057	150	0.044	.164*	149	0.035	.173*	150	0.019	.191*	149	0.005	.231**	149
.176*	149	0.831	0.018	150	0.547	0.050	148	0.713	0.030	150	0.154	0.117	147	0.518	0.054	151	0.295	0.086	151	0.043	.165*	150	0.003	.243**	151	0.002	.245**	150	0.028	.179*	150
.266**	150	0.611	0.042	151	0.435	0.064	149	0.431	0.065	150	0.679	-0.034	147	0.011	.209*	151	0.003	.237**	151	0.000	.287**	150	0.000	.334**	151	0.000	.339**	150	0.000	.290**	150
.409**	145	0.026	.184*	146	0.001	.277**	145	0.151	0.120	147	0.243	0.097	145	0.001	.274**	147	0.000	.287**	148	0.000	.617**	147	0.000	.640**	148	0.000	.669**	147	0.000	.582**	147
- .167*	146	0.953	0.005	147	0.173	-0.113	146	0.130	-0.126	148	0.639	0.039	145	0.008	- .218**	149	0.001	- .276**	149	0.000	- .384**	148	0.000	- .460**	149	0.000	- .528**	148	0.000	- .393**	148
.400**	148	0.196	0.107	149	0.000	.353**	148	0.749	0.027	150	0.529	0.052	147	0.018	.195*	150	0.122	0.127	152	0.000	.547**	151	0.000	.477**	152	0.000	.491**	151	0.000	.500**	151
.339**	148	0.026	.183*	149	0.001	.264**	147	0.169	-0.114	149	0.354	0.076	146	0.612	-0.042	150	0.752	-0.026	151	0.000	.331**	150	0.000	.360**	151	0.000	.294**	150	0.001	.264**	150
.363**	146	0.012	.207*	147	0.003	.241**	146	0.618	0.042	148	0.489	0.057	145	0.934	-0.007	148	0.464	0.061	150	0.004	.232**	149	0.006	.224**	150	0.044	.164*	149	0.013	.202*	149
.363**	145	0.012	.209*	146	0.000	.364**	145	0.974	-0.003	147	0.756	0.026	145	0.473	0.060	147	0.690	0.033	149	0.000	.296**	148	0.005	.229**	149	0.002	.257**	148	0.019	.192*	148
.337**	147	0.207	0.105	148	0.000	.339**	147	0.721	-0.030	149	0.496	0.056	146	0.791	0.022	149	0.648	0.038	151	0.000	.364**	150	0.000	.325**	151	0.000	.359**	150	0.000	.333**	150
.393**	147	0.015	.200*	148	0.000	.313**	147	0.155	0.118	149	0.474	-0.059	146	0.081	0.145	149	0.011	.208*	151	0.000	.305**	150	0.000	.343**	151	0.000	.314**	150	0.000	.289**	150
.246**	147	0.008	.217**	148	0.023	.186*	146	0.261	0.094	148	0.766	-0.025	145	0.924	-0.008	149	0.183	0.110	150	0.011	.206*	149	0.010	.212**	150	0.033	.174*	149	0.107	0.132	149
.399**	146	0.066	0.152	147	0.001	.261**	145	0.084	0.144	147	0.221	-0.102	145	0.066	0.153	147	0.049	.163*	149	0.000	.355**	148	0.000	.387**	149	0.000	.342**	148	0.001	.276**	148
.415**	146	0.195	0.108	147	0.000	.328**	145	0.237	0.099	147	0.572	0.047	145	0.309	0.085	148	0.320	0.082	149	0.000	.398**	148	0.000	.358**	149	0.000	.295**	148	0.000	.383**	148
.430**	143	0.011	.212*	144	0.000	.348**	144	0.575	0.047	146	0.386	0.072	143	0.092	0.142	145	0.435	0.065	146	0.000	.445**	145	0.000	.433**	146	0.000	.371**	145	0.000	.453**	145
.311**	149	0.595	0.044	150	0.000	.311**	148	0.664	0.036	150	0.711	0.030	147	0.091	0.140	151	0.109	0.131	152	0.000	.516**	151	0.000	.656**	152	0.000	.658**	151	0.000	.505**	151
.373**	149	0.957	-0.004	150	0.003	.245**	148	0.935	-0.007	150	0.009	.213**	147	0.107	0.133	151	0.060	0.153	152	0.000	.653**	151	0.000	.663**	152	0.000	.622**	151	0.000	.647**	151
.525**	148	0.006	.225**	149	0.001	.270**	147	0.011	.210*	148	0.243	0.096	145	0.001	.281**	148	0.003	.246**	150	0.000	.614**	149	0.000	.560**	150	0.000	.602**	149	0.000	.552**	149
.337**	148	0.111	0.132	149	0.067	0.151	147	0.237	0.098	148	0.115	0.130	145	0.005	.234**	148	0.122	0.128	150	0.000	.428**	149	0.000	.391**	150	0.000	.397**	149	0.000	.460**	149
.312**	145	0.602	0.044	146	0.135	0.124	146	0.660	0.037	148	0.395	0.070	145	0.199	0.107	149	0.016	.198*	149	0.000	.403**	148	0.000	.427**	149	0.000	.493**	148	0.000	.344**	148
.367**	146	0.683	0.034	147	0.010	.213**	146	0.210	0.104	148	0.018	.194*	146	0.007	.224**	148	0.048	.163*	150	0.000	.584**	149	0.000	.569**	150	0.000	.545**	149	0.000	.551**	149
.412**	148	0.160	0.116	149	0.001	.267**	148	0.044	.166*	149	0.213	0.103	146	0.000	.355**	149	0.000	.305**	151	0.000	.636**	150	0.000	.644**	151	0.000	.608**	150	0.000	.554**	150
.437**	148	0.236	0.098	149	0.001	.273**	148	0.015	.199*	150	0.501	0.055	147	0.001	.262**	150	0.001	.277**	152	0.000	.492**	151	0.000	.560**	152	0.000	.569**	151	0.000	.488**	151
.395**	147	0.084	0.143	148	0.001	.271**	147	0.002	.259**	148	0.519	0.053	145	0.001	.275**	148	0.001	.275**	150	0.000	.597**	149	0.000	.631**	150	0.000	.561**	149	0.000	.552**	149
.338**	148	0.440	0.064	149	0.005	.229**	148	0.009	.215**	149	0.531	0.052	146	0.001	.280**	149	0.001	.278**	151	0.000	.564**	150	0.000	.662**	151	0.000	.622**	150	0.000	.563**	150
- .187*	146	0.895	-0.011	147	0.183	-0.110	146	0.863	-0.014	147	0.157	-0.117	144	0.152	-0.120	147	0.073	-0.148	149	0.000	- .399**	148	0.000	- .451**	149	0.000	- .468**	148	0.000	- .417**	148
.457**	147	0.168	0.114	148	0.000	.377**	146	0.216	0.103	148	0.086	0.142	145	0.002	.256**	148	0.005	.230**	150	0.000	.609**	149	0.000	.563**	150	0.000	.515**	149	0.000	.589**	150
.383**	148	0.368	0.075	149	0.000	.377**	147	0.482	0.058	149	0.069	0.149	146	0.048	.164*	149	0.017	.195*	151	0.000	.638**	150	0.000	.732**	151	0.000	.725**	150	0.000	.639**	151
.413**	148	0.170	0.113	149	0.000	.330**	147	0.305	0.085	149	0.009	.215**	147	0.012	.207*	149	0.065	0.152	151	0.000	.717**	150	0.000	.751**	151	0.000	.739**	151		1.000		
.472**	148	0.157	0.117	149	0.000	.352**	148	0.948	-0.005	150	0.070	0.148	147	0.017	.196*	150	0.031	.176*	152	0.000	.694**	151	0.000	.866**	152		1.000					
.372**	147	0.209	0.104	148	0.000	.316**	147	0.345	0.078	149	0.184	0.109	146	0.006	.227**	149	0.008	.217**	151	0.000	.761**	151		1.000								
.406**	148	0.016	.198*	149	0.000	.348**	148	0.193	0.108	150	0.024	.184*	147	0.005	.230**	150	0.057	0.156	152		1.000												
.170*	147	0.690	0.033	148	0.086	-0.142	148	0.000	.666**	150	0.000	- .446**	147	0.000	.807**	152		1.000															
.223**	145	0.280	0.090	146	0.266	-0.093	145	0.000	.637**	147	0.000	- .356**	148		1.000																		
0.142	147	0.368	0.075	148	0.019	.193*	149	0.000	- .351**	151		1.000																					
0.084	146	0.059	0.157	147	0.133	-0.125	149		1.000																								
.481**	150	0.000	.408**	151		1.000																											
.426**	150		1.000																														
1.000																																	

I am able to advise my students on how to use BB				
N	Sig.	Correlatio	N	Sig.
149	0.001	.272**	148	0.019
149	0.049	.162*	148	0.159
147	0.002	.255**	146	0.001
148	0.177	0.111	147	0.033
149	0.000	.375**	148	0.001
144	0.000	.617**	143	0.000
145	0.000	-.356**	144	0.045
148	0.000	.462**	147	0.000
148	0.000	.364**	147	0.000
146	0.000	.325**	145	0.000
146	0.000	.302**	144	0.000
147	0.001	.281**	146	0.000
147	0.000	.307**	147	0.000
147	0.006	.226**	146	0.003
147	0.000	.371**	145	0.000
147	0.000	.383**	145	0.000
144	0.000	.436**	144	0.000
149	0.000	.604**	148	0.000
149	0.000	.598**	148	0.000
148	0.000	.556**	147	0.000
148	0.000	.482**	147	0.000
145	0.000	.446**	145	0.000
147	0.000	.580**	145	0.000
148	0.000	.598**	147	0.000
148	0.000	.463**	147	0.000
147	0.000	.573**	147	0.000
148	0.000	.544**	147	0.000
146	0.000	-.320**	146	0.024
147	0.000	.612**	147	0.000
148	0.000	.646**	147	0.000
147	0.000	.657**	146	0.000
148	0.000	.676**	147	0.000
147	0.000	.668**	146	0.000
148	0.000	.659**	147	0.000
146	0.019	.194*	145	0.040
144	0.005	.235**	142	0.008
146	0.059	0.157	146	0.088
145	0.848	-0.016	145	0.314
148	0.000	.360**	147	0.000
147	0.007	.222**	146	0.000
146	0.000	.616**	148	
149		1.000		

O8 Correlations: Demographic Elements effect on the themes

I regularly browse the internet for personal, work, and study matters * Age Group Cross-tabulation								
			Age Group					Total
			≤ 30	31 - 35	36 - 40	41 - 45	46 - 50	> 50	
I regularly browse the internet for personal, work, and study matters	Strongly Agree	Count	18	11	11	28	20	12	100
		% within Age Group	54,5%	91,7%	64,7%	73,7%	87,0%	38,7%	64,9%
		% of Total	11,7%	7,1%	7,1%	18,2%	13,0%	7,8%	64,9%
	Agree	Count	13	1	5	8	3	18	48
		% within Age Group	39,4%	8,3%	29,4%	21,1%	13,0%	58,1%	31,2%
		% of Total	8,4%	0,6%	3,2%	5,2%	1,9%	11,7%	31,2%
	Neutral	Count	1	0	1	2	0	1	5
		% within Age Group	3,0%	0,0%	5,9%	5,3%	0,0%	3,2%	3,2%
		% of Total	0,6%	0,0%	0,6%	1,3%	0,0%	0,6%	3,2%
	Strongly Disagree	Count	1	0	0	0	0	0	1
		% within Age Group	3,0%	0,0%	0,0%	0,0%	0,0%	0,0%	0,6%
		% of Total	0,6%	0,0%	0,0%	0,0%	0,0%	0,0%	0,6%
Total		Count	33	12	17	38	23	31	154
		% within Age Group	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
		% of Total	21,4%	7,8%	11,0%	24,7%	14,9%	20,1%	100,0%

I know what process to follow when I need assistance on BB * Gender Cross-tabulation					
			Gender		Total
			Male	Female	
I know what process to follow when I need assistance on BB	Strongly Agree	Count	13	21	34
		% within Gender	17,3%	29,2%	23,1%
		% of Total	8,8%	14,3%	23,1%
	Agree	Count	29	36	65
		% within Gender	38,7%	50,0%	44,2%
		% of Total	19,7%	24,5%	44,2%
	Neutral	Count	18	6	24
		% within Gender	24,0%	8,3%	16,3%
		% of Total	12,2%	4,1%	16,3%
	Disagree	Count	12	8	20
		% within Gender	16,0%	11,1%	13,6%
		% of Total	8,2%	5,4%	13,6%
	Strongly Disagree	Count	3	1	4
		% within Gender	4,0%	1,4%	2,7%
		% of Total	2,0%	0,7%	2,7%
Total		Count	75	72	147
		% within Gender	100,0%	100,0%	100,0%
		% of Total	51,0%	49,0%	100,0%

There are policies, procedures and guideline documentation available * Age Group Cross-tabulation								
			Age Group					Total
			≤ 30	31 - 35	36 - 40	41 - 45	46 - 50	> 50	
There are policies, procedures and guideline documentation available	Strongly Agree	Count	1	2	1	12	3	1	20
		% within Age Group	3,1%	16,7%	5,9%	30,8%	13,6%	3,2%	13,1%
		% of Total	0,7%	1,3%	0,7%	7,8%	2,0%	0,7%	13,1%
	Agree	Count	10	3	5	13	10	12	53
		% within Age Group	31,3%	25,0%	29,4%	33,3%	45,5%	38,7%	34,6%
		% of Total	6,5%	2,0%	3,3%	8,5%	6,5%	7,8%	34,6%
	Neutral	Count	13	6	10	12	9	15	65
		% within Age Group	40,6%	50,0%	58,8%	30,8%	40,9%	48,4%	42,5%
		% of Total	8,5%	3,9%	6,5%	7,8%	5,9%	9,8%	42,5%
	Disagree	Count	7	1	0	2	0	3	13
		% within Age Group	21,9%	8,3%	0,0%	5,1%	0,0%	9,7%	8,5%
		% of Total	4,6%	0,7%	0,0%	1,3%	0,0%	2,0%	8,5%
	Strongly Disagree	Count	1	0	1	0	0	0	2
		% within Age Group	3,1%	0,0%	5,9%	0,0%	0,0%	0,0%	1,3%

		% of Total	0,7%	0,0%	0,7%	0,0%	0,0%	0,0%	1,3%
Total		Count	32	12	17	39	22	31	153
		% within Age Group	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
		% of Total	20,9%	7,8%	11,1%	25,5%	14,4%	20,3%	100,0%

There are policies, procedures and guideline documentation available * Gender Cross-tabulation

			Gender		Total
			Male	Female	
There are policies, procedures and guideline documentation available	Strongly Agree	Count	4	16	20
		% within Gender	5,3%	22,2%	13,5%
		% of Total	2,7%	10,8%	13,5%
	Agree	Count	26	25	51
		% within Gender	34,2%	34,7%	34,5%
		% of Total	17,6%	16,9%	34,5%
	Neutral	Count	35	26	61
		% within Gender	46,1%	36,1%	41,2%
		% of Total	23,6%	17,6%	41,2%
	Disagree	Count	9	4	13
		% within Gender	11,8%	5,6%	8,8%
		% of Total	6,1%	2,7%	8,8%
	Strongly Disagree	Count	2	1	3
		% within Gender	2,6%	1,4%	2,0%
		% of Total	1,4%	0,7%	2,0%
Total		Count	76	72	148
		% within Gender	100,0%	100,0%	100,0%
		% of Total	51,4%	48,6%	100,0%

This documentation is easily accessible to all staff to follow when assistance on BB is needed * Age Group Cross-tabulation

			Age Group						Total
			≤ 30	31 - 35	36 - 40	41 - 45	46 - 50	> 50	
This documentation is easily accessible to all staff to follow when assistance on BB is needed	Strongly Agree	Count	2	3	0	9	3	1	18
		% within Age Group	6,3%	25,0%	0,0%	24,3%	13,6%	3,3%	12,0%
		% of Total	1,3%	2,0%	0,0%	6,0%	2,0%	0,7%	12,0%
	Agree	Count	11	2	8	10	11	7	49
		% within Age Group	34,4%	16,7%	47,1%	27,0%	50,0%	23,3%	32,7%
		% of Total	7,3%	1,3%	5,3%	6,7%	7,3%	4,7%	32,7%
	Neutral	Count	10	6	7	17	6	13	59
		% within Age Group	31,3%	50,0%	41,2%	45,9%	27,3%	43,3%	39,3%
		% of Total	6,7%	4,0%	4,7%	11,3%	4,0%	8,7%	39,3%
	Disagree	Count	8	1	2	1	2	7	21
		% within Age Group	25,0%	8,3%	11,8%	2,7%	9,1%	23,3%	14,0%
		% of Total	5,3%	0,7%	1,3%	0,7%	1,3%	4,7%	14,0%
	Strongly Disagree	Count	1	0	0	0	0	2	3
		% within Age Group	3,1%	0,0%	0,0%	0,0%	0,0%	6,7%	2,0%
		% of Total	0,7%	0,0%	0,0%	0,0%	0,0%	1,3%	2,0%
Total		Count	32	12	17	37	22	30	150
		% within Age Group	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
		% of Total	21,3%	8,0%	11,3%	24,7%	14,7%	20,0%	100,0%

This documentation is easily accessible to all staff to follow when assistance on BB is needed * Gender Cross-tabulation

			Gender		Total
			Male	Female	
This documentation is easily accessible to all	Strongly Agree	Count	2	16	18
		% within Gender	2,7%	22,2%	12,4%
		% of Total	1,4%	11,0%	12,4%
	Agree	Count	25	21	46
		% within Gender	34,2%	29,2%	31,7%
		% of Total	17,2%	14,5%	31,7%

	Neutral	Count	35	21	56
		% within Gender	47,9%	29,2%	38,6%
		% of Total	24,1%	14,5%	38,6%
	Disagree	Count	8	13	21
		% within Gender	11,0%	18,1%	14,5%
		% of Total	5,5%	9,0%	14,5%
	Strongly Disagree	Count	3	1	4
		% within Gender	4,1%	1,4%	2,8%
		% of Total	2,1%	0,7%	2,8%
Total		Count	73	72	145
		% within Gender	100,0%	100,0%	100,0%
		% of Total	50,3%	49,7%	100,0%

Any queries on BB are answered promptly and in time for me to continue with my task * Age Group Cross-tabulation

			Age Group						Total
			≤ 30	31 - 35	36 - 40	41 - 45	46 - 50	> 50	
Any queries on BB are answered promptly and in time for me to continue with my task	Strongly Agree	Count	2	3	2	9	5	1	22
		% within Age Group	6,3%	25,0%	11,8%	24,3%	22,7%	3,3%	14,7%
		% of Total	1,3%	2,0%	1,3%	6,0%	3,3%	0,7%	14,7%
	Agree	Count	8	2	7	10	10	8	45
		% within Age Group	25,0%	16,7%	41,2%	27,0%	45,5%	26,7%	30,0%
		% of Total	5,3%	1,3%	4,7%	6,7%	6,7%	5,3%	30,0%
	Neutral	Count	13	6	6	13	4	13	55
		% within Age Group	40,6%	50,0%	35,3%	35,1%	18,2%	43,3%	36,7%
		% of Total	8,7%	4,0%	4,0%	8,7%	2,7%	8,7%	36,7%
	Disagree	Count	4	1	2	5	3	8	23
		% within Age Group	12,5%	8,3%	11,8%	13,5%	13,6%	26,7%	15,3%
		% of Total	2,7%	0,7%	1,3%	3,3%	2,0%	5,3%	15,3%
	Strongly Disagree	Count	5	0	0	0	0	0	5
		% within Age Group	15,6%	0,0%	0,0%	0,0%	0,0%	0,0%	3,3%
		% of Total	3,3%	0,0%	0,0%	0,0%	0,0%	0,0%	3,3%
Total		Count	32	12	17	37	22	30	150
		% within Age Group	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
		% of Total	21,3%	8,0%	11,3%	24,7%	14,7%	20,0%	100,0%

Any queries on BB are answered promptly and in time for me to continue with my task * Gender Cross-tabulation

			Gender		Total
			Male	Female	
Any queries on BB are answered promptly and in time for me to continue with my task	Strongly Agree	Count	5	17	22
		% within Gender	6,8%	23,9%	15,3%
		% of Total	3,5%	11,8%	15,3%
	Agree	Count	16	26	42
		% within Gender	21,9%	36,6%	29,2%
		% of Total	11,1%	18,1%	29,2%
	Neutral	Count	35	19	54
		% within Gender	47,9%	26,8%	37,5%
		% of Total	24,3%	13,2%	37,5%
	Disagree	Count	14	7	21
		% within Gender	19,2%	9,9%	14,6%
		% of Total	9,7%	4,9%	14,6%
	Strongly Disagree	Count	3	2	5
		% within Gender	4,1%	2,8%	3,5%
		% of Total	2,1%	1,4%	3,5%
Total		Count	73	71	144
		% within Gender	100,0%	100,0%	100,0%
		% of Total	50,7%	49,3%	100,0%

Contact details for BB support staff are known * Ethnic Group Cross-tabulation

	Ethnic Group	Total

			African	Coloured	Indian	White	
Contact details for BB support staff are known	Strongly Agree	Count	6	2	15	4	27
		% within Ethnic Group	9,5%	25,0%	22,7%	30,8%	18,0%
		% of Total	4,0%	1,3%	10,0%	2,7%	18,0%
	Agree	Count	24	2	31	3	60
		% within Ethnic Group	38,1%	25,0%	47,0%	23,1%	40,0%
		% of Total	16,0%	1,3%	20,7%	2,0%	40,0%
	Neutral	Count	20	3	10	3	36
		% within Ethnic Group	31,7%	37,5%	15,2%	23,1%	24,0%
		% of Total	13,3%	2,0%	6,7%	2,0%	24,0%
	Disagree	Count	7	0	10	3	20
		% within Ethnic Group	11,1%	0,0%	15,2%	23,1%	13,3%
		% of Total	4,7%	0,0%	6,7%	2,0%	13,3%
	Strongly Disagree	Count	6	1	0	0	7
		% within Ethnic Group	9,5%	12,5%	0,0%	0,0%	4,7%
		% of Total	4,0%	0,7%	0,0%	0,0%	4,7%
Total		Count	63	8	66	13	150
		% within Ethnic Group	100,0%	100,0%	100,0%	100,0%	100,0%
		% of Total	42,0%	5,3%	44,0%	8,7%	100,0%

Support staff are ready to assist and available when needed * Age Group Cross-tabulation

			Age Group						Total
			≤ 30	31 - 35	36 - 40	41 - 45	46 - 50	> 50	
Support staff are ready to assist and available when needed	Strongly Agree	Count	2	2	1	11	4	2	22
		% within Age Group	6,1%	16,7%	6,3%	28,9%	18,2%	6,9%	14,7%
		% of Total	1,3%	1,3%	0,7%	7,3%	2,7%	1,3%	14,7%
	Agree	Count	13	3	11	14	11	11	63
		% within Age Group	39,4%	25,0%	68,8%	36,8%	50,0%	37,9%	42,0%
		% of Total	8,7%	2,0%	7,3%	9,3%	7,3%	7,3%	42,0%
	Neutral	Count	7	6	4	12	5	9	43
		% within Age Group	21,2%	50,0%	25,0%	31,6%	22,7%	31,0%	28,7%
		% of Total	4,7%	4,0%	2,7%	8,0%	3,3%	6,0%	28,7%
	Disagree	Count	5	1	0	0	1	7	14
		% within Age Group	15,2%	8,3%	0,0%	0,0%	4,5%	24,1%	9,3%
		% of Total	3,3%	0,7%	0,0%	0,0%	0,7%	4,7%	9,3%
	Strongly Disagree	Count	6	0	0	1	1	0	8
		% within Age Group	18,2%	0,0%	0,0%	2,6%	4,5%	0,0%	5,3%
		% of Total	4,0%	0,0%	0,0%	0,7%	0,7%	0,0%	5,3%
Total		Count	33	12	16	38	22	29	150
		% within Age Group	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%	100,0%
		% of Total	22,0%	8,0%	10,7%	25,3%	14,7%	19,3%	100,0%

There are known policies in place at DUT regarding BB * Ethnic Group Cross-tabulation

			Ethnic Group				Total
			African	Coloured	Indian	White	
There are known policies in place at DUT regarding BB	Strongly Agree	Count	5	1	7	3	16
		% within Ethnic Group	7,8%	14,3%	10,4%	23,1%	10,6%
		% of Total	3,3%	0,7%	4,6%	2,0%	10,6%
	Agree	Count	13	2	33	3	51
		% within Ethnic Group	20,3%	28,6%	49,3%	23,1%	33,8%
		% of Total	8,6%	1,3%	21,9%	2,0%	33,8%
	Neutral	Count	36	3	22	5	66
		% within Ethnic Group	56,3%	42,9%	32,8%	38,5%	43,7%
		% of Total	23,8%	2,0%	14,6%	3,3%	43,7%
	Disagree	Count	5	1	5	2	13
		% within Ethnic Group	7,8%	14,3%	7,5%	15,4%	8,6%
		% of Total	3,3%	0,7%	3,3%	1,3%	8,6%
	Strongly Disagree	Count	5	0	0	0	5
		% within Ethnic Group	7,8%	0,0%	0,0%	0,0%	3,3%

		% of Total	3,3%	0,0%	0,0%	0,0%	3,3%
Total		Count	64	7	67	13	151
		% within Ethnic Group	100,0%	100,0%	100,0%	100,0%	100,0%
		% of Total	42,4%	4,6%	44,4%	8,6%	100,0%

I follow the guidelines provided to allow the use of BB to aid in my teaching * Gender Cross-tabulation

			Gender		Total
			Male	Female	
I follow the guidelines provided to allow the use of BB to aid in my teaching	Strongly Agree	Count	5	16	21
		% within Gender	6,9%	23,2%	14,9%
		% of Total	3,5%	11,3%	14,9%
	Agree	Count	33	34	67
		% within Gender	45,8%	49,3%	47,5%
		% of Total	23,4%	24,1%	47,5%
	Neutral	Count	22	13	35
		% within Gender	30,6%	18,8%	24,8%
		% of Total	15,6%	9,2%	24,8%
	Disagree	Count	11	5	16
		% within Gender	15,3%	7,2%	11,3%
		% of Total	7,8%	3,5%	11,3%
	Strongly Disagree	Count	1	1	2
		% within Gender	1,4%	1,4%	1,4%
		% of Total	0,7%	0,7%	1,4%
Total		Count	72	69	141
		% within Gender	100,0%	100,0%	100,0%
		% of Total	51,1%	48,9%	100,0%

I support subject content being presented online * Gender Cross-tabulation

			Gender		Total
			Male	Female	
I support subject content being presented online	Strongly Agree	Count	17	31	48
		% within Gender	23,0%	44,3%	33,3%
		% of Total	11,8%	21,5%	33,3%
	Agree	Count	42	23	65
		% within Gender	56,8%	32,9%	45,1%
		% of Total	29,2%	16,0%	45,1%
	Neutral	Count	13	9	22
		% within Gender	17,6%	12,9%	15,3%
		% of Total	9,0%	6,3%	15,3%
	Disagree	Count	1	6	7
		% within Gender	1,4%	8,6%	4,9%
		% of Total	0,7%	4,2%	4,9%
	Strongly Disagree	Count	1	1	2
		% within Gender	1,4%	1,4%	1,4%
		% of Total	0,7%	0,7%	1,4%
Total		Count	74	70	144
		% within Gender	100,0%	100,0%	100,0%
		% of Total	51,4%	48,6%	100,0%

The adoption on BB has positively changed the way I teach * Gender Cross-tabulation

			Gender		Total
			Male	Female	
The adoption on BB has positively changed the	Strongly Agree	Count	11	22	33
		% within Gender	15,1%	31,0%	22,9%
		% of Total	7,6%	15,3%	22,9%
	Agree	Count	24	18	42
		% within Gender	32,9%	25,4%	29,2%
		% of Total	16,7%	12,5%	29,2%
	Neutral	Count	34	20	54

		% within Gender	46,6%	28,2%	37,5%
		% of Total	23,6%	13,9%	37,5%
	Disagree	Count	1	11	12
		% within Gender	1,4%	15,5%	8,3%
		% of Total	0,7%	7,6%	8,3%
	Strongly Disagree	Count	3	0	3
		% within Gender	4,1%	0,0%	2,1%
		% of Total	2,1%	0,0%	2,1%
Total		Count	73	71	144
		% within Gender	100,0%	100,0%	100,0%
		% of Total	50,7%	49,3%	100,0%

I know how to use BB to add my subject material * Citizenship Cross-tabulation

			Citizenship		Total
			SA citizen	Non SA citizen	
I know how to use BB to add my subject material	Strongly Agree	Count	38	3	41
		% within Citizenship	29,5%	16,7%	27,9%
		% of Total	25,9%	2,0%	27,9%
	Agree	Count	67	7	74
		% within Citizenship	51,9%	38,9%	50,3%
		% of Total	45,6%	4,8%	50,3%
	Neutral	Count	13	2	15
		% within Citizenship	10,1%	11,1%	10,2%
		% of Total	8,8%	1,4%	10,2%
	Disagree	Count	7	5	12
		% within Citizenship	5,4%	27,8%	8,2%
		% of Total	4,8%	3,4%	8,2%
	Strongly Disagree	Count	4	1	5
		% within Citizenship	3,1%	5,6%	3,4%
		% of Total	2,7%	0,7%	3,4%
Total		Count	129	18	147
		% within Citizenship	100,0%	100,0%	100,0%
		% of Total	87,8%	12,2%	100,0%

I know how to use BB to add my class or a student * Gender Cross-tabulation

			Gender		Total
			Male	Female	
I know how to use BB to add my class or a student	Strongly Agree	Count	14	25	39
		% within Gender	18,9%	35,2%	26,9%
		% of Total	9,7%	17,2%	26,9%
	Agree	Count	23	27	50
		% within Gender	31,1%	38,0%	34,5%
		% of Total	15,9%	18,6%	34,5%
	Neutral	Count	18	6	24
		% within Gender	24,3%	8,5%	16,6%
		% of Total	12,4%	4,1%	16,6%
	Disagree	Count	13	10	23
		% within Gender	17,6%	14,1%	15,9%
		% of Total	9,0%	6,9%	15,9%
	Strongly Disagree	Count	6	3	9
		% within Gender	8,1%	4,2%	6,2%
		% of Total	4,1%	2,1%	6,2%
Total		Count	74	71	145
		% within Gender	100,0%	100,0%	100,0%
		% of Total	51,0%	49,0%	100,0%

I know how to use BB to add/edit/update course material * Ethnic Group Cross-tabulation

	Ethnic Group				Total
	African	Coloured	Indian	White	

I know how to use BB to add/edit/update course material	Strongly Agree	Count	12	4	27	5	48
		% within Ethnic Group	18,8%	50,0%	40,9%	38,5%	31,8%
		% of Total	7,9%	2,6%	17,9%	3,3%	31,8%
	Agree	Count	30	1	27	6	64
		% within Ethnic Group	46,9%	12,5%	40,9%	46,2%	42,4%
		% of Total	19,9%	0,7%	17,9%	4,0%	42,4%
	Neutral	Count	10	1	4	0	15
		% within Ethnic Group	15,6%	12,5%	6,1%	0,0%	9,9%
		% of Total	6,6%	0,7%	2,6%	0,0%	9,9%
	Disagree	Count	8	2	8	0	18
		% within Ethnic Group	12,5%	25,0%	12,1%	0,0%	11,9%
		% of Total	5,3%	1,3%	5,3%	0,0%	11,9%
	Strongly Disagree	Count	4	0	0	2	6
		% within Ethnic Group	6,3%	0,0%	0,0%	15,4%	4,0%
		% of Total	2,6%	0,0%	0,0%	1,3%	4,0%
Total		Count	64	8	66	13	151
		% within Ethnic Group	100,0%	100,0%	100,0%	100,0%	100,0%
		% of Total	42,4%	5,3%	43,7%	8,6%	100,0%

I know how to use BB to add/edit/update course material * Citizenship Cross-tabulation

			Citizenship		Total
			SA citizen	Non SA citizen	
I know how to use BB to add/edit/update course material	Strongly Agree	Count	43	3	46
		% within Citizenship	33,3%	15,8%	31,1%
		% of Total	29,1%	2,0%	31,1%
	Agree	Count	57	7	64
		% within Citizenship	44,2%	36,8%	43,2%
		% of Total	38,5%	4,7%	43,2%
	Neutral	Count	13	2	15
		% within Citizenship	10,1%	10,5%	10,1%
		% of Total	8,8%	1,4%	10,1%
	Disagree	Count	11	6	17
		% within Citizenship	8,5%	31,6%	11,5%
		% of Total	7,4%	4,1%	11,5%
	Strongly Disagree	Count	5	1	6
		% within Citizenship	3,9%	5,3%	4,1%
		% of Total	3,4%	0,7%	4,1%
Total		Count	129	19	148
		% within Citizenship	100,0%	100,0%	100,0%
		% of Total	87,2%	12,8%	100,0%

I know how to use BB to put up notifications and due dates * Gender Cross-tabulation

			Gender		Total
			Male	Female	
I know how to use BB to put up notifications and due dates	Strongly Agree	Count	16	31	47
		% within Gender	21,9%	43,1%	32,4%
		% of Total	11,0%	21,4%	32,4%
	Agree	Count	33	22	55
		% within Gender	45,2%	30,6%	37,9%
		% of Total	22,8%	15,2%	37,9%
	Neutral	Count	10	11	21
		% within Gender	13,7%	15,3%	14,5%
		% of Total	6,9%	7,6%	14,5%
	Disagree	Count	9	7	16
		% within Gender	12,3%	9,7%	11,0%
		% of Total	6,2%	4,8%	11,0%
	Strongly Disagree	Count	5	1	6
		% within Gender	6,8%	1,4%	4,1%
		% of Total	3,4%	0,7%	4,1%
Total		Count	73	72	145

	% within Gender	100,0%	100,0%	100,0%	
	% of Total	50,3%	49,7%	100,0%	

I know how to use BB to put up notifications and due dates * Ethnic Group Cross-tabulation							
			Ethnic Group				Total
			African	Coloured	Indian	White	
I know how to use BB to put up notifications and due dates	Strongly Agree	Count	13	3	27	5	48
		% within Ethnic Group	20,6%	37,5%	40,9%	38,5%	32,0%
		% of Total	8,7%	2,0%	18,0%	3,3%	32,0%
	Agree	Count	27	2	23	3	55
		% within Ethnic Group	42,9%	25,0%	34,8%	23,1%	36,7%
		% of Total	18,0%	1,3%	15,3%	2,0%	36,7%
	Neutral	Count	11	0	10	0	21
		% within Ethnic Group	17,5%	0,0%	15,2%	0,0%	14,0%
		% of Total	7,3%	0,0%	6,7%	0,0%	14,0%
	Disagree	Count	8	3	6	3	20
		% within Ethnic Group	12,7%	37,5%	9,1%	23,1%	13,3%
		% of Total	5,3%	2,0%	4,0%	2,0%	13,3%
	Strongly Disagree	Count	4	0	0	2	6
		% within Ethnic Group	6,3%	0,0%	0,0%	15,4%	4,0%
		% of Total	2,7%	0,0%	0,0%	1,3%	4,0%
Total		Count	63	8	66	13	150
		% within Ethnic Group	100,0%	100,0%	100,0%	100,0%	100,0%
		% of Total	42,0%	5,3%	44,0%	8,7%	100,0%

I find the workload between my lectures and the maintenance on BB manageable * Ethnic Group Cross-tabulation							
			Ethnic Group				Total
			African	Coloured	Indian	White	
I find the workload between my lectures and the maintenance on BB manageable	Strongly Agree	Count	2	0	6	0	8
		% within Ethnic Group	3,3%	0,0%	9,2%	0,0%	5,4%
		% of Total	1,4%	0,0%	4,1%	0,0%	5,4%
	Agree	Count	22	0	14	3	39
		% within Ethnic Group	36,1%	0,0%	21,5%	23,1%	26,5%
		% of Total	15,0%	0,0%	9,5%	2,0%	26,5%
	Neutral	Count	21	2	21	3	47
		% within Ethnic Group	34,4%	25,0%	32,3%	23,1%	32,0%
		% of Total	14,3%	1,4%	14,3%	2,0%	32,0%
	Disagree	Count	9	2	17	6	34
		% within Ethnic Group	14,8%	25,0%	26,2%	46,2%	23,1%
		% of Total	6,1%	1,4%	11,6%	4,1%	23,1%
	Strongly Disagree	Count	7	4	7	1	19
		% within Ethnic Group	11,5%	50,0%	10,8%	7,7%	12,9%
		% of Total	4,8%	2,7%	4,8%	0,7%	12,9%
Total		Count	61	8	65	13	147
		% within Ethnic Group	100,0%	100,0%	100,0%	100,0%	100,0%
		% of Total	41,5%	5,4%	44,2%	8,8%	100,0%

Additional time should be allocated for the housekeeping on BB * Ethnic Group Cross-tabulation							
			Ethnic Group				Total
			African	Coloured	Indian	White	
Additional time should be allocated for the housekeeping on BB	Strongly Agree	Count	10	5	20	3	38
		% within Ethnic Group	15,6%	62,5%	30,3%	25,0%	25,3%
		% of Total	6,7%	3,3%	13,3%	2,0%	25,3%
	Agree	Count	28	0	24	6	58
		% within Ethnic Group	43,8%	0,0%	36,4%	50,0%	38,7%
		% of Total	18,7%	0,0%	16,0%	4,0%	38,7%
	Neutral	Count	19	2	17	0	38
		% within Ethnic Group	29,7%	25,0%	25,8%	0,0%	25,3%
		% of Total	12,7%	1,3%	11,3%	0,0%	25,3%
	Disagree	Count	6	0	3	3	12

		% within Ethnic Group	9,4%	0,0%	4,5%	25,0%	8,0%
		% of Total	4,0%	0,0%	2,0%	2,0%	8,0%
	Strongly Disagree	Count	1	1	2	0	4
		% within Ethnic Group	1,6%	12,5%	3,0%	0,0%	2,7%
		% of Total	0,7%	0,7%	1,3%	0,0%	2,7%
Total		Count	64	8	66	12	150
		% within Ethnic Group	100,0%	100,0%	100,0%	100,0%	100,0%
		% of Total	42,7%	5,3%	44,0%	8,0%	100,0%

Using BB is not time consuming * Ethnic Group Cross-tabulation

			Ethnic Group				Total
			African	Coloured	Indian	White	
Using BB is not time consuming	Strongly Agree	Count	6	1	7	0	14
		% within Ethnic Group	9,5%	12,5%	10,6%	0,0%	9,5%
		% of Total	4,1%	0,7%	4,7%	0,0%	9,5%
	Agree	Count	19	0	14	0	33
		% within Ethnic Group	30,2%	0,0%	21,2%	0,0%	22,3%
		% of Total	12,8%	0,0%	9,5%	0,0%	22,3%
	Neutral	Count	19	2	17	2	40
		% within Ethnic Group	30,2%	25,0%	25,8%	18,2%	27,0%
		% of Total	12,8%	1,4%	11,5%	1,4%	27,0%
	Disagree	Count	12	1	18	7	38
		% within Ethnic Group	19,0%	12,5%	27,3%	63,6%	25,7%
		% of Total	8,1%	0,7%	12,2%	4,7%	25,7%
	Strongly Disagree	Count	7	4	10	2	23
		% within Ethnic Group	11,1%	50,0%	15,2%	18,2%	15,5%
		% of Total	4,7%	2,7%	6,8%	1,4%	15,5%
Total		Count	63	8	66	11	148
		% within Ethnic Group	100,0%	100,0%	100,0%	100,0%	100,0%
		% of Total	42,6%	5,4%	44,6%	7,4%	100,0%

I received training on how to use BB * Citizenship Cross-tabulation

			Citizenship		Total
			SA citizen	Non SA citizen	
I received training on how to use BB	Strongly Agree	Count	29	3	32
		% within Citizenship	22,3%	17,6%	21,8%
		% of Total	19,7%	2,0%	21,8%
	Agree	Count	57	4	61
		% within Citizenship	43,8%	23,5%	41,5%
		% of Total	38,8%	2,7%	41,5%
	Neutral	Count	10	6	16
		% within Citizenship	7,7%	35,3%	10,9%
		% of Total	6,8%	4,1%	10,9%
	Disagree	Count	22	3	25
		% within Citizenship	16,9%	17,6%	17,0%
		% of Total	15,0%	2,0%	17,0%
	Strongly Disagree	Count	12	1	13
		% within Citizenship	9,2%	5,9%	8,8%
		% of Total	8,2%	0,7%	8,8%
Total		Count	130	17	147
		% within Citizenship	100,0%	100,0%	100,0%
		% of Total	88,4%	11,6%	100,0%

O9 Descriptive Statistics across themes

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Technology	156	1.00	4.67	1.6372	.62589
Software	152	1.00	5.00	2.3520	.91228
Ease	154	1.00	4.20	2.2144	.79564
Functionality	152	1.00	5.00	2.3093	.95424
Internal Support	155	1.00	5.00	2.5149	.78828
Policies Procedures	153	1.00	5.00	2.3949	.78481
Time	153	1.00	5.00	3.1122	1.07075
Training	152	1.00	5.00	2.8180	.87155

APPENDIX P: Qualitative responses from the main study

J56 Adoption of BB at DUT
BB is a useful tool on teaching and learning . The implementation must be complusory to all students and staff.
Online help manuals guides should be sent out to staff using BB
Improve ease of access for both lecturers and students
insufficient indepth training on BB. Only superficial training given on how to setup a classroom. Insufficient/inadequate training given on assessments - limited to mcq- should XXX on assignments and yyy forms and assessments
I would love to see this become more user friendly and for it to become more useable - pleasing and encouraging to use
I think the improvement in terms of speed is important to allow students accessing uploaded materials on BB. There is always long time between posting something and the notification to access it on BB
Training provided was useful to know the technical aspects of BB eg how to setup the classroom, upload content, set assessment etc. The pedagogical training/knowledge however was lacking. Staff that do not have a formal educational qualificiation/training tend to implement the tool without understnading / evaluating its effect on the learning process.
the remote access of BB has been problematic and has demotivated me.
It lacks real-time interaction
The use of BB for Mathematics is limited. It is time consuming to type an equation/math formulars and hence the capability to generate tests is not utilized by me. I am currently using the LMS to supplement notes and for communication.
greater support - dedicated staff to upload and manage class content by an IT expert - information can be supplied by lecturer
I really need to get going with BB - my own fault
System needs to be more user firendly
The training was not adequate. Person doing the training was too dull and boring. Also the training lacked academic experience
I did not get training to use BB
I have found that the current old-fashioned way of teaching , making information available, publishing results etc is adequate. I feel BB for me is currently a waste of time. Students are not all equipped with electronic devices, don't have money for airtime and cannot access BB remotely.
It is very difficult to fit BB in with current workload and other added responsibilities
Yes it engages students to use the online resources and view notes- its what universities need
This is such a nice tool to teach however I am still not understanding why we are still wasting so much paper printing study guides and notes while we can upload everything on BB
They need to provide proper innovative ways to attract staff and students to keep learning the various functions available on BB
I think that it is important to allocate a BB champion to each department. This will certainly facilitate effective use of BB and allay concerns and glitches in th use of BB
BB has enormous potential which can only be optimized if the necessary resources are available
BB is not a solution to education because it causes a lot of issues between students and the lecturers

students complain that they cannot access the material - would rather have it emailed to them
A more user friendly online manual and hands-on training sessions should be introduced
I believe that BB LMS should be used as a learning tool and a medium whereby content should be uploaded and extracted by students. However I have reservations regarding our students being consistent if BB LMS were to be used for assessment purposes.
Furthur education on how to use BB to staff and students
Students need to be provided with information about BB campuswide. A short intro to BB, a workshop, a little guide to assist them in using BB. Students make excuses otherwise to not use BB despite lecturers uploading content.
Its now great that al/most students add automatically when students register at beginning of semester. Was time consuming to do ourselves.
Its hard putting up assessments for programming subjects as BB works mainly with MCQs
DUT should consider a free alternative to BB. Costs are too high for BB
I never received training on BB
The implementation of these systems is not to replace traditional lectures but to enhance learning. The question arises as to whether we are a contact drivent university or distance/self study institution
Up to date training and followups needed
Ongoing adequate training should be provided to staff showing advanced features and other software that BB integrates with
a mobile component required for all processes
I found it difficult to use mathematical operations on BB and sometimes people who are training us do not know where to go on BB to find those mathematical operations
There is a need for proper coordination of BB training for academic staff on campus. Currently it is not clear when and how the training takes place
There should be more workshops on using BB for assessments both formative and summative
greater support - dedicated staff to upload and manage class content by an IT expert - information can be supplied by lecturer
support for novice / new staff. 24hr helpline. There should be a move towards opensource LMS like moodle, sakal, enrodo
Most often I would like to attend but cannot do so due to lectures load. Kitchen practicals are scheduled for 7 hours a day
after training I used it regularly and got the students to use it
It would be nice to have assistance regarding the uploading and setting of tests on BB. Also the download of marks from BB. We had problems with setting online tests and assignments
The turnaround time for queries should be improved. We had an issue with an assigment online that was only visible to the dbn students and not the pmb students. We had to extend due dates as the mother module was created very late and the info was not copied to the mother module in totality
Initially the take up by students was slow but how it has picked up and the interaction - great!
Some students are not actively accessing BB. There needs to be some intervention administratively that forces students to look at BB. Maybe rerouting their ITS access through BB. It seems to be a practice at other universities. Also older students are reluctant to use BB - not sure why
Less downtime
The lecturer does not always have to be in front of the students and it is a new challenge for me
Need more consistent training
More training provided on use of BB
There are many errors/glitches that students face when logging on especially once logged on the courses that the student is registered for is not visible making this difficult for them.
The way content s uploaded onto BB should be addressed. Doing 1 file at a time is time consuming where adding folders would be way easier and time efficient.
Perhaps a ' roadshow' should be conducted with each department to show staff on how to use and update test usage capacity with BB. Also 'zip' files should be allowed so that modules of bulk coursework can be uploaded easily.
There are other functions in BB which I personally don't find valuable.
Other features should be implemented on BB
Training for students or workshops
Yes, BB has been a beneficial aid to the institution especially in terms of university and student unrest - lecturers are then able to communicate with studetns on BB able to give them work content and messages
BB training discussions must remain as ongoing to allow staff to be kept updated at any gien time

For BB to work well students need to have tablets (minimum) - currently many access them via tiny cellphones
It must be user friendly
The system allows students to connect to course from anywhere on planet as long as they have internet, which is most attractive.
I have answered section b in some cases pertaining to moodle and in other instances (NA) declined to rate as I have not had any training on BB and have never used it.
The students should be given training but not in lecture time by lecturers. Rather by the BB admin dept.
unfortunately engineering is using moodle. Would need a real presentation showing benefits to move to BB
I have found the support staff very helpful. I am still working on the quiz side of things.

J57 Most useful features
Easily accessible
easy and accessible
convenience it gives to students to engage in course content
It has improved the rate of interaction between students and lecturers
students can access information on their own
From what I hear from my colleagues its easy to work with but does not communicate closely with students
helps to communicate with students on mass
usefull as an additional tool - cannot replace classroom- need one on one
user friendliness
nothing
serves as reference and filing tool and one can interact with students without having to be in class
adequate, efficient and convenient
everything
Support of IT staff
Allow for subject content online/ ease accessible
The wide variety of features - assessment tools, collaboration, content etc.
It is linked to the IT system
Keeping students updated with the information and links all at once as the registered info is always stored there.
convenience
can use to do on-line learning - notes/application excercises, notices on test dates, assignment due dates
convenience - hopefully it appeals to my students
easy to access notes
Making Powerpoint notes available
Extra learning material, videos etc canbe made available
submission of assignments. Ability to do tests online
Ability to communicate with studetns and facilitate/administer tests/assessments
All students have access to BB
Informing students about excercises , study guides, assignments etc
Attaching and making information available online(videos/ppts)
Announcements, submission of assignments, mcqs, marking is so easy to
The various options available for lecturers and students interact and this provides easy assessment methods
Uploading information is quick and easy
Students can work their own time. I do not always need to see them
It absolves me of having to carry learning materials to my different classes
Posting notes and not having handouts. Communicating with students
Functions are user friendly
Interactive - students can monitor his academic progress in the course
Communication with students uploading videos

Reduces assessment time and there is more engagement with students who would generally not contribute in a normal face to face classroom
It has all information regarding students academic updates
Efficiency - speedy in communicatating to all students at once. Uploading activities and revision, announcements etc.
Teaching and learning can happen in and out of my classroom. Able to flip my classroom
students have access to course content all the time
We need to print study quides/notes to students . Notices are also placed regularly on BB
The display of content on BB
Accessibility beyond the classroom
accessibility off campus
It serves as a good repository for content material
Ease of use. Broadcast medium. Testing features
Uploading notes and communicating with students
Avoid sysytem (achievement), discussion forums, assessments
a simple tool for interacting with students
How efficient it is and how I am able to communicate with students regardless of where I am
access to the information about dut
The prompt delivery method it uses to get across information to both students and lecturers devices
It is easy to upload / edit course material
BB entails embracing technology. It allows academics to keep up with our generation of students who are techno-orientated
students can access course content whenever and wherever they can
The accessibility for the students. Ease of use
easily accessible and makes teaching and communication with students much easier
I like that it adds to the integrated teaching approach where students also need to take responsibility to be active learners
I am in contact with my students 24/7. I have access to past courses. It serves as a data repository
easy to use
once familiar with the system it is an easily accessible and attractive way to learn
real time. Allows communication with students
the announcements, email, discussion forum
We can get a hold of students whenever needed
The ability to inform students - announcements especially during times of strike action
I can pickup the phone and get assistance from Gita or prega immediately
All the ability to interact with the students who do not attend lectures. Many of our full-time students do not attend lectures thus BB allows me to interact with these students and keep them aware of work.
ease of use, facilitation of communication, enhancing learning
More workshops/trainingfor students and lecturers who are still not familiar with BB
Being able to communicate with students quickly and easily. To make material available to them in an environementlly friendly convenient manner
Interaction and functions
high accessibilty of studetns and improved communication generally between lecturers and students
easier interaction with learners in respect of learning material
one can reach the population of classes taught
I do not have to print anything and no student can claim they never received the information
Adding online content, weblinks, additional information for students to view or work with outside the class time
Content upload system to folders not just files and having to name each each file on submission
Being pressurized to utilized the facility for institutional quotas? With new DUT contact hours policy of 40% contact time and 60% self study this helps with allow students to access important coursework that would have been actively taught.
easy course administrative matters eg announments
Sharing material with students anytime and anywhere
Its just another teaching aid
It is an excellent platform to support teaching and learning

It affords access to all users 24/7
flexibility
The variety of content it allows you to upload and the convenience
Posting notes, guidelines, tutorials remotely
Enables contact with students regarding work tests and feedback outside formal lecture contact time in class
Relevance
ease of use and good support
Information dissemination to student
Serves as usefull repository for subject material assignments tutorials etc.
The system can be setup in such a manner that one can do real-time assessments and real time monitoring of use of the system.
Immediate annoucements sent to students email. Tests can be released at different times for different groups. Automatic registration of students on BB as the student registers
when I receive responses and feedback from students
Remote access is convenient, easy to share ideas. Great during strikes.

J58 Suggested Improvements

Training will enable the lecturer to understand it better
Students complain they cannot access it.
an easier path to follow when uploading material on BB
usage on how students can access it without having problems
assessments - limited to mcqs
layout and formatting and student identification should be made easier.
The home page and all other tabs
must be more user friendly
improvement in terms of speed
I noticed that DUT does not purchase all the packages for BB. There are certain tools/features that are not fully available to us eg.
Uploading groups directly into BB
to have real time interaction with my students
to have uninterrupted internet services in labs to access BB during class times and non-contact times.
It would be useful if BB would have a feature of a 'data bank' which would allow lecturers to input items to be used in eg. Generating tests or notes for reuse.
students to be educated on BB
speed
To be used more for assessments
student access
BB is fine the way it is
Its reliability and consistency. One of the main reasons I have lost interest/confidence in the product.
less tabs on th programme
The awareness of BB. Old staff members are not using BB
The menu. There should be more options available on the home menu
access for all students. Not all students have smart phones and wifi access at home
It must be taken out from our teaching system
accessibility to students
more training sessions on its use
user -friendly
easier accessibility
Prehaps having media components inserted? Having DUT4life email addresses attached to BB, if possible.
not sure - still much to investigate on what is available
support, access
Quicker response of the software- fast load times
question - why use a system that costs too much . Moodle is free. Adopt or dut must answer to the exhorbitant costs

Class register should be incorporated and assessment marks from BB should automatically be entered onto ITS
The interface is an example of " information overload " cluttered
More workshops on how to use it
The FAQ section
Mathematical operations need to be available (all of them)
Integration with student reg systems
Uploading of tests
access to use of BB by students
Encourage academic staff members both new and old to fully engage the use of BB
greater storage space for students to upload video presentations
reduced licensing costs. Greater training, support to staff
videos/ graphics/ training
more interaction
Students and staff need to work with it more
More user friendly for lecturers and assessments
reliability
More integration with dut applications especially ITS and capturing of marks
technical support
simplicity
more use by students
It is under maintenance often and also the problems with adding content. Sometimes editig paragraphs/inserting images can be difficult and will require doing this many times to get it right.
Good idea but sometimes confusing
Bulk files should be easy to upload.
appearance
functionality that adds value
There are a whole lot of functions that BB can provide. By using the BB system with all functionalities
It needs to be improved in terms of assessments since it is limited to mcqs
Instructoe permission of use. I have instructors just adding themselves to the class whom they don't belong to the subject, hence stricter implementation of adding members to be applied
Easier assessment design - maybe permit simultaneous online assessment submission so students start at specific times and is marked
Not necessarily on BB iteself but in order for the tool to be implemented successfully it must be readily accessible - students having challenges in accessing internet or computer systems due to affordability
Deletion of part information
Simpler ease of application
I must be a plug and play programme - there is no time for training
Less down time
so far so good
Frequent access and downtime issues. I currently do not have off-site access since the last update which is difficult as I use it on my off time.

J59 Integration of BB into teaching and learning

<u>Positive</u>
Great
Good
good communication for e-learning
brings us into 21st century
it makes students more engaged but makes them suffer if they are computer illiterate
It can improve delivery of learning content

useful but difficult to apply
its good but we do not get thorough training as to know how to use it regularly - just one workshop
Positive
Time consuming and very few students actually use it. Issues regarding availability of a PC and network/data bundles.
It will enforce learning and teaching
it is very useful and helpful
I think it is progressively gaining pace, though students still have challenges
It will proof to be effective
I think it is very relevant to education in the 21st century however emphasis for training needs to be planned/well structured to ensure that all stakeholders are adequately trained(staff and students)
BB is a great supplementary work to teaching but staff and students need more guidance
BB has been an 'ivory tower' and needed to be more accessible. The recent years has seen changes but it can be made more visible through an integrated IT support.
excited
very good especially at a university of technology. Students need to learn in classroom as well as on electronic platform.
excellent idea
I support BB
It an excellent way of teaching as you are able to access notes
With proper training (students and staff) improving its reliability, 100% access by student anytime, anywhere, cost effectiveness. I think it can become a fantastic tool to have.
Agree
great if time can be allocated - reducing current workload
Its very helpful in covering additional content and getting students to be independent learners
It can be very useful. It's a tool that also helps students to initiate stuff on their own.
I am happy about it and I hope with more experience will all use it to benefit students
I love it. Its an easier manner of teaching and learning
It makes sense and is particularly useful when there are disruptions on campus
BB is a useful tool but I need more learning
Need network points in the classrooms to enable access by lecturers
very positive for teaching and communication
It is a tool for both students and lecturers - allows effective communication
It enables lecturers to cover more content in class without having students take down notes manually
very important - blended learning can be more effectively implemented
I think it is a good idea and could make teaching and learning easier. I am sure that there would be doubt across the board during the transition but the final results could be beneficial.
The adoption is a bit complex and technical for students understanding
It has done quite well however we need to make BB a staple for every DUT student and academic
greatly improved teaching and learning, facilitates formative assessments and feedback.
imperative
It helps students after hours, granting them access to content beyond the classroom which helps with our students centered approach.
Its very useful especially with notifications
It was an easy transition
good idea - too expensive- very little training and IT support. We are not IT designers- can design content only
Its good though it increases the workload initially but over time it reduces work once things are on BB. You have them forever, you just update to keep it current and enhance it.
Helpful
It really helps with the teaching and communication process
nice and informative
Quite helpful only if the students will use it adequately
great idea
it is integrated already. Staff have been encouraged to use it.

supportline
excited. I currentlt use BB in T and L. students love it
I support it
I personally like it and use it in my modules so integration is good
I am a new lecturer here hence still a novice on the knowledge of BB but I am interested to participate in its use to enhance my teaching skills
very usefulallows for blended learning
I love it. Fully support it.
not relevant to kitchen practicals
very difficult to make the transition
its okay
It allows for greater understanding and application by the student
important and necessary for students for 21st century TLA
it does assist in teaching and learning . Reduces paperwork but very little time to sit in front of computer because of workload
awesome however it has a negative impact on attendance
makes it much easier with regards to accessibility of material - printing time
fine but time consuming
very good method of interaction
I enjoy using BB as it is a useful tool and does add value to the subjects
It helps with student access to notes and coursework readily. Students however do not have access because computers or are not computer literate so access becomes problematic.
excellent blended learning approach
Neutral - it is a brilliant idea however if online lecturers were to be available not all students have internet/computer access
Not all students are active
It is a useful tool in that it can bridge the gap in communication between lecturer and student outside the classroom
If students follow it is a good resource provided they have internet access everywhere
BB has improved teaching a learning by the ease of access to relevant information that is available
Useful and holds promise for the future. Help to enforce students to read and understand lecture notes
Moodle has allowed me to put some info on the site but am concerned about having it all on and students may then not attend lectures.
Lectures is where you can interact with students
its great to have subject material online and being able to see who is accessing the material.
It is great to promote student centeredness
Interesting
Good idea, fairly well implemented. Wifi has to be a huge task that has succeeded

<u>Negative</u>
very bad
not really- it is best to keep things separate and simple rather than complicating the fnctions of the other DUT applications (60)
its already a system that requires your knowledge. I fear integrating might make both systems more complex

J60 Integration with iEnabler and ITS

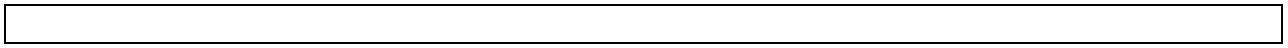
Yes 97

1 /3 / 4/ 5/ 6/ 8/ 9/ 11 /12 /14 /15 /16 /17 /18 /21 /23 /24 /25 /26 /27 /
28 /29 /32 /34 /35 /36/ 37/ 40/ 41/ 42 /43 /44 / 53 /54 /57 /59 /62 /63 /64 /66 /
67 /70 /72 /73 /77 /78 /79 /80 /81 /83/86 /89 /90 /91 /92 /93 /94 /95 /96 /97 /
98 /99 /102 /103 /104 / 105 /106 /107 /109 /111/112 /113 /114 /115 /117 /118 /119 /120 /123 /125/
126 /128 /130 /131 /134 /135 /136 /137 / 139 /140 /141 /143 /149 /152 /153 /155 /156

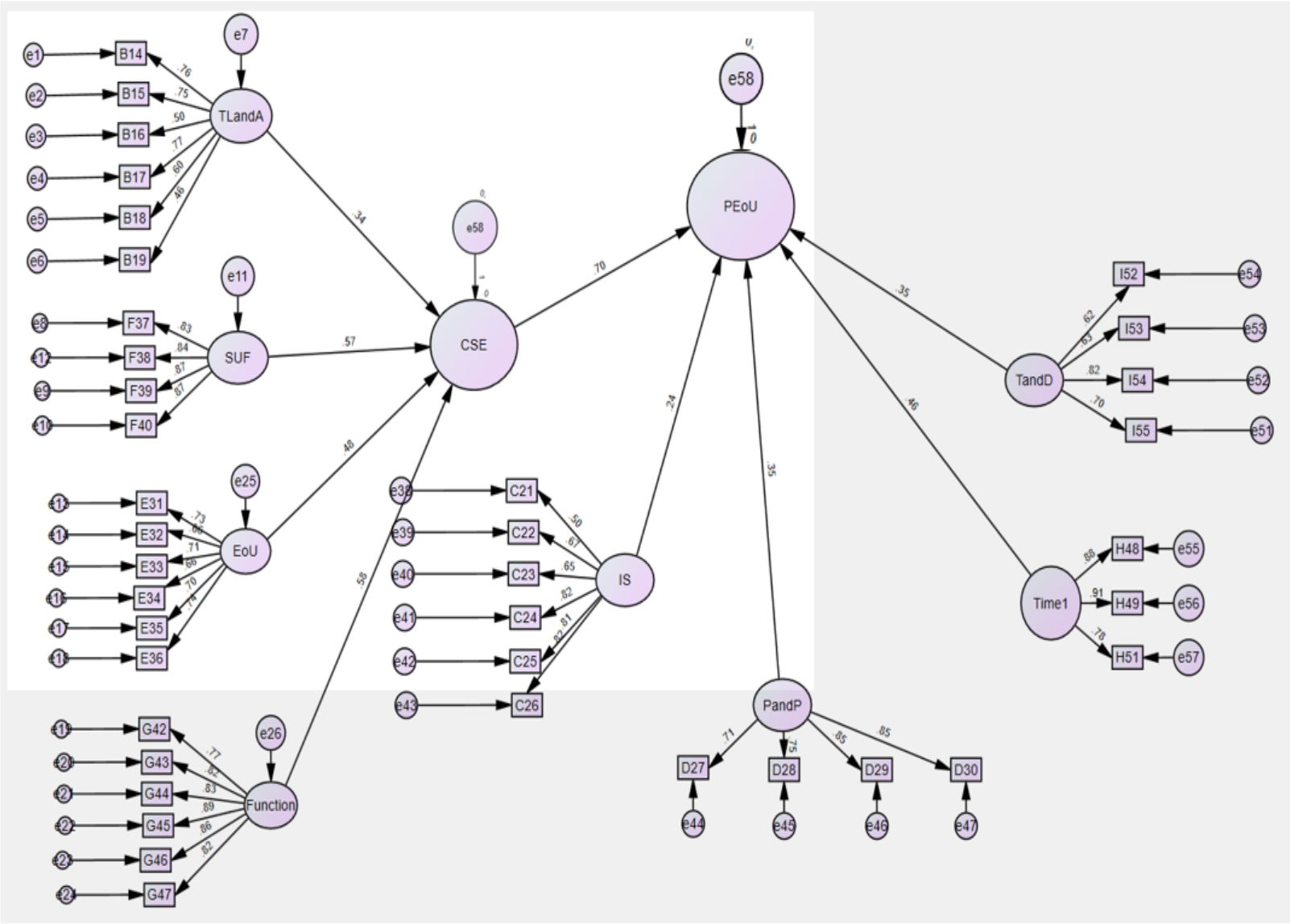
No

Never used BB 3

7/17/144



APPENDIX Q: Structural Equation Modelling (SEM)



Model Fit Summary

Chi-square = 2203.724

Degrees of freedom = 725

Probability level = .000

This Chi-square tests the null hypothesis that the over-identified (reduced) model fits the data as well as does a just-identified (full, saturated) model. In a just-identified model there is a direct path (not through an intervening variable) from each variable to each other variable. In such a model the Chi-square will always have a value of zero, since the fit will always be perfect. The probability should not be significant. In this model, the chi square p-value < 0.001.

It is however worth noting that even though, technically, the Chi-Square should be non-significant in model testing, this is very hard to achieve due to the usually large sample required for it. Hence, if it is in fact significant, that isn't a problem so long as the RMSEA, CFI, and other indicators of fit are good.

Maximum Likelihood Estimates

Standardized Regression Weights

			Estimate
CSE	<---	TLandA	.343
CSE	<---	SUF	.566
CSE	<---	EoU	.477
CSE	<---	Function	.579
B16	<---	TLandA	.497
B17	<---	TLandA	.773
B18	<---	TLandA	.596
B19	<---	TLandA	.456
B14	<---	TLandA	.764
B15	<---	TLandA	.752
F37	<---	SUF	.827
F38	<---	SUF	.840
F39	<---	SUF	.873
F40	<---	SUF	.866
E31	<---	EoU	.729
E32	<---	EoU	.661
E33	<---	EoU	.714
E34	<---	EoU	.656

			Estimate
E35	<---	EoU	.699
E36	<---	EoU	.737
G42	<---	Function	.765
G43	<---	Function	.823
G44	<---	Function	.829
G45	<---	Function	.887
G46	<---	Function	.859
G47	<---	Function	.824
C21	<---	IS	.501
C22	<---	IS	.667
C23	<---	IS	.654
C24	<---	IS	.824
C25	<---	IS	.812
C26	<---	IS	.820
D27	<---	PandP	.710
D28	<---	PandP	.749
D29	<---	PandP	.850
D30	<---	PandP	.851
I55	<---	TandD	.701
I54	<---	TandD	.822
I53	<---	TandD	.626
I52	<---	TandD	.622
PEoU	<---	IS	.242
PEoU	<---	PandP	.345
PEoU	<---	CSE	.695
PEoU	<---	TandD	.354
H48	<---	Time1	.876
H49	<---	Time1	.914
H51	<---	Time1	.784
PEoU	<---	Time1	.463

The parameters are estimated by maximum likelihood (ML) methods, which (is an iterative procedure that) attempts to maximize the likelihood that obtained values of the criterion variable will be correctly predicted.

Squared Multiple Correlations: (Group number 1 - Default model)

	Estimate
Function	.000
EoU	.000
SUF	.000
TLandA	.000
H51	.614
H49	.835
H48	.768
I52	.387
I53	.392
I54	.676
I55	.491
D30	.725

	Estimate
D29	.723
D28	.561
D27	.505
C26	.672
C25	.659
C24	.680
C23	.428
C22	.445
C21	.251
G47	.679
G46	.739
G45	.786
G44	.687
G43	.678
G42	.585
E36	.544
E35	.488
E34	.431
E33	.510
E32	.437
E31	.531
F38	.705
F40	.750
F39	.762
F37	.684
B19	.208
B15	.565
B14	.584
B18	.355
B17	.597
B16	.247

Above are the squared multiple correlation coefficients, that are observed in multiple regressions. The total effect of one variable on another can be divided into direct effects (no intervening variables involved) and indirect effects (through one or more intervening variables). These are shown below.

Standardized Direct Effects (Group number 1 - Default model)

	TandD	PandP	IS	Time1	Function	EoU	SUF	TLandA
CSE	.000	.000	.000	.000	.579	.477	.566	.343
H51	.000	.000	.000	.784	.000	.000	.000	.000
H49	.000	.000	.000	.914	.000	.000	.000	.000
H48	.000	.000	.000	.876	.000	.000	.000	.000
PEoU	.354	.345	.242	.463	.000	.000	.000	.000
I52	.622	.000	.000	.000	.000	.000	.000	.000
I53	.626	.000	.000	.000	.000	.000	.000	.000
I54	.822	.000	.000	.000	.000	.000	.000	.000
I55	.701	.000	.000	.000	.000	.000	.000	.000
D30	.000	.851	.000	.000	.000	.000	.000	.000
D29	.000	.850	.000	.000	.000	.000	.000	.000
D28	.000	.749	.000	.000	.000	.000	.000	.000
D27	.000	.710	.000	.000	.000	.000	.000	.000
C26	.000	.000	.820	.000	.000	.000	.000	.000
C25	.000	.000	.812	.000	.000	.000	.000	.000
C24	.000	.000	.824	.000	.000	.000	.000	.000
C23	.000	.000	.654	.000	.000	.000	.000	.000
C22	.000	.000	.667	.000	.000	.000	.000	.000
C21	.000	.000	.501	.000	.000	.000	.000	.000
G47	.000	.000	.000	.000	.824	.000	.000	.000
G46	.000	.000	.000	.000	.859	.000	.000	.000
G45	.000	.000	.000	.000	.887	.000	.000	.000
G44	.000	.000	.000	.000	.829	.000	.000	.000
G43	.000	.000	.000	.000	.823	.000	.000	.000
G42	.000	.000	.000	.000	.765	.000	.000	.000
E36	.000	.000	.000	.000	.000	.737	.000	.000
E35	.000	.000	.000	.000	.000	.699	.000	.000
E34	.000	.000	.000	.000	.000	.656	.000	.000
E33	.000	.000	.000	.000	.000	.714	.000	.000
E32	.000	.000	.000	.000	.000	.661	.000	.000
E31	.000	.000	.000	.000	.000	.729	.000	.000
F38	.000	.000	.000	.000	.000	.000	.840	.000
F40	.000	.000	.000	.000	.000	.000	.866	.000
F39	.000	.000	.000	.000	.000	.000	.873	.000
F37	.000	.000	.000	.000	.000	.000	.827	.000
B19	.000	.000	.000	.000	.000	.000	.000	.456

	TandD	PandP	IS	Time1	Function	EoU	SUF	TLandA
B15	.000	.000	.000	.000	.000	.000	.000	.752
B14	.000	.000	.000	.000	.000	.000	.000	.764
B18	.000	.000	.000	.000	.000	.000	.000	.596
B17	.000	.000	.000	.000	.000	.000	.000	.773
B16	.000	.000	.000	.000	.000	.000	.000	.497

Model Fit Summary

The suggested acceptable value for relative chi-square, CMIN/DF should be as high as 5 which are used to reduce dependency on sample size. However, the cut-off point for TLI, CFI, NFI and IFI is between zero to one. Schumacker and Lomax (2004) state that a good model is indicated by RMSEA value of less than or equal to 0.05.

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	94	2203.724	725	.000	3.040
Saturated model	819	.000	0		
Independence model	39	4875.473	780	.000	6.251

CMIN is a Chi-square statistic comparing the tested model and the independence model to the saturated model. The ratio, CMIN/DF, the relative chi-square, is an index of how much the fit of data to model has been reduced by dropping one or more paths. The CMIN/DF is lower than the acceptable value of 5.

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.695	.647	.806	.770	.801
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

These goodness of fit indices compare the model to the independence model rather than to the saturated model. The Normed Fit Index (NFI) is simply the difference between the

two models' chi-squares divided by the chi-square for the independence model. For this data, the NFI is 0.695. Values of .9 or higher indicate good fit. The Comparative Fit Index (CFI) uses a similar approach (with a noncentral chi-square) and is said to be a good index for use even with small samples. It ranges from 0 to 1, like the NFI, and 0.95 (or 0.9 or higher) indicates good fit. The CFI value is 0.801.

Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	.864	.601	.693
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

PRATIO is the ratio of how many paths are dropped to how many that could have been dropped (all of them). The Parsimony Normed Fit Index (PNFI), is the product of NFI and PRATIO, and PCFI is the product of the CFI and PRATIO. The PNFI and PCFI are intended to reward those whose models are parsimonious (contain few paths). A value greater than 0.900 is considered acceptable. This model has a marginally lower value.

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.088	.082	.094	.000
Independence model	.184	.179	.189	.000

The Root Mean Square Error of Approximation (RMSEA) estimates lack of fit compared to the saturated model. RMSEA of .05 or less indicates good fit, and .08 or less adequate fit. LO 90 and HI 90 are the lower and upper ends of a 90% confidence interval on this estimate. Even though the model is adequate, the PCLOSE p value that tests the null that RMSEA is no greater than 0.05, is significant. The RMSEA value is 0.088.

SUMMARY

The fit indices of the model do not meet the required cut-off values, indicating that, for this set of data, the model is not the best fit. The primary cause of this is the small sample size, which has limited the observed effects. (The recommended sample size for SEM is at least 300.)

Factor analysis and reliability were used to identify and eliminate the statements that loaded poorly along a component.

The regression weights for each of the sub-sections though are fairly high. The path coefficients are reflected on the diagram.