**An Investigation into the use of a Learning Management System**

**to support teaching and learning in a Grade 10 Information Technology class**

**by**

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## Preface

The work described in this thesis was carried out in the School of Science, Mathematics and Technology Education, University of KwaZulu-Natal, from January 2009 to April 2012, under the supervision of Dr D.W. Govender (supervisor), Edgewood Campus.

## Declaration

This study represents original work by the author and has not otherwise been submitted in any other form for degree or diploma to any tertiary institution.  Where use has been made of the work of others, it is duly acknowledged in the text.

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Signature (Y. Mudaly)                                                      Date

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Place

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# GLOSSARY OF TERMS

| | |
|---|---|
| Learners | In South Africa the word refers to what are commonly known as pupils in the United Kingdom and students in the United States of America In this context learners are school-going children. |
| Educator | In South Africa the word educator is the official designated word for what is universally known as a teacher. Educators in this context are professional people who teach learners at a school. |
| Blended/hybrid classes | Blended or hybrid classes are classes where a blended (hybrid) course is taught partly in the classroom and partly online. Blended courses allow the student to benefit from both methods of teaching: online and face-to-face. |
| Learning management system | A learning management system is a server-based software program that interfaces with a database containing information about users, courses and content. |

# LIST OF ABBREVIATIONS

LMS             Learning management system

LCMS            Learning content management system

CMS             Content management systems

DOI             Diffusion of innovations

IT              Information technology

Moodle          Modular Object-Oriented Dynamic Learning Environment

TAM             Technology acceptance model

UTAUT           Unified theory of acceptance and use of technology

# Abstract

The potential of the Internet as a learning tool has emerged as a result of its increased development and its use as a means of communication in various academic institutions. Online learning is one of the ways in which the Internet can be used as a learning tool which can provide support to educators in a classroom. The tools which support online learning cover a wide range of different applications, such as discussion forums, chat and file sharing. These tools can be used to support different activities in the learning process, such as content delivery and encouraging collaboration between the various people that participate. It is possible to link these different tools into a single system such as a learning management system (LMS). WebCT, BlackBoard and Moodle are examples of such LMSs. It is within the context of this background knowledge that the study on hand investigated the use of a LMS. The focus of this study was to investigate the use of an LMS in the teaching and learning of a Grade 10 Information Technology (IT) class, with emphasis on the attitudes and experiences of learners in relation to implementation of the LMS as a teaching and learning tool in the classroom.

This study employed a mixed-methods approach (a combination of quantitative and qualitative approaches). The quantitative approach included an attitudinal survey in the form of a questionnaire which used a Likert scale to assess responses to statements. The qualitative approach concerned itself with production of in-depth data. Focus group interviews were conducted with Grade 10 IT learners. These instruments generated data that were used to answer the main research questions.

In terms of analysis of the data thematic analysis was used, with texts representing qualitative data and tables and statistics representing quantitative data. In order to discuss all of the findings the characteristics (attributes) of an innovation, as explained in the Diffusion of Innovations Theory, the constructs of the Unified Theory of Acceptance and Use of Technology and the principles of connectivism were used.

The research findings indicated that the learners had a positive attitude towards the use of the LMS to support teaching and learning.

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Finally, I thank God for granting me the strength and courage to persevere in completing this thesis.

**Dedicated To**

**Parushka, Sarisha**

**and**

**Liveshan**

# Chapter One: **Introduction**

## 1.1 Introduction

Over the past two decades education has changed considerably, with more and more resources being spent on technology supporting both face-to-face and distance education. To a large extent these changes have been influenced by online learning. The term 'distance learning' is quite often used and applied to either pure online courses offerings (where 100% of the course content is delivered online) or to courses where only some of the content is delivered online. The latter may include blended or hybrid classes as well as traditional classes supported by web-based content. Blended or hybrid classes are classes where a blended (hybrid) course is taught partly in the classroom and partly online; they allow the student to benefit from both methods of teaching; online and face-to-face.

All web-based and web-supported courses use specialised educational technologies called learning management systems (LMS). Learning Management Systems are widely used not only for online learning but also as a support and supplement tool for traditional face-to-face teaching; and learning.

## 1.2 Purpose of the study

The purpose of this study was to investigate the use of a LMS to support teaching and learning in a Grade 10 Information Technology (IT) class.

## 1.3 Problem statement

Currently there are multiple LMS options available for higher education (especially at universities) and not at secondary school level (grade 10).  The most popular open-source products include Moodle, Sakai and OLAT. The Blackboard Corporation is one of the providers for commercial LMSs (Kats, 2010). The researcher's first experience in using a LMS was in 2008 at a university where the Honours course made use of such a system.  This was a blended/hybrid course and the LMS had much to offer in terms of access to a variety of resources, availability of discussions via the discussion forum and 24-hour access so that students could work independently at their own pace.  As an IT educator the researcher asked the following important questions:  Why has this technology, the LMS, not been introduced to schools, and how do I introduce this technology into my classroom to support teaching and learning?

## 1.4 Rationale for the study

As a Bachelor of Education Honours student and an IT teacher the researcher was convinced of the benefits of this specialised technology called a LMS.  While studying, the researcher used the LMS to access a wide variety of resources (lecture notes, previous year's assignments, PowerPoint presentations, electronic textbooks, and links to other universities offering a similar course and many other Internet hyperlinks), participated in group discussions with fellow colleagues and had the opportunity of submitting work online. The researcher's fascination with this technology was carried from the university to school, with her wondering how the LMS could be implemented in the classroom. Generally when LMSs are used, the

educator gives a short introduction to the lesson (20 minutes), helps with exercises and guides group discussion, while the learners follow subject content via the LMS, read notes, do exercises on their computer and take part in discussion. The rationale is that the LMS would encourage critical thinking and independent and collaborative learning by forming network connections (Siemens, 2004). Wiburg (2003) agrees that the use of a LMS in teaching and learning is associated with several learning opportunities, such as enhancing students' critical thinking and problem-solving skills development.

## 1.5  Objectives of the study

The objective of the study was to investigate the use of a LMS to support teaching and learning. Bannan-Ritland (2005) identified the most common features of a LMS by categorising them as pedagogical tools for content creation, communication, assessment and administration. The major advantage of the LMS is that it brings about content delivery, communication, assessment and administration of online instruction into a single secure platform that can be accessed by anyone on the Internet (Bannan-Ritland, 2005; Ullman & Rabinowitz, 2004).  .

In 2005 EDUCAUSE conducted a study of  LMS use by over 12 000 college students. Researchers found that student attitudes toward their LMS were overwhelmingly positive (Kvavnik & Caruso, 2005).  According to Bates (2006) the LMS could be used to support and improve teaching and learning if used as a teaching and learning platform.

The objective was to obtain a better understanding of learner attitudes and experiences towards using the LMS and hence how it supported teaching and learning.

## 1.6 Theoretical framework

The diffusion of innovation (DOI) model (Rogers, 2003), the unified theory of acceptance and use of technology (UTAUT) (Venkatesh, Morris, Davis & Davis, 2003) and connectivism (Siemens, 2004) constitute the theoretical framework for this study. DOI and UTAUT are two theories commonly used in information systems.

DOI seeks to explain the process and factors that influence the adoption of new innovations (Rogers, 2003). Rogers (2003, p. 5) defines diffusion as "a process in which an innovation is communicated through certain channels over time amongst members of a social system." Rogers defines several intrinsic characteristics of innovations that influence an individual's decision to adopt or reject an innovation. According to DOI, the likelihood that an innovation will be adopted depends partly on its attributes. The following five attributes are considered in DOI: relative advantage, compatibility, complexity, observability, and trialability. These attributes are discussed in detail in Chapter three.

The UTAUT aims to explain user intentions when using an information system and subsequent usage behaviour. The theory holds that four key constructs (performance expectancy, effort expectancy, social influence, and facilitating

conditions) are direct determinants of usage intention and behaviour. The four key constructs of the UTAUT are also discussed in detail in Chapter three.

Connectivism was introduced as a theory of learning based on the premise that knowledge exists in the world rather than in the head of an individual. According to Siemens (2004, p.1), Connectivism is "a learning theory for the digital age", and special importance is given to the effect that technology has on how people live, how they communicate and how they learn. One aspect of connectivism is the use of a network with nodes and connections to facilitate learning. It is within the boundaries of these theoretical frameworks that the research questions were answered.

## 1.7 Key research questions

In this study the key research questions were as follows:

- What are the learners' attitudes when using a LMS?
- What are the learners' experiences when using a LMS?
- How do learners use a LMS to support their learning?
- What benefits do learners derive from the use of the different tools in the LMS?

## 1.8 Research design and methodology

### 1.8.1 Research methodology

This study employed a mixed-method approach, using both qualitative and quantitative methods. Qualitative research involves collecting textual or verbal data (data which cannot be counted), while qualitative methods basically involve observation of people followed by careful description and analysis (Boeree, 2007). Quantitative research, on the other hand, is more highly defined and closely related to research in the physical sciences (Mouton & Marais, 1994), and involves collecting numerical data which can be counted. Quantitative data collection methods make use of a limited range of predetermined responses whereby the experiences and perceptions of people can be measured. The quantitative approach was used to analyse the data from the questionnaire, while the interviews used the qualitative approach.

### 1.8.2 Context and sampling

The participants in this study were Grade 10 IT learners from a Secondary School in Chatsworth. There were 29 learners in the class, but only 28 participated in this research.

### 1.8.3 Methods of data Collection

In order to obtain data that would further the aims of the study and to strengthen this study it was decided that it was necessary to use more than one data collection method. The observation, interview and questionnaire enabled me to obtain data that were used to provide answers to the research questions: the researcher observed the learners' interaction with the LMS, gauged the attitudes of learners towards using a LMS through the questionnaire, and gauged learners' perceptions and experiences of using the LMS through the interview.

### 1.8.4 Data analysis and interpretation

The data from the questionnaire were captured on a spreadsheet in terms of actual numbers, which facilitated statistical representation of the data in percentages and graphs. The DOI and UTUAT constructs were each operationalised in five statements/questions.

Analysis of data encompasses breaking up complex data into manageable themes, patterns, trends and relationships (Mouton, 2001). Analysing what the respondents have said in an interview requires the researcher to relive the interview and to tie up the responses with the underlying theories, while looking for evidence in support of the theories and that which contradicts it (Gaskell, 2000). This part of the analysis began with producing the transcript of the group interviews. Once the transcripts were done, the researcher looked for themes and categories that were associated with the theoretical framework, keeping the research questions in mind. The analysis included data from the questionnaire and the interview.

### 1.8.5 Ensuring trustworthiness of the study

Application of a multi-method approach allowed for a comparison of data – referred to as triangulation (Krefting, 1991). According to Denzin and Lincoln (2003) triangulation is a means of ensuring concurrent validity and prevents personal bias. Validity refers to the appropriateness of the conclusions claimed from the analysis of the collected data (McMillan & Wergin, 2002). This has to do with whether the research methods, approaches and techniques used were appropriate to the study conducted. To ensure credibility in this study, the researcher interviewed (using a voice recorder) the participants with an intention to gain insight into their understandings and experiences about the learning benefits and challenges they were facing with integration of a LMS in teaching and learning. The interviews were then transcribed. Learners had an opportunity to read the transcripts to ascertain whether they were a true reflection of their responses. Data were also collected from observation of lessons using the LMS and a questionnaire. The collection of data from differences sources as described in chapter four, adds to the strength of the validity, reliability and trustworthiness of the study.

### 1.8.6 Ethical issues

According to McMillan and Schumacher (2006), ethical issues refer to all the precautions, steps and efforts that researchers carefully put into practice to protect the research participants while interacting with them for data production. Bell (2005) argues for the establishment of ethics committees which can ensure that no badly designed or harmful research is permitted. A credible research design involves the

appropriate selection of participants and effective research strategies, all of which adhere to principles of research ethics. During the planning and implementation of this research project due consideration was given to ethical issues in using learners as part of the data collection method.  All ethical procedures were followed, which included obtaining ethical clearance from the university and the Department of Education as well as obtaining signed consent letters from the parents of the learners and the learners themselves.

## 1.9 Structure of the study

Chapter one introduces the study and presents the research topic, research questions, problem statement and rationale of the study. Chapter two provides a literature review about the research topic, including development of the LMS and its increased use in education.  This literature review also reveals results of some previously conducted studies on the utility of LMSs in education.  Chapter three discusses the framework of the research, including DOI (Rogers, 2003), UTAUT (Venkatesh, et al., 2003) and connectivism (Siemens, 2004). DOI and the UTAUT were combined using a questionnaire because they could supplement each other and are both theories of the digital age. The principles of connectivism are stated and discussed, that learning and knowledge rests in a diversity of opinions and that learning is a process of connecting specialised nodes and may reside in non-human appliances (Siemens, 2004).

Chapter four explains the research methodology used in this study. The mixed-methods approach (Tashakkori & Teddlie, 2003) was used for data production, with

both qualitative and quantitative methods applied. The questionnaire constituted the quantitative approach for producing data regarding the learners' attitudes towards use of a LMS to support teaching and learning, with Grade 10 IT learners selected as participants.  The qualitative approach incorporated focus group and participatory observation for collection of data regarding learners' experiences when using the LMS.  This chapter also briefly explains the ways in which data were analysed (thematic analysis; Aronson, 1994). The validity, reliability and trustworthiness (credibility) of the research findings and ethical issues are also discussed.

Chapter five presents the analysis of the data.  Tables and graphs are used to show the findings from the questionnaire, and thematic analysis (Aronson, 1994) is applied to analyse data from the interviews. The research questions are answered in this chapter. The principles of connectivism were used to guide the analysis and interpretations.

Chapter six includes a discussion of the research findings according to the principles of connectivism and with reference to the literature review.  Chapter seven presents an argument as to why the LMS should be used in classrooms to support teaching and learning.

# Chapter Two: **Literature review**

## 2.1 Introduction

Technology has infused all facets of society, with some of the most significant changes having occurred in the field of education. The manner in which universities conduct administration, and the way in which educators teach and students learn are invariably affected by technological advancements. Recent additions to instructional technologies are LMSs, one of the key methods for expanding communication in the educational environment. These are sometimes also referred to as course management systems (CMSs) (Caudill, 2009). The objective of this study was to investigate the use of a LMS to support teaching and learning in a Grade 10 IT class. My particular interest as an educator lies in: a) the attitudes of learners when using a LMS as a technological tool in the classroom; b) how learners use a LMS to support their learning; c) the learners' experiences when using a LMS; and d) the benefits that learners derive from the use of a LMS.

This chapter focuses on academic research regarding the implementation of LMSs in education, and the experiences of other scholars of the capabilities and challenges faced by implementers of a LMS in teaching and learning. These involve traditional face-to-face learning, blended learning and distance learning. The key issues discussed in this section involve the definition of a LMS, the difference between a LMS and a learning content management system (LCMS), the history of LMSs, using LMSs in education, success of LMSs, integrating LMSs in education, and possible challenges related to adoption of a LMS.

## 2.2 What is a LMS?

Technically a LMS is a server-based software program that interfaces with a database containing information about users, courses and content. A LMS provides a place for learning and teaching to occur within an integrated environment (Ullman & Rabinowitz, 2004). These systems allow educational institutions to offer a larger number of full online or blended/hybrid (partly online and partly face-to-face) courses. Face-to-face courses that use a LMS to supplement activities are often referred to as web-enhanced courses (Schmidt, 2002). LMSs are known in the literature by several different names, including course management system, virtual learning environments and e-learning courseware (Gibbons, 2005).

The term LMS is the generic classification for web-based software for the dissemination of course materials, learning and collaborative tools. LMS is the preferred generic term used in this study, whereas others have used the terms used above and 'web-based learning environment' or similar labels (Seale & Mence, 2001). A LMS is also referred to as a software application for administration, documentation, tracking and reporting of training programmes and classroom activities (Ellis, 2009). Another definition refers to LMSs as software systems that are specifically designed and marketed to educational institutions to support teaching and learning, and that typically provide tools for communication, student assessment, presentation of study material and organisation of student activities (McConachie, Danaher, Luck, & Jones, 2004). According to the Organization for Economic Co-operation and Development (OECD) (2005), a LMS is an information technology tool used by instructors to build and maintain course websites easily. Website maintenance includes posting course content, updating events and

managing interactive communication with students via messages, forums, and surveys (OECD, 2005). Olufemi (2007) defines a LMS as application software that allows content management, knowledge sharing, information gathering and redistribution, as well as opportunities for collaborative activities within the educational enterprise.

## 2.3 Difference between a LMS and LCMS

An LCMS is related to a LMS in that it is focused on the development, management and publishing of the content that will typically be delivered via a LMS. An LCMS is an environment where educators may create, store, reuse, manage and deliver digital learning content. A LMS offers learning tools such as lesson plans, course materials, discussion forums, assessments and chat rooms. In contrast, an LCMS is used for managing learning content. These systems are also referred to by a number of different terms, including virtual learning environments, course management systems (CMS), learning support systems and learning platforms (Mendoza, Pérez, Díaz-Antón & Grimán, 2006).

There are tools of LMSs that are common across the different platforms. LMSs provide areas for collaboration between students and the instructor or between students themselves – this normally takes the form of a discussion forum. The features of a LMS for student support include, amongst other things, chat rooms, discussion forums and emails. All of these have the potential to facilitate communication amongst students (Hall, 2003). It is within this context that learners could interact to share learning resources.

## 2.4 History of LMSs

In recent years computer technology has become a new type of technological innovation, with the aim to improve teaching and learning. While educational technology researchers have been studying the effects of using myriad different tools, like discussion forums, blogs, wikis and whiteboards, there is one tool that has taken a rapid and steadfast hold on higher education – the adaptation of a LMS.

From as early as the mid-1990s the dominant form of e-learning within universities has been based on the use of a LMS. Earliest examples of LMSs appeared from 1995 to 1997 (Stiles, 2007) and included systems such as WebCT and Lotus LearningSpace. Other LMSs included self-developed systems such as Bodington (Lakhan & Jhunjhunwala, 2008) and POLCA (Ayub, Tarmizi, Jaafar, Ali & Luan, 2010) and commercially developed systems such as Blackboard, , WebCT and DesireToLearn (Jones & Muldoon, 2007; Caudill, 2009). While most LMSs are commercially developed, there are several free open source systems. Sakai and Moodle are popular free open source LMSs.

In my study I made use of an open source LMS called Moodle, which focuses on content management and is also referred to as an LCMS. (For the purposes of this study the term LMS includes a content management system.) Moodle is a free web application (open source program) from Australia, which was created and developed by Dougiamas and Taylor (2003) and volunteer programmers worldwide. Educators can use Moodle to create an effective online learning site, and there are currently over 300 000 people registered on Moodle.org and over 30 000 Moodle sites in 195 countries (Cole & Foster, 2007). The acronym MOODLE stands for Modular Object Oriented Dynamic Learning Environment.

## 2.5 Growth of the LMS

The use of a LMS portal is not novel, especially amongst students in higher learning institutions. Various forms of such portals can be accessed through either the official University LMS or through specifically self-developed portals by the lecturers (Ayub et al., 2010). The speed with which the adoption of a LMS has spread through universities is alarming (West et al., 2007). According to the NCODE-FLA LMS Survey (2002), 33 participating universities in Australia all used either commercial or in-house developed LMSs. A 2004 survey of universities found that 73% had adopted an institution-wide LMS, compared to 60% in 2002, with 90% expecting to make such a claim within five years (OECD, 2005).

Other LMS adoption research supports these findings. The Flexible Learning Leaders in New Zealand (FLFinNZ) 2004-2005 project (Elgort, 2005) reveals that 22 universities in Australia, New Zealand and the United Kingdom (UK) all used one or more LMS and many have completed the early stages of LMS adoption. A UK survey (Joint Information Systems Committee & Universities and Colleges Information Systems Association, 2003a, 2003b) indicates that 86% of the 102 higher education institutions surveyed used a virtual learning environment. A study conducted by Mitchell, Clayton, Gower, Barr and Bright (2005) with 18 New Zealand institutes of technology and polytechnics (ITP) showed that all surveyed institutes used a LMS. According to Allen and Seaman (2007), in the fall of 2006 nearly 3.5 million students (representing nearly 20% of higher education students in the United States of America (USA)) took at least one online course via a LMS.

The Campus Computing Project reported in 2002 that approximately three-quarters of all colleges and universities in the USA had adopted a LMS and nearly one-fifth of

all college courses used a LMS (Campus Computing Project, 2002). By 2006 the LMS had increased in popularity by 90% (Basset & Burndt, 2006). However, between 2006 and 2008 the growth of the LMS was a mere 10.6%, the reason for which could be market trends and a slow economy. By 2009 revenues from LMSs were projected to be at least US $715 million (Bersin, Howard, O'Leonard & Mallon, 2009).

Desire2Learn experienced 2.12% growth during 2001 and 2006 (Deloitte & Touche, 2007; Kempfert, 2003). Angel Learning became the fastest-growing LMS amongst community colleges during 2007 and 2008 (Lokken, 2009). Blackboard's acquisition of WebCT in 2006 gave them a dominance of 80% of shares in the educational learning management market (Mangan, 2008). This dominance was extended in 2009 when Blackboard purchased Angel Learning (Carter, 2009). Moodle was released in 2002, and by December 2011 Moodle had a user base of 72 177 registered and verified sites serving 57 112 671 users in 5.8 million courses (http://moodle.org/stats).

Whether focusing on distance or campus-based education, universities all over the world are using LMSs to support and enhance learning within their institutions (Dalsgaard, 2006). Recent reports showed that by 2007 over 90% of all American universities and colleges had established one or more LMS-type products for both student and faculty use (Hawkins & Rudy, 2008). Supporting this, evidence from Browne, Jenkins and Walker (2006) shows that 95% of higher education institutions in the UK also adopted some kind of LMS within their institutions.

Academic institutions have invested large sums of money in LMS implementation to support online teaching (Hawkins & Rudy, 2009). While many higher education

institutions have some sort of LMS that provides students access to a wide range of tools to support learning (Kirkwood, 2009), the use of LMS in high schools is also currently growing (Perkins & Pfaffman, 2006).  To justify the widespread investment in LMS technology it is important to study learner perceptions of and their experiences with  LMS technology.

## 2.6 Using LMSs

Belief in the potential of LMSs to improve teaching and learning has led to widespread LMS implementation worldwide (Hawkins & Rudy, 2009).  Much of the early research about e-learning consisted of descriptions of implementation of LMSs.  These descriptions sometimes included comparisons between learning in a traditional face-to-face environment and in a LMS environment.  Between 2000 and 2007 several studies (Murphy & Lindner, 2001; Rivera, McAllister & Rice, 2002; Lim, 2002; Jones & Jones, 2005; Lim & Sudweeks, 2006) focused on the adoption of a LMS together with face-to-face teaching and learning.

Overall, students' perceptions of the adoption of a LMS were positive. Rivera et al. (2002) conducted a study where a section of an introductory management information systems course was offered almost exclusively via the web, another was taught in the traditional classroom setting and a third was a hybrid of traditional methods supported by the course management system, WebCT.  The average enrolment for each of the different modes of delivery was 45 students.  No significant differences in student performance were found amongst the different options.  Students were generally satisfied with the traditional and hybrid (traditional supported by the CMS) classes.  A similar study was conducted by Lim (2002), who

also compared three different instructional formats: the first was a traditional classroom, the second web-based and the third satellite based. Nineteen students were surveyed and no significant differences in learning were identified.

Murphy and Lindner (2001) administered a survey to 111 students in an undergraduate course on technological change which used WebCT through the semester. Students were asked questions about their perceptions on the use of WebCT. Overall, 70% of the students agreed that WebCT had tangibly contributed to their success in the course. Eighty-nine per cent of the students had a positive perception of the use of WebCT.

LMSs are incorporated for blended learning in many institutions of higher education. This is the combination of types of e-learning and also of e-learning and conventional learning (Broadbent, 2002). The inclusion of LMSs in education is hoped to supplement the face-to-face teaching. This is an example of mixed-mode learning (also known as blended learning). The advantages of blended learning include the improved utilisation of available resources, because it uses multiple ways through which learners can retrieve useful information or resources for learning. This technology uses several methods, such as collaboration software, web-based courses and knowledge management. It describes the learning that blends various event-based activities, including face-to-face classrooms, live e-learning, and self-paced learning. In a more recent study conducted by Govender and Govender (2009), 80% of the students recommended the mixed-mode delivery. The survey included 30 learners from a second-year Computer Science education class. The primary tool used for this class was the university LMS, the Open Learning Management System. The study concentrated on the attitudes of students towards a mixed learning mode of instruction. The results showed a positive trend towards

acceptance of a mixed-mode environment for learning. This positive response to mixed-mode delivery (face-to-face and LMS) is a good indicator for educators wishing to incorporate technology into their teaching as a means of support to traditional classroom teaching.

The problem with some of these studies is that they are limited in scope.  None of them have large sample sizes, and few have such small samples that no generalisations can be made. In contrast to this, a study conducted by Jones and Jones (2005) discovered that students (971) and faculty members (44) overwhelmingly agreed that the web is a beneficial educational tool which improved student learning.  In an even larger study conducted by Paulsen (2002), it was shown that LMSs are used widely in Nordic education.  Paulsen interviewed 20 Nordic training managers in five Nordic countries, and some important findings were as follows:

- LMS systems seem to be widely used in Nordic higher, further and continuing education.  It is not easy to find Nordic institutions without experience with LMS systems.
- There is a clear trend towards large-scale online education in Nordic countries, with 12 of the 20 institutes offering at least 50 online courses.
- ClassFrontierm, WebCT, FirstClass and BlackBoard seemed to be the most used LMSs in the Nordic countries.

Concurrently educationalists in Malaysia conducted research into developing an e-LMS for schools there, and Rashid, Majid and Yen (2002) presented a conference paper  that focused on developing an e-LMS which is a web-based application that supports the learning process in various schools in Malaysia.  An objective that they

hoped to achieve from this development was that students would always be presented with the latest technology and could always learn in a "conducive environment". This was, however, a proposed design, and the next step was to test the system in the real school environment.

On the other hand, an interactive e-LMS was seen as a solution to the problems experienced in Tanzanian secondary schools (Kalingo, Burchard & Trojer, 2007), which included problems receiving learning materials because they were geographically situated in rural areas and socially isolated. This resulted in poor performance in national examinations, and an e-LMS was seen as the solution to support curriculum development within a number of schools.

Although the study on hand focuses on learner perceptions, it would be good to know what teacher attitudes towards the use of a LMS are. Fewer studies have assessed teacher attitudes towards the use of a LMS. One such study makes reference to research conducted at the Waikato Institute of Technology in New Zealand in 2005, using Moodle as the LMS (Gower & Barr, 2005). Thirty-five tutors were interviewed, and conclusions show that they were positive to the introduction of Moodle and the efficacy and user-friendliness of the tools within Moodle. One tutor commented: "Moodle provides a framework which lends itself to the development of activities which can promote critical thinking" (Cower & Barr, 2005, p. 253).

Witt (2003) surveyed 36 instructors using websites for a classroom course, and 26 of them responded. Most indicated that their goals for the websites had been achieved, and most also felt that the course websites promoted more and better

communication (Witt, 2003). This study concentrated particularly on the experiences and perceptions of learners when a LMS was implemented.

## 2.7 Success of LMSs

LMS success depends on two variables, namely "use" and "user satisfaction" (Seddon, Staples, Patnayakuni, & Bowtell, 1999).    Lonn and Teasely (2009) conducted a survey focusing on specific uses of the LMS that emphasised either efficient communication or interactive teaching and learning practices. The LMS used in this study is based on the Sakai LMS.  The user log data were matched with corresponding survey items to ascertain if system use was consistent with patterns seen in the survey results.  The survey item analysis revealed that instructors and students highly valued the teaching and learning tools within the LMS and attitudes and preferences were consistent with student LMS use (Lonn & Teasely, 2009).

A study investigating LMS use by 424 students in Taiwan found that efficiency and satisfaction contributed to intention to use (Liaw, 2008).  On the other hand, Sun, Tsai, Finger, Chen & Yeh (2008) showed that perceived usefulness and ease of use impacted satisfaction.   Naveh, Tubin and Pliskin (2010) examined the students' use of and satisfaction with the LMS, and how these dependent variables were correlated with organisational variables at one Israeli university. Data were gathered in 2007 and the findings indicated varied use of LMS, a high level of satisfaction, and low significant correlation between use and satisfaction. In the studies described above research on LMS has shown mixed findings about the two variables  of use and user satisfaction.

The success of a LMS is dependent on student satisfaction for several reasons, one of these being that LMS use supports existing teaching and learning approaches rather than modifying them (Arbaugh et al., 2009).  Another reason is that even if student needs are not fully known, it may be assumed that high student satisfaction is indicative of success in the sense of whether the LMS responds well to their needs (Seddon et al., 1999).

## 2.8 Integrating LMS into teaching and learning

Historically learners depended most on what teachers had to say during lessons. This does not promote any active learning because of reduced learner participation. Chang (2007) supports Olufemi's (2007) idea in arguing that the inclusion of technology such as a LMS in teaching and learning produces learners who are self-directive, active and explorative. Students become more responsible for their learning by identifying and interacting with a variety of technologies and teammates to construct their own knowledge.

The integration of a LMS represents a different approach to learning.  The LMS allows students to learn at their own pace. It is a very helpful system in which there is tremendous diversity of educational backgrounds and differences in ages (Woodill, 2007).  Different learners possess varying levels of educational experiences, as well as different learning styles, which any instructional approach should address for ideal learning.  Lynch (2004) agrees that some students learn visually, that is, they learn

and understand the concept much better if they are presented with a picture. He argues that online materials contain more visual tools, requiring simple reading and graphic interpretations. Lynch (2004) further recommends the use of quizzes, short questions, simulations and examples to enhance interactivity with the content.

In his study, Alavi (1994) wanted to extend the traditional classroom instruction to develop and evaluate computer-supported pedagogical approaches with undergraduate students. The study investigated whether the use of a group discussion support system in a collaborative learning process could enhance student learning and evaluation of classroom experiences. The findings indicated that collaborative learning which was supported by group discussion led to higher levels of perceived skill development, self-reported learning and evaluation. Students develop initiatives for their own learning, through which they could confidently report their own discovery of knowledge. Alavi (1994) suggests that integration of technology such as a LMS in teaching and learning is unquestionably capable of introducing active learning, and this facilitates the process in which students construct their own meanings. According to Alavi (1994), many higher educational institutions prepared students to engage in continuous acquisition of knowledge and understanding, this implying a move toward more active forms of instruction, including use of a LMS in teaching and learning.

Wagner and Du (2005) investigated the effect of LMS use on individual learning in a university environment, with a case study conducted to collect data from some of the undergraduate students. It was believed that LMS and other forms of technology were relatively new knowledge-sharing technologies in undergraduate teaching and

learning. Students were interviewed on their understandings and experiences of the potential of LMS integration in teaching and learning. The findings indicated that the inclusion of LMS in education could promote active learning, and provide reinforcement and increased accountability on the part of a student. The student discovers information and is responsible for applying this knowledge to everyday life, using the information to solve problems that may arise in society. The results also indicated that LMS could be a significant tool in the achievement of learning outcomes.

Birch and Burnett (2009) explain that the global transformation of distance education is the function of advancements in educational technologies. Learning technologies such as LMSs with their chat rooms, discussion forums, emails and video conferencing, have placed enormous pressure on the distance education sector to operate beyond traditional correspondence modes and embrace an expanding e-learning environment. Conole (2004) argues that e-learning is capable of transforming education, providing opportunities for learning any- time and anywhere. He further explains that there is a broader base of research which has expanded in part because of the impact of the Internet and methods in which it can be used to support learning and teaching, but also because of increased use of different learning management environments and systems.

Birch and Burnett (2009) agree with Conole's (2004) argument. The introduction of LMSs in the curriculum has resulted in meaningful ways of learning, because students are actively involved in the learning process in virtual environments. This is also supported from Olufemi's (2007) work, stating that virtual learning is a step

away from face-to-face learning. Siemens (2004), the founder of connectivism, supports the belief that learning may occur from the interaction between people with non-human appliances, such as mobile technology and the Internet. In all of these studies (Conole, 2004; Siemens, 2004; Olufemi, 2007; Birch & Burnett, 2009) there is a common tendency to agree that virtual classes (including distance education) are possible and meaningful. However, these studies do not investigate the attitudes and experiences of the users of this LMS technology. There is a need to research the attitudes and experiences of its users.

This suggests that further research is required to explore the learning benefits that LMS provides for effective communication as a teaching and learning platform. Several studies (Alavi, 1994; Wagner & Du, 2005) have shown that integration of LMS has a positive contribution on teaching and learning, because it provides an effective means of communication and full utilisation of resources by learners. My personal experience with a LMS in postgraduate education also suggests that this technology is important in teaching and learning. Further research is needed to explore these issues in detail, with more users of LMSs. The focus of this study is on the integration of a LMS in the teaching and learning of IT in a Grade 10 class.

## 2.9 Conclusion

Review of the literature reveals that LMSs have been extensively used in higher educational institutions to either deliver online courses and/or to support face-to-face learning. Relatively few studies have investigated the use of LMSs as a support tool in teaching and learning at secondary school level, and even fewer have been conducted in the South African setting. While the adoption rate of LMS has been

increasing rapidly, very little is known on how this technology benefits teaching and learning or how it brings about change to the current classroom practice.  In the present study the researcher investigates learner perceptions and experiences of using a LMS.  The research intends to add to previous research on the use of a LMS in education, since to date student experiences and efficacy of the tools have been subjected to limited research.

# Chapter Three: **Theoretical framework**

## 3.1 Introduction

This chapter details the theories surrounding the use of technology in the classroom, and describes the frameworks used in this study to guide analysis and discussion of the research findings. It includes adoption theories as well as a learning theory for the digital age and their principles that were applied in this study during the analysis and interpretation of the research findings.

There are a large number of technology adoption models and theories on information systems research, including the Difffusion of Innovation (DOI), also known as innovation diffusion theory, the theory of reasoned action, technology acceptance model, the Unified Theory of Acceptance and Use of Technology (UTAUT) and connectivism. This study concentrates on the following influential theorists and their theories/models as a combined framework of inquiry:

a) DOI by Everett Rogers,

b) Venkatesh et al.'s UTAUT, and

c) George Siemen's theory of connectivism.

## 3.2 Diffusion of innovation (DOI)

DOI has provided a popular framework to explain how new ideas and technologies are adopted in a community (Rogers, 2003). In his book *Diffusion of Innovation* Rogers (1995) defines innovation as an idea, object or practice that is perceived as "new" by an individual or organisation (the words innovation and technology are used as synonyms). Various individuals may perceive the innovation differently and therefore decide to adopt an innovation at various points in the diffusion process. Thus, diffusion is defined as the process, over time, by which an innovation is conveyed through certain channels amongst the members of a social system. Diffusion is a special type of communication concerned with the spread of messages that are perceived as new ideas.  Communication is a process in which participants create and share information with one another in order to reach a mutual understanding.  From the definition of diffusion, four main elements can be detected: (1) the innovation; (2) communication channels; (3) time; and (4) social system (Rogers, 2003, p.11). DOI theory provides well-developed concepts and tools for assessing the likely rate of diffusion of a technology, and identifies numerous factors that facilitate or hinder technology adoption and implementation (Fichman, 1992), including the innovation-decision process, attributes of the innovation and innovators' characteristics.

### 3.2.1 Innovation decision process

The innovation decision process is that through which an individual passes from first knowledge about the innovation to formulating an attitude towards it, to a decision regarding adoption or rejection, to implementation of the new idea, and to

confirmation of this decision.   This process has five stages: (1) knowledge; (2) persuasion; (3) decision; (4) implementation; and (5) confirmation.

*Knowledge:* When the individual (or other decision-making unit) is exposed to an innovation's existence and gains an understanding of how it functions.   There are three types of knowledge. *Awareness knowledge* is the seeking of information that an innovation exists.  This may motivate individual(s) to seek the second or third type of knowledge, and such information seeking may also happen at the 'persuasion' and 'decision stages'. *How-to knowledge* is the seeking of information necessary to use an innovation properly.   Lack of adequate level of knowledge prior to trial and adoption is likely to result in rejection and discontinuance. *Principles knowledge* is the seeking of information dealing with the functioning principles underlying how an innovation works. Rogers argued that it is possible to adopt an innovation without principle knowledge, but there is a danger of misusing a new idea which may result in discontinuance.   In addition, individuals' competence in judging the effectiveness of an innovation is facilitated by their understanding of the principles knowledge.   He argued that awareness knowledge can be achieved through the mass media, and that how-to knowledge can be assigned to change agents who could play a distinctive and important role at the decision stage of the innovation-decision process.   He felt that principles knowledge is a more appropriate task for formal education.

*Persuasion:* This is when the individual forms a favourable attitude towards the innovation.   Individuals at this stage become psychologically involved; they seek information about the innovation, decide on credible message sources and interpret the messages they receive to develop a general perception of the innovation.   They

seek information from their peers to reduce the level of uncertainty around the new idea. Rogers argued that the attitude a person forms about an innovation in this stage is expected to lead him/her to a subsequent change in overt behaviour.  In many cases attitudes and actions may be disparate. Thus, a favourable or unfavourable attitude towards an innovation does not necessarily lead directly or indirectly to adoption or rejection of that innovation.

*Decision:* When an individual engages in activities that lead to a choice to adopt or reject an innovation.  Most individuals prefer to try an innovation first on a small scale before making the decision to adopt or reject it.  Innovations that prove to have a relative advantage upon trial by an individual drive the adoption/rejection decision. Rogers argued that the rejection decision can happen at any stage of the innovation-decision process, even after a prior decision to adopt. Such discontinuance can either be active or passive rejection: active rejection consists of considering adoption but then deciding not to adopt, and passive rejection of never really considering the use of the new idea.

*Implementation:* When the individual puts an innovation into use.  The individual involved in the innovation-decision process has been engaged in a mental exercise of thinking and deciding.  Implementation at this stage of the process involves overt behaviour change as the innovation is put to use.  Problems may arise as to how to use it; as a result, individuals rely on a change agent to provide information and technical assistance as they begin using the innovation. Rogers stated that during the implementation stage, the original idea may be reinvented.  He mentioned reasons such a complexity and difficulty to understand that leads to simplifications;

ignorance and inadequate learning of adopters or users; many possible applications (e.g. computers and Internet); and local pride of ownership (Rogers, 2003, p. 180). Reinventions can be of benefit to adopters; flexibility may reduce mistakes and encourage customisation to fit the innovation to local conditions or evolving environments. An individual might have more than an adopt/reject opinion in the decision; they may actively participate in the diffusion process.

*Confirmation:* When the individual seeks reinforcement for an innovation decision already made, but may reverse the decision if exposed to conflicting messages about it. At the confirmation stage individuals might seek to avoid a state of internal disequilibrium related to the adoption idea. They might, if they have already decided against adoption of the new idea, become exposed to pro-innovation messages, causing a state of dissonance that can be reduced by adopting the new idea. Or quite the opposite, they might experience a discontinuance and reject an innovation after having previously adopted it. There are two types of discontinuance: (1) replacement discontinuance – rejecting an idea in order to adopt a better one that supersedes it; and (2) disenchantment discontinuance – rejecting an idea as a result of dissatisfaction with its performance (Rogers, 2003, p. 189).

Rogers argued that individuals passing through the innovation decision stages may not recognise when one stage ends and another starts; thus a sharp distinction between each stage should not be expected. In addition, innovation decisions vary in length of time taken, differences being in part related to the innovation attributes and innovators' characteristics.

### 3.2.2 Attributes of the innovation

According to Rogers (2003, p. 232), individuals' perceptions of the attributes of an innovation, and not the attributes as classified objectively by experts or change agents, affect the rate of adoption. Innovation attributes can explain the rate of innovation adoption, and most variance in the rate of adoption (49-87%) is explained by the five perceived attributes of an innovation. These attributes are interrelated empirically but each is conceptually distinct; selection is based on past research as well as a desire for maximum generality and succinctness.

*Relative advantage:* The degree to which an innovation is perceived as better than the idea it supersedes. The degree of relative advantage may be measured in economic terms; social prestige, convenience, and satisfaction are also integral factors. It does not matter so much if an innovation has a great deal of advantage, what does matter is whether an individual perceives the innovation as advantageous. The greater the perceived relative advantage of an innovation, the more rapid its rate of adoption will be.

*Compatibility:* The degree to which an innovation is perceived as being consistent with the existing values, past experiences, and needs of potential adopters. An idea that is incompatible with the values and norms of a social system will not be adopted as rapidly as an innovation that is compatible. Adoption of an incompatible innovation often requires prior adoption of a new value system, a relatively slow process.

*Complexity:* The degree to which an innovation is perceived as difficult to understand and use. Some innovations are readily understood by most members of a social system; others are more complicated and will be adopted more slowly. New

ideas that are simpler to understand are adopted more rapidly than those that require the adopter to develop new skill and understandings.

***Trialability:*** The degree to which an innovation may be experimented with on a limited basis.  New ideas that can be tried on the instalment plan will generally be adopted more quickly than innovations that are not divisible.  An innovation that is trialable represents less uncertainty to the individual who is considering it for adoption, who can learn by doing.

***Observability:*** The degree to which the results of an innovation are visible to others.  The easier it is for individuals to see the results of an innovation, the more likely they are to adopt it.  Such visibility stimulates peer discussion of a new idea.  Innovations that are perceived as having all these elements will be adopted more rapidly than others.

In addition to the five perceived attributes of an innovation, there are variables such as: (1) type of innovation (optional, collective, or authoritative); (2) communication channel (e.g. mass media or interpersonal); (3) nature of the social system (e.g. norms, degree of network interconnectedness, etc.); and (4) extent of change agents' promotion efforts.

Innovations requiring an organisation innovation decision are generally adopted less rapidly than an individual optional decision. That is, the more people involved in making a decision, the slower the rate of adoption. To speed up the rate of adoption, fewer people should be involved. When interpersonal communication channels are used rather than mass media channels, the rate of adoption is slowed. In addition, social system norms and network connectedness, agents' promotion efforts and

changes within such efforts also affect the rate of adoption of an innovation at any stage of the process (Rogers, 2003, p. 283).

### 3.2.3 Characteristics of innovators

Individuals differ in their adoption patterns and can be classified into categories according to the time they first begin using the new idea or on the basis of their innovativeness – the degree to which an individual or other unit of adoption is relatively earlier in adopting new ideas than other members of the system. The time element of the diffusion process allows for this classification of adopters and drawing diffusion curves. Adoption of innovation usually follows a bell-shaped curve when plotted over time on a frequency basis. With this curve, the normal distribution is not symmetrical; there are three adopters' categories to the left of the mean and two to the right, as indicated below.

**(1) Innovators (2.5%):** The salient characteristic of innovators is that they are adventurous. They enjoy substantial financial resources, an ability to understand and apply complex technical knowledge, and can cope with a high degree of uncertainty about the innovation at the time of adoption. They play an important role in launching new ideas into a social system, and can thus be thought of as system gatekeepers when new ideas flow in.

**(2) Early adopters (13.5%):** The salient characteristic of early adopters is respect; they are looked up to in the local social system. This category contains the highest opinion leaders with the highest influence, whom potential adopters consult regarding information and advice about the new ideas. They serve as a role model for many members in the social system and for this reason are sought out by change

agents for their capacity to trigger critical mass when they adopt an innovation. They put their stamp of approval on the new idea by adopting it.

**(3) Early majority (34%):** These adopt new ideas before the average member of the system. Their salient characteristic is that they may deliberate or take some time before completely adopting a new idea. They follow with deliberate willingness but seldom lead. They form an important link in the diffusion process since they mediate the two categories of early adopters and the late majority.

**(4) Late majority (34%):** Contrary to the previous category, the late majority adopt new ideas just after the average member of a system. Their adoption behaviour may be a result of peer pressure (norms) or economic necessity. Nevertheless, the adoption is made with scepticism and caution; they only adopt when most others in their system have already done so. Due to their scarce resources they need to remove most of the uncertainty before they feel safe to adopt an innovation. This is why their salient characteristic is that of being sceptical.

**(5) Laggards (16%):** These are the last in the social system to adopt; there are almost no opinion leaders amongst them. They rely on what has been done in the past to make decisions now, which is why their salient characteristic is tradition. They only interact with traditional people like themselves and are suspicious of change agents. Their resistance may be rational from their point of view, since their limited resources mean they cannot afford to adopt an innovation that is likely to fail (Rogers, 2003, p. 295).

Figure 1 provides a diagrammatic representation of the DOI model.
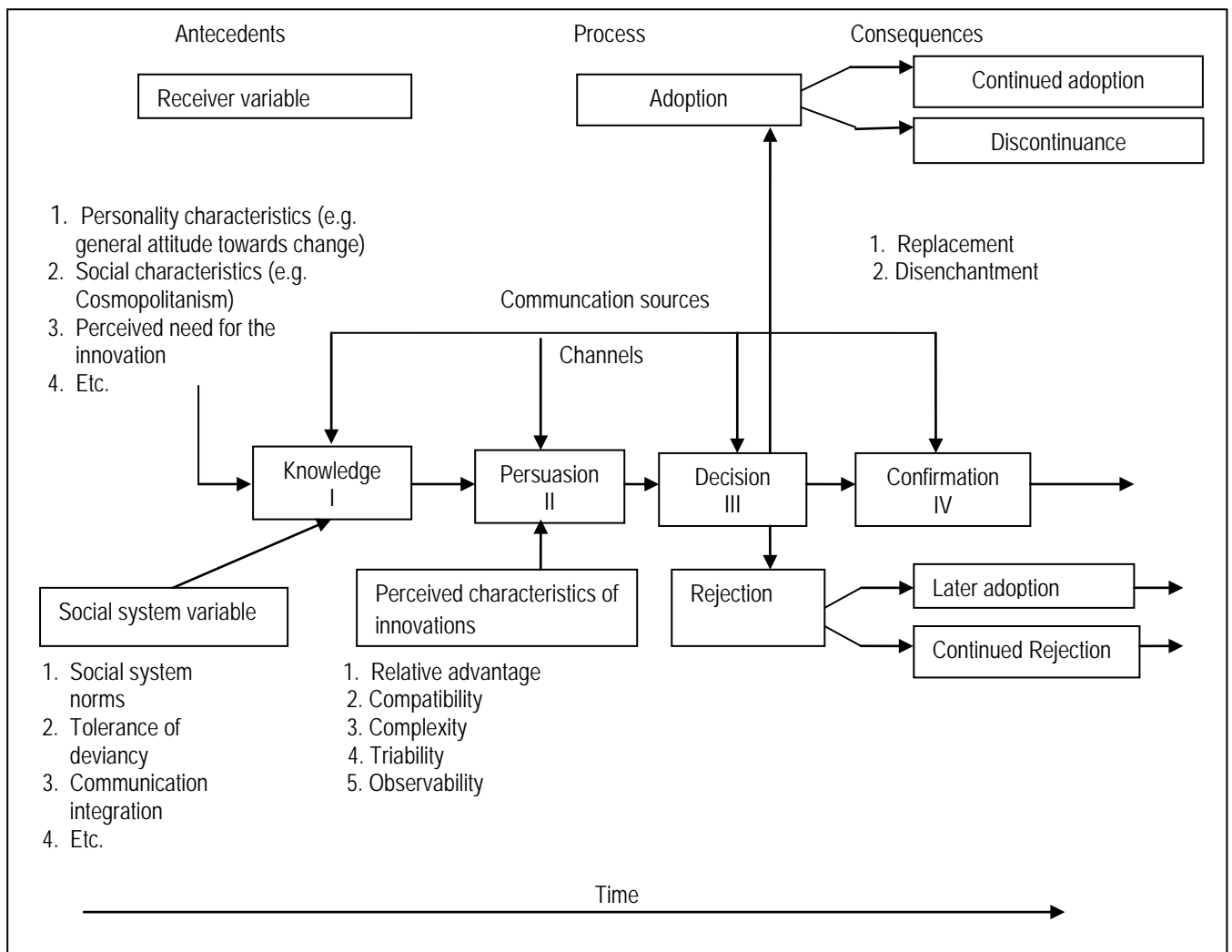


**Figure 1: DOI model: Adapted from Rogers, (1995).**

### 3.2.4 Limitations of DOI theory

DOI theory tries to explain the innovation decision process, factors determining the rate of adoption, and categories of adopters. It helps in predicting the likelihood of adoption of an innovation. Nevertheless, it has been argued that the theory does not provide evidence of how attitude evolves into accept/reject decisions, and how innovation characteristics fit into this process (Karahanna & Straub, 1999; Chen, Gillenson & Sherrell, 2002). Conversely, Rogers stated that rejection decisions can

happen at any stage in the decision process and that attitudes are formed along the way in the knowledge-reinforcement path, although he did not fully explain the role innovation attributes can play in forming these attitudes. However, it is important to remember that an innovation has different categories of adopters; it is unrealistic to expect one model to be able to generalise how positive or negative attitudes can be formed in respect of innovation attributes, stages of adoption and categories of adopters.

### 3.2.5 Research applying the DOI theory

Rogers' (1995) DOI model was used to examine adoption and contribution of a web-based course management system at a college campus. Liao (2005) interviewed 196 students. It was found that Rogers' model successfully explained adoption of innovation. Adoption of the course management system led to increased interaction between students, instructors and course materials, which in turn significantly contributed to student learning. Sanchez-Franco (2010) used the technology WebCT to examine learners' interest in electronic learning technologies in order to determine their acceptance of the tool for delivering lessons. The research provided strong support that the learners developed a positive attitude towards the use of WebCT. Similarly, Nanayakkara (2007) also found that use of a LMS was easily adopted by students in tertiary institutions in New Zealand. In trying to understand the experiences of instructors as they adopted a course management system, West, Waddoups and Graham (2007) found that many of the instructors' experiences matched elements of Rogers' (2003) adoption model.

As stated earlier, the rate of adoption of an innovation is impacted by five characteristics (attributes), namely relative advantage, compatibility, trialability, observability, and complexity (Rogers, 1995). Most of the studies that refer to Rogers' model (including education-related models) tend to focus on those categories of adopters that predict the speed of the diffusion process (Macchiussi & Trinidad, 2001; Surry, 1997). With regard to the study on hand, the researcher chose to use Rogers' five characteristics of the innovation, because Rogers' research focuses on adoption. As a result his model focuses on factors that lead a person to adopt or reject an innovation (in this case the learners' intention to adopt the LMS).

The five characteristics (attributes) of the innovation (in this case the LMS) are tested using survey data from a Likert scale questionnaire (Appendix A). The findings clearly demonstrate how learners' attitudes towards an innovation can influence and impact on innovation adoption.

The next section discusses the UTAUT, which focuses on users' intentions to use an information system and subsequent usage behaviour.

## 3.3 The unified theory of acceptance and use of technology (UTAUT)

### 3.3.1 Description of the UTAUT

Technology acceptance research is a constantly developing field as new technologies keep evolving (Al-Qeisi, 2009). One well-known model related to

technology acceptance and its use is the technology acceptance model (TAM), originally proposed by Davis in 1989. TAM has proven to be a theoretical model in helping to explain and predict user behaviour of IT (Legris, Ingham, & Collerette, 2003). Davis (1989) and Davis, Bagozzi and Warshaw (1989) proposed TAM to explain why a user accepts or rejects the technology. Since its introduction, TAM has enjoyed wide acceptance and has proven to be a reasonably accurate predictor of both users' intentions to use an IT and of their actual system usage. TAM has evolved through the years, and many researchers have tested the addition of new variables to the model in an attempt to increase its explanatory power. Venkatesh along with Davis and other researchers (2003) integrated TAM with seven other dominant models in the field of technology acceptance, and introduced the UTAUT, as shown in Figure 2.
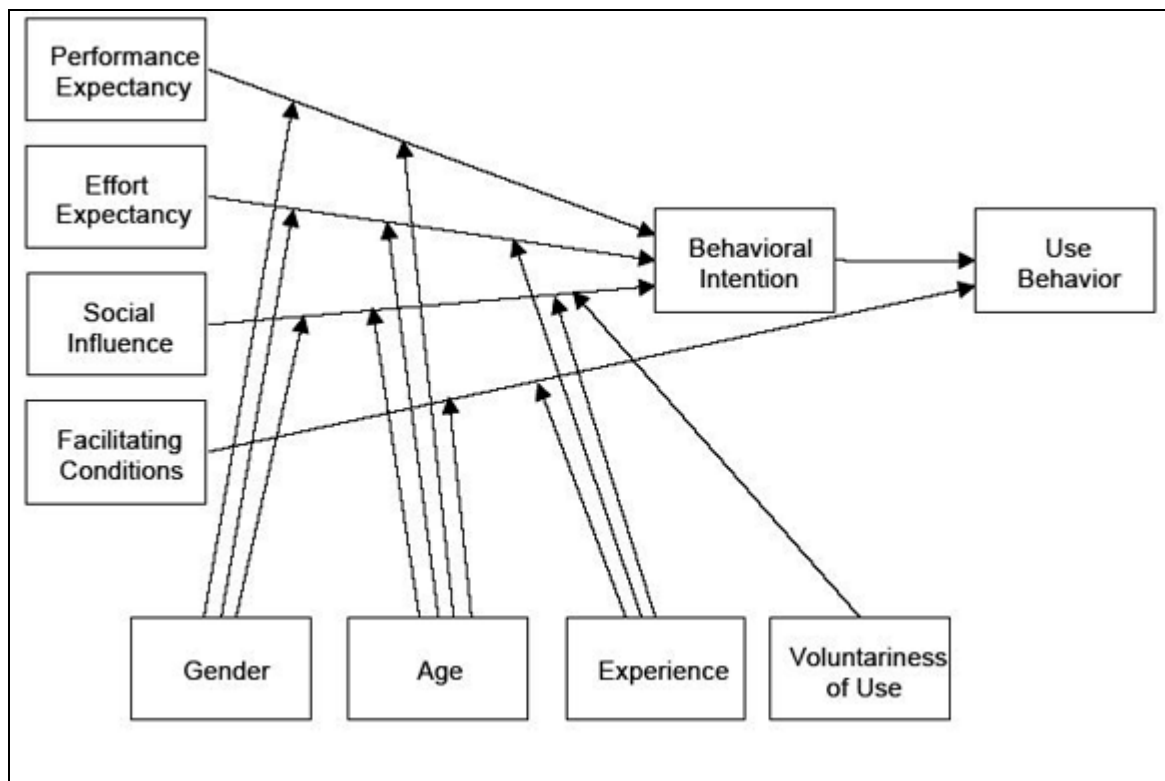


**Figure 2: Research model for the UTAUT (** Venkatesh, Morris, Davis & Davis, 2003).

The UTAUT proposed by Venkatesh et al. (2003) extends TAM to take into account several constructs that have significant influence on behavioural intention and ultimately usage of technologies (see Figure 2). As a result of their investigations into the eight underlying models of the UTAUT, Venkatesh et al. state that seven constructs appear to be significant direct determinants of intention or usage in one or more of the individual underlying UTAUT models: (1) anxiety; (2) attitude toward using technology; (3) effort expectancy; (4) facilitating conditions; (5) performance expectancy; (6) self-efficacy; and (7) social influence. Further investigations by Venkatesh et al. led them to conclude that the constructs attitude toward using technology, self-efficacy, and anxiety are not direct determinants of behavioural intention. They exclude these constructs from consideration in the UTAUT model, and the four core constructs of UTAUT therefore include (1) performance expectancy; (2) effort expectancy; (3) social influence; and (4) facilitating conditions. The core constructs are further defined below.

**Performance expectancy:** The degree to which an individual believes that using the system will help him or her to attain gains in job performance. Performance expectancy is adapted from the UTAUT model (Venkatesh et al., 2003; Al-Qeisi, 2009). The construct from the DOI model that pertains to performance expectancy is relative advantage.

**Effort expectancy:** The degree of ease associated with the use of the system. Effort expectancy is adapted from the UTAUT model (Venkatesh et al., 2003; Al-

Qeisi, 2009). The complexity construct from the DOI model captures the same concept as effort expectancy.

**Social influence:** The degree to which an individual perceives how important it is that others believe that he or she should use the new system. Social influence construct has been used in UTAUT (Venkatesh et al., 2003) and model of PC utilisation in internet banking (Al-Qeisi, 2009). Similar to this is the image construct from the DOI model. Image is the self-perception that adopting an innovation could result in enhanced social status for an individual amongst his / her peers (Agarwal & Prasad, 1997).

**Facilitating conditions:** This refers to the extent to which an individual believes that an organisational and technical infrastructure exists to support use of the system. This definition captures the compatibility construct from the DOI model. The facilitating condition has been used in the UTAUT model (Venkatesh et al., 2003) and the model of PC utilisation in internet banking (Al-Qeisi, 2009). The relationships between the variables of the UTAUT model are depicted in Figure 2.

The UTAUT model attempts to explain how individual differences influence technology use. More specifically, the relationship between perceived usefulness, ease of use and intention to use can be moderated by age, gender and experience. Gender, age, experience and voluntariness of system use have an indirect influence on the dependent variables via the four core constructs. For example, strength between perceived usefulness and intention to use varies with age and gender such that it is more significant for male and younger workers. The effect of perceived ease of use on intention is also moderated by gender and age, such that it is more

significant for female and older workers, and those effects decrease with experiences. Performance expectancy and effort expectancy were used to incorporate the constructs of perceived usefulness and ease of use in the original TAM study. Although the UTAUT model asserts that the effort expectancy construct can be significant in determining user acceptance of IT, concerns for ease of use may become non-significant over extended and sustained usage. Therefore, perceived ease of use can be expected to be more salient only in the early stages of using a new technology, and can have a positive effect on perceived usefulness of the technology. This study did not take into consideration the four moderating factors of gender, age, experience and voluntariness.

### 3.3.2 Research applying the UTAUT

The results from a survey conducted by Ismail (2009) show that students agreed on the idea that performance expectancy, effort expectancy, social influence and facilitating conditions will lift the behavioural intention of using blogs as a learning tool. Ismail (2010) carried out a further study on international students' acceptance of using a social networking site to support learning activities, and the results once again reveal that the students agreed on the idea that performance expectancy, effort expectancy, social influence and facilitating conditions will lift the behavioural intention of using a social networking site to support their learning activities.

Al-Qeisi (2009) conducted a research on Internet banking to show an extension of the UTAUT model and online usage behaviour. This research was conducted in the UK and Jordan to investigate the viability of the UTAUT model. The results of the

study found support for the proposed extension of – website quality perceptions on usage behaviour. Website quality perceptions turned out to the most influential determinant in usage behaviour followed by performance expectancy. Social influence had no impact on usage behaviour.

Similarly Li and Kishore (2006) carried out a test to determine whether the key constructs in the UTAUT model were invariant across different population subgroups. The area of application included the use of a web log system. The findings indicated that users with different experience and knowledge in computing and web log use have the same interpretation of the instruments of performance expectancy and effort expectancy. On the other hand, social influence is not interpreted similarly amongst users with high or low frequency of web log usage. Nor are the scores of the facilitating conditions instrument comparable for users with different levels of web log experience and usage frequency from the perspective of statistical significance, although they are comparable for computing and web log knowledge. However, the authors argued that this statistical significance does not mean that the difference in true score between these subgroups is high in magnitude. Gender statistical results showed that the instruments of effort expectancy and facilitating conditions are comparable, while the case is not so for the performance expectancy and social influence instruments. The authors recommended caution in interpreting the findings since the instrument pertaining to the UTAUT constructs has invariant true scores across most subgroups in the context of acceptance of online community web log systems. They also indicated the need for more invariant studies about the UTAUT constructs that were not found to be invariant in this study (Li & Kishore, 2006).

Not all results obtained from research findings show full support of the UTAUT model. Marchewka, Liu and Kostiwa (2007) conducted a study describing student perceptions of using Blackboard by applying the UTAUT.  The results of their study did not find strong support for the UTAUT model.  Although the UTAUT suggests that there is a greater effect impacted by age for older workers and a stronger willingness by younger workers to adopt new IT products, it appeared that age did not have a significant effect on Blackboard use.  Similar to age, gender has been recognised to play an important moderating role in information system acceptance research.  The male gender's tendency to feel more at ease with computers has also been demonstrated in the information systems literature and UTAUT studies.  Marchewka et al. (2007) found that gender did not appear to have a significant effect on Blackboard use.

UTAUT provides great promise to enhance our understanding of technology acceptance. There has been very little effort to investigate the intention to use a LMS from the UTAUT perspective. Since LMSs are quite a new and unique phenomenon to schools, it is crucial to investigate the factors that could influence the use of a LMS so that new approaches to the LMS can be implemented and benefit both learners and educators. In this study the researcher concentrated on the four elements as mentioned above, to depict the significant role they play as direct determinants of user acceptance and usage behaviour.  In order to evaluate the UTAUT model, the study made use of a Likert scale questionnaire to examine learners' perceptions of the use of the LMS. This study adopted the UTAUT model in favour of the belief that familiar, easy-to-use technologies would drive increased use behaviour, which would

consequently equate to increased performance. Not adopted in the study were the UTAUT moderating factors regarding gender and age, although Venkatesh et al. (2003) find that age plays an important part in "usage behaviour". Age was not included in the study of the UTAUT model due to the age homogeneity of participants.

The following section provides a discussion of George Siemen's theory of connectivism, which perceives learning as the process of creating connections and developing a network.

## 3.4 George Siemens' theory of connectivism

### 3.4.1 Description of connectivism

Connectivism, according to Siemens (2004, p.1) "is a learning theory for the digital age". Siemens developed the learning theory of connectivism due to the belief that previous learning theories such as behaviourism, cognitivism and constructivism did not sufficiently cover the nature of learning in the digital age. The three theories also do not address learning that takes place outside people, the type of learning mediated through the integration of technology, and fail to describe how learning happens within organisations. Siemens (2004) argues that in a networked world the very manner of information that people acquire is worth exploring. Previous theories were developed at a time when "Information Development was slow" (Siemens, 2004, p.1) as compared to the digital era of today where the flow of information is fast, accurate and relevant. Connectivism aims to address how learning occurs in the digital environment. Technology has transformed the way we "live, communicate

and learn" (Siemens, 2004, p.1) and as a result of the technological change, traditional learning theories such as cognitivism, behaviourism and constructivism "were developed in a time when learning was not impacted through technology" and do not sufficiently transfer to digital format (Siemens, 2004, p.1).

Since this study involves the use of the computer and access to the LMS, the study is embedded within the fundamental principles of connectivism. Connectivism is a very important concept to consider as learners continuously lean towards computers for information in today's digital age. Connectivism recognises that technology has impacted society and the styles of teaching and learning are continuously changing. Connectivism is about forming connections between people and technology (Giesbrecht, 2007).


Siemens (2004) indicates that connectivism is the integration of principles explored by networking. It focuses on connecting specialised information sets. Each individual learner represents a potential source of information, and when these individuals form connections, they may learn better because their connections might be more important than their current state of knowing. Siemens (2004) emphasises that connectivism is driven by the understanding that decisions are based on rapidly altering foundations. This implies that there is a need for a continuous retrieval of new information from all possible sources, because it could be appropriate to address new emerging challenges that people have to go through in this current dynamic world. Siemens (2004) identifies eight core principles of connectivism namely that:

- Learning and knowledge rest in diversity of opinions;
- Learning is a process of connecting specialised nodes or information sources;

- Learning may reside in non-human appliances;

- Capacity to know is more critical than what is currently known;

- Nurturing and maintaining connections is needed to facilitate continual learning;

- Ability to see connections between fields, ideas, and concepts is a core skill;

- Currency (accurate, up-to-date knowledge) is the intent of all connectivist learning activities; and

- Decision-making is itself a learning process; choosing what to learn and the meaning of incoming information is seen through the lens of a shifting reality. While there is a right answer now, it may be wrong tomorrow due to an alteration in the information climate affecting the decision (dynamic nature of the technological age of information).

Connectivism explains how and why students connect to the network in order to access the latest information that is available on a topic. Students are able to learn by connecting to the information that is available and then build on the information to form new knowledge, which can then be shared back into the network for other students to access. The connection of a network enhances learning, and this extension of a personal network is the "epitome of connectivism" (Siemens, 2005b, p.6). Educators must not only allow students to gain access to the Internet but must also teach students how to upload new information to the network so that new knowledge can be shared with others. Students must be taught how to critically evaluate web-based content. Taking into consideration the principles of connectivism, there are various factors that must be taken into account when designing or using technology-based/supported learning environments. It is not

sufficient to use technology in isolation from a network; students must have access to a network so that they can locate the most current information (Williams, 2008).

This school of thought has its critics. They point out that connectivism does not explain or even concentrate on the individual and the changes in a person due to physical maturation or social mediation. Verhagen (2006, p. 1) says connectivism is not a learning theory at all, but a "pedagogical view on education with the apparent underlying philosophy that pupils from an early age need to create connections with the world beyond the school in order to develop the networking skills that will allow them to manage their knowledge effectively and efficiently in the information society." Others are of the opinion that connectivism's contributions to the new way of communicating and teaching do not "warrant it being treated as a separate learning theory in and of its own right" (Kop & Hill, 2008, p. 7).

For the purposes of this research, connectivism will be used to describe a connected learning environment in which connectivist learning strategies, learning skills and learning activities are acquired to learn effectively. Siemens (2005b, p.7) correctly states that "Connectivism provides insight into learning skills and tasks needed for learners to flourish in the digital era." Connectivisim presents a model that acknowledges that learning is no longer an internal activity. The rapid development of technology not only influences the way we organise, develop and manage our knowledge but also our approach to teaching and learning. This relatively new learning theory called connectivism is thus appropriate because it influences our "learning theory in the digital age" (Siemens, 2004. p.1). The following section provides a discussion of studies adopting the connectivism framework in their research design.

### 3.4.2 Research applying connectivism

Mafata (2009) investigated the use of a LMS in postgraduate Educational Technology modules at a local university, and the study incorporated the theory of connectivism as part of its theoretical framework. Data analysis was conducted using the principles of connectivism as a guiding factor, and the research findings revealed that a LMS enhances teaching and learning in the following ways:

• by promoting access to learning resources, improving social interaction and peer learning amongst the users;

• by establishing relevant environments for active participation; and

• by serving as student support, instructors' support, a supportive environment, and supporting student diversity.

Siemens (2004) explains that decision-making on the learning process, the choice of what to learn, and the meaning of new information, are the function of a student; the lens of a shifting reality. It is in this context that efforts should be made to provide a form of a training environment in which students may have an opportunity to connect and interact with machines and their peers for active learning. Students should be encouraged to acquire and develop the skills and knowledge which can be of significant value to their life in future. Kerr (2007) criticises connectivism by asserting that networks have not changed learning so much that one could discard other existing learning theories. He argues, for instance, that connectivism cannot work in isolation, and states that Siemens (2004) is becoming so taken with the power of

network, to the point of denying the importance of the individual and the learning that takes place inside our heads.

The researcher is recommending the use of a LMS, a visual online learning tool to enhance teaching and learning in IT.  Connectivism is a relevant theory for this study because it matches the retrieval of information and a meaningful construction of knowledge in the digital age (Siemens, 2004).  A link between the technology , the LMS and the learners can be identified and therefore the theory of connectivism is relevant to this research. .

## 3.5 Conclusion

Although UTAUT and DOI originated in different disciplines, the two theories have obvious similarities. As reported in the studies above and elsewhere, the relative advantage attribute of innovation is often considered to be the performance expectancy construct in UTAUT, and the complexity attribute is similar to the effort expectancy concept in UTAUT. This suggests that UTAUT and DOI reconfirm and often complement each other (Chen, Gillenson & Sherrell, 2002).

This study is based around the DOI (Rogers, 2003) and the UTAUT (Venkatesh et al., 2003) models and the theory of connectivism (Siemens, 2004). A Likert scale questionnaire was used (Appendix A) to test for adoption or rejection of a LMS. The questionnaire operationalised the five characteristics (attributes) of an innovation as explained in Rogers' model. Similarly, the four constructs of the UTAUT were also tested. Each construct was tested using five statements. In terms of analysis, thematic analysis was used with tables and statistics representing quantitative data

and text representing qualitative data. Thematic analysis was conducted on the data collected from the interviews to represent the fundamental principles of connectivism. The data analysis is discussed further in Chapter five.

The next chapter outlines the research methodology employed in this study.

# Chapter Four:  Research methodology

## 4.1 Introduction

The aim of this chapter is to explain the research process that led to the collection of data that were used to provide answers to the main research questions.  This chapter provides a discussion of the research context, research design, rationale behind the research methodologies and data collection instruments, the data collection process, ethical considerations, sampling strategies and techniques that were used in the analysis and interpretation of data.

In order to gauge learner perceptions of the learning benefits of using a LMS when teaching IT, a questionnaire was administered and an interview was conducted.  The learners who were studying IT as a learning area had not previously been exposed to a LMS. Essentially the interview sought to measure learner perceptions of the efficacy of a LMS in IT.  The interview sought learner responses in three areas:

1.  use of other LMS tools such as chat rooms (discussion group);

2.  overall evaluation of the LMS; and

3.  provision of subject content.

## 4.2 Research context

The research was conducted at a Secondary School in Chatsworth, which is situated in an average economic area and provides for learners predominantly from Shallcross, Pinetown, Mariannhill, Klaarwater and Northdene in Durban, KwaZulu-

Natal.  There were 1280 learners enrolled at the school in 2011, and class sizes were generally not very large, approximately up to 38 learners.  The School Governing Body plays an active role in the management of the school.  This Secondary School is one of several secondary schools in close proximity of each other and the learner intake is much higher than that of the neighbouring schools in the area.  This School produced excellent results in the National Senior Certificate Examinations for 2008, 2009 and 2010 and has received commendations from the Department of Education.  This school is relatively well resourced and is the only school in the Chatsworth area that has free Internet access for all learners during and after school hours.  The school has 20 computers with Internet access which are situated in the media centre, 35 computers in the IT centre and 40 in the Maths Laboratory.  It is one of the very few schools in the area that has a website.

To implement the LMS in teaching and learning at this school, server space was needed in order to download the software for the educators and learners to have access to.  The school's website was used to set up the LMS.  Moodle was used because this software is open source and no financial outlay was required.

## 4.3 Research methodologies

Having found the research topic for this study, it was appropriate to develop research questions that would provide solutions and answers needed to address the research on hand.  The research questions had to be developed in order to determine the research methods and data collection instruments that would be most appropriate in gathering the data needed. These questions provide a focused means of investigating the research area (Cohen, Manion & Morrison, 2000; Gaskell, 2000).

The identification of these research questions which arose from the main research topic helped the researcher determine the type of data that were to be captured in order to answer these questions. The following research questions were developed:

- What are the attitudes of Grade 10 learners towards using a LMS in IT?;

- How do Grade 10 Learners use a LMS to support their learning?;

- What are the learners' experiences when using a LMS?; and

- What benefits do learners derive from the use of the different tools in the LMS?

The first research question was aimed at finding out the attitudes of learners towards the use of a LMS. Research question two was aimed at determining how learners made use of the LMS to support their learning. Research question three targeted the experiences of learners when using the LMS in the classroom. Research question four was aimed at the benefits of using the LMS in a classroom.

The researcher chose to use a mix of qualitative and quantitative methods for this study. Qualitative research involves collecting textual or verbal data (data which cannot be counted). Qualitative methods basically involve observation of people, followed by careful description and analysis (Boeree, 2007). Qualitative research methodology is an inductive and exploratory tool, because it is characterised by observing and sensing what is occurring naturally in a non-contrived situation. It is therefore an in-depth analysis of a problem in order to understand human behaviour (Hatch, 1998). Qualitative research is concerned with exploring social and human problems in a natural setting, with the intention of understanding what people feel and the experiences that have caused them to have these feelings.

Quantitative research, on the other hand, is more highly defined and closely related to research in the physical sciences (Mouton & Marais, 1994). Quantitative research involves collecting numerical data (data which can be counted). Quantitative data collection methods make use of a limited range of predetermined responses in which the experiences and perceptions of people can be measured. The data from this type of research can be represented statistically and graphically. This type of research facilitates the analysis and comparison of data.

The benefit of using the mixed-methods approach is that it allowed the researcher to capture the best of both the qualitative and quantitative approach (Spicer, 2004). Since this study required in-depth knowledge on learners' experiences, perceptions and attitudes when using a LMS in a secondary school, the researcher chose to conduct this study within the mixed-method framework. Asking open-ended questions enabled the researcher to gain insight into the personal experiences of the respondents with regard to their perceptions and experiences when using a LMS to learn IT. This also assisted in obtaining information regarding how learners benefited from the use of a LMS (Patton, 2002; Bell, 1993; Cohen et al., 2000).

After much deliberation on the merits of the various data collection instruments, it was decided that it would be necessary to use more than one method in order to obtain data that would further the aims of the study and to strengthen this study. Use of the observation, interview and questionnaire enabled the researcher to obtain data that were used to provide answers to the research questions. Observation allowed the researcher to observe the learners' interaction with the LMS. The questionnaire enabled the researcher to gauge the attitudes of learners towards using a LMS, and the interview enabled the researcher to gauge learner perceptions and experiences when using the LMS. This study therefore had both a qualitative

and a quantitative component. The qualitative approach consisted of the group interview to determine answers to three of the research questions. The quantitative approach allowed the researcher to use a questionnaire to establish the attitude of learners to using the LMS.

Table 1 indicates the data collection instruments used in the collection of data.

| Data collection instrument | | | |
|---|---|---|---|
| **Research questions** | **Observation** | **Questionnaire** | **Interview** |
| 1. What are the attitudes of Grade 10 learners towards using an LMS in IT? | ✓ | ✓ | ✓ |
| 2. How do Grade 10 Learners use a LMS to support their learning? | | | ✓<br>Plus logs from LMS |
| 3. What are the learners' experiences when using a LMS? | ✓ | ✓ | ✓ |
| 4. What benefits do learners derive from the use of the different tools in the LMS? | | | ✓ |

**Table 1: Research questions and type of data collected**

## 4.4 Timeframes for data collection

The following timeframes where decided upon and followed accordingly. The learners were introduced to the LMS in the first term (February to March) at school. The observation process continued for the duration of the first term – for as long as the LMS was being used in the classroom under the researcher's supervision. The questionnaire and interview process was conducted during the latter part of the first term, after learners had been sufficiently exposed to the LMS. The following sections discuss each of the data collection methods in detail.

## 4.5 Observation

Observation is a way of gathering data by watching behaviour and events, or noting physical characteristics in their natural setting. Learners were given activities involving the LMS. These lessons were observed since the researcher wanted to gauge the learners' initial reaction to and interaction with the LMS. Although this was unstructured observation, the lessons were recorded. Observational research involves the researcher making observations. This method of collecting data involves the researcher going into a classroom, school or university and observing what is actually taking place there. Unstructured observation means that the researcher writes down a description of what he/she sees happening in the classroom (Cohen et al., 2000). While the learners were engaged in accessing the LMS and its various tools, the researcher would informally observe them to monitor and observe their interaction with the LMS. The researcher's presence in the classroom as an observer was nothing out of the ordinary because of the dual role (teacher and researcher). This suited the data collection because the researcher wanted to remain as unobtrusive as possible in order to get an idea of the learners' experiences without interfering with their behaviour. The observation process also provided the researcher with realistic data that the learners may not have been able to provide through the questionnaire or interview, such as the learners' hands- on interaction with the LMS interface. See Appendix C for observation schedule.

The observation process was used to answer the following research questions:
What are the attitudes of Grade 10 learners towards using  in IT?; and what are the learners' experiences when using a LMS?

The advantage of observing the learners in the classroom was that data could be collected when and where the activity was occurring, and the researcher could directly observe what the learners were doing. The disadvantage to using the observation process was that it was susceptible to observer bias – especially with the observer being researcher and teacher at the same time. This was achieved by using a mixed-method approach, with observation being unstructured and the presence of the researcher being unobtrusive while observing.

## 4.6 Questionnaire

### 4.6.1   Value of a questionnaire

Attitudinal surveys (in the form of a questionnaire) consist of a series of statements which respondents are required to answer within preset responses. This method is widely accepted and used to collect valuable data on learner perceptions and attitudes. The questionnaire facilitates the collection and analysis of numerical data that are structured and can be easily generalised and administered by someone besides the researcher (Cohen et al., 2000; Gaskell, 2000).

This data collection instrument is not without its disadvantages, in that it is weighed down by the time taken to design, pilot and refine it (Cohen et al., 2000). A questionnaire also has its limitation in terms of the scope of the questions that can be asked and the range of responses that can be anticipated (Bell, 1993). Due to strict time constraints at school, the data collection has to be quick and efficient whilst ensuring reliability and validity. A structured questionnaire met the needs as

far as this was concerned since the questions were preset and the responses fell within a prescribed range. Learners selected a response from those that had already been preset. Walker (1985) pointed out that a questionnaire was quick and easy to fill in and was directly and immediately accessible to the researcher whilst ensuring confidentiality. According to Cohen et al. (2000) a properly designed questionnaire facilitates the process of analysis, and can be made even easier when the researcher is involved in the design. A questionnaire was useful in this context because it was not time-consuming to administer by the researcher; the teaching load of the teacher, as researcher, does not allow sufficient time for a method that takes up too much time.

All the Grade 10 IT learners at this Chatsworth School were invited to participate in the survey in order to ensure that an adequate number of learners would respond to constitute a valid study. Out of 29 IT learners, 28 questionnaires were used in the study. One learner was not granted consent by his parents and was therefore excluded from this research. All responses were used to ensure that the data were not skewed. Despite the fact that the number of boys and of girls was not equal, it was decided that the statistics reflected the reality of the situation and that the status quo should remain. The questionnaire sought to measure learners' perceptions and experiences with regard to the use of the LMS.

### 4.6.2 Development of the questionnaire

The development of the questionnaire was guided by an extensive review of the literature. The questionnaire included questions eliciting the basic views of respondents toward the use of technology in the classroom, their perception of

administrative and actual support and their self-estimated use of technology. The questionnaire asked questions based on Roger's model of the characteristics of innovation: relative advantage, compatibility, complexity, observability and trialability. Learning-related questions, interaction questions, and technology-related questions were asked to assess the impact and context of the adoption of the LMS by learners. Venkatesh et al. (2003) developed their original model from an exploratory factor analysis of similar constructs taken from a large selection of previous technology acceptance theories. Their questions were taken directly from previously validated questionnaires. Because the questionnaire in this study was used in a similar context, questions from Venkatesh et al.'s (2003) instruments were used and adapted for this study. Measures were derived to elicit the four direct determinants of the UTAUT in a classroom context – performance expectancy, effort expectancy, social influence, and facilitating conditions. Five questions were derived for each of the direct determinants.

### 4.6.3 Rating scale

On the questionnaire a Likert scale ranging from "Strongly disagree" to "Strongly agree" was used to indicate learners' level of agreement on the factors that were important to their approach to technology integration/adoption. Data from 28 learners were gathered to determine the influential factors perceived by learners in technology integration/adoption into their classroom. The questionnaire was designed to facilitate crossing off responses. The Likert scale caters for a range of responses that exhibit varying degrees or intensities of feeling, thereby making it a more flexible tool to use, and yet it enables one to generate statistics that can be easily analysed.

Learners were asked to 'ring' the appropriate column.  This facilitated the recording of responses on a spreadsheet that was used in analysis of the questionnaire.   Each of the factors consisted of five questions, totalling 45 questions in all.   Positive and negative statements were included in the scale, although not equivalent in number. A copy of the Questionnaire is found in Appendix A.

### 4.6.4.  Analysis

The data from the questionnaire were captured on a spreadsheet in terms of actual numbers. This facilitated the statistical representation of data in terms of percentages and graphs. The DOI and UTUAT constructs were each operationalised in five statements/questions. Data from the questionnaire were captured on Microsoft Excel.  The questionnaire has been summarised with learner responses under the following headings: 'Strongly disagree', 'Disagree', 'Neutral',  'Agree', and 'Strongly agree'.  In the discussion the researcher uses percentages to indicate learner responses.

## 4.7 Interview

After the observation and questionnaire, the third method of data collection the researcher used for this study was interviewing.  Interviewing is a technique that employs questioning as its principal method of data collection (Neuman, 2006; Huysamen, 2001; Henning, van Rensburg & Smith, 2004; McMillan & Schumacher,

2001). Neuman (2006, p. 304) asserts that "The interview is a short-term secondary social interaction between two strangers with the explicit purpose of one person's obtaining specific information from the other".

For the purposes of this study, interviewing was employed as one of the data collection methods with a view to exploring learners' general perceptions of the use of a LMS as a tool in the classroom. As a data collection method the interview may vary from those that are completely unstructured to those that are completely standardised and structured (Johnson & Turner, 2003; McMillan & Schumacher, 2001; Cohen et al., 2000; Neuman, 2006). Seidman (1998) points out that the basis of interviewing is the desire to understand other people's experiences and what they make of such experiences. He says:

> "At the root of in-depth interviewing is an interest in understanding the experience of other people and the meaning they make of that experience. [...] If the researcher's goal is ... to understand the meaning people involved in education make of their experience, then interviewing provides a necessary, if not always completely sufficient, a venue of inquiry" (Seidman, 1998, p. 3).

For the purpose of this study the researcher chose to use a semi-structured and standardised open-ended interviewing method, because this was a powerful way of gaining insight into educational issues, and hence would give the researcher and the respondents the opportunity to explore and discuss issues together, face-to-face (Johnson & Turner, 2003; Neuman, 2006; Seidman, 1998; McMillan & Schumacher, 2001). This type of interviewing is in line with the sequential inter-method mixing technique (or method triangulation), which is in keeping with the mixed-methods

approach/mode employed in this study (Johnson & Turner, 2003; McMillan & Schumacher, 2001).

Henning et al. (2004) describe standardised interviews as a data production method in which the interviewer is to control the process so as to ensure that the interviewee does not wander off the topic, yet allowing the respondent(s) to "freely" give subjective answers (that yield information that represent reality more or less as it is through the response of the interviewee) to the questions posed by the interviewer. Thus the interview method employed in this study took the form of a standardised open-ended interview which used semi-structured questions (Johnson & Turner, 2003; McMillan & Schumacher, 2001; Neuman, 2006). All the interviews were guided by a set of questions, and were recorded using a digital voice-recorder and later transcribed.

According to Neuman (2006) and Johnson and Turner (2003), focus groups are a variation of an interviewing method, comprising a homogenous group of about 6 - 12 people, to discuss a research topic or issue for the purpose of obtaining a better understanding of a problem or idea by interviewing a sampled group rather than each person individually. This technique is qualitative in nature, and can be used in an inter-method mixing approach as a sequential mixed-method strategy to aid a better understanding and interpretation of information and findings emanating from earlier use of other data collection method(s) (McMillan & Schumacher, 2001; Holland & Campbell, 2005). For this reason the researcher planned to use focus group interviews as one of the data collection methods for this study. Group interviews bring together learners of varying ability and perceptions and minimise the potential intimidation of individual interviews.

The aim of the interview was to allow the learners an opportunity to express their perceptions and experiences of the use of a LMS in the classroom.

## 4.7.1   Sampling and data collection

The interviews were semi-structured and conducted with a sample of 28 participants. Participants in the interview were Grade 10 IT learners from a Secondary School in Chatsworth.  Dates for the interviews were arranged and fixed, and scheduled for the last week of March 2011. There were seven separate interviews conducted altogether, with each group consisting of a minimum of three to a maximum of six participants.  The first interview was conducted on 28 March 2011 during first break; the second interview on the same day during the second break, the third interview on 29 March 2011 during first break, the fourth and fifth on the same day during the second break, and the last two interviews on 31 March 2011 during the second break. All interviews were recorded using a voice recorder and later transcribed.

## 4.7.2   Design of the interview

A list of interview questions was drawn up to direct the interviewer and the interview process.  See Appendix B.

## 4.7.3   Data collection method

Letters of consent (Appendix E) requesting learners' participation in the interview were given to the interviewees and their parents.  An interview schedule was drawn up indicating dates and times during which learners would be interviewed.  Learners were told a day in advance when they would be interviewed.  Copies of the interview

questions were given to the learners in the morning prior to the commencement of the interview, so that they had time to peruse the questions. Learners were told that they could jot down their thoughts and ideas if they wished to. They were not compelled to write down responses on their interview sheet.

At the start of the interview the researcher welcomed the learners and then explained the research process. The researcher reiterated their rights as participants and outlined the interview process to them. Learners were informed that the data collection from this interview would be analysed and used in the write-up of the dissertation, whilst respecting the confidentiality of the individual interviewees.

### 4.7.4  Analysis

The analysis of data encompasses the breaking up of complex data into manageable themes, patterns, trends and relationships (Mouton, 2001). Analysing what the respondents have said in an interview requires the researcher to relive the interview and to link the responses with the underlying theories, whilst looking for evidence in support of the theories and that which contradicts it (Gaskell, 2000). This part of the analysis began with producing the transcript of the group interviews. The researcher preferred to do the transcript personally because the voices could be easily recognised and she could recall what was said if the recording was unclear, since the interviews were still fresh in her mind. It also gave the researcher a chance to relive the interview process by going through every word and expression in an effort to try and make sense of the data. Once the transcripts were done, the researcher looked for themes and categories that were associated with the theoretical

framework. This was done with the research questions in mind. The analysis included data from both the questionnaire and the interview.

## 4.8 Validity/reliability/trustworthiness

The application of a multi-method approach allowed for a comparison of data – referred to as triangulation (Krefting, 1991). According to Denzin and Lincoln (2003) triangulation is a means of ensuring concurrent validity and prevents personal bias. Validity refers to the appropriateness of the conclusions claimed from the analysis of the collected data (McMillan & Wergin, 2002). This has to do with whether the research methods, approaches and techniques used were appropriate to the study conducted. To ensure credibility in this study, the researcher interviewed (using a voice-recorder) the participants with the intention to gain insight into their understandings and experiences of the learning benefits and challenges they were facing with integration of a LMS in teaching and learning. The interviews were transcribed (the researcher listened to the voice recorder and typed the responses). Data were also collected from the observation of lessons using the LMS and a questionnaire. The collection of data from differences sources adds to the strength of the validity, reliability and trustworthiness of the study.

## 4.9 Ethical considerations

According to McMillan and Schumacher (2006), ethical issues refer to all the precautions, steps and efforts that researchers carefully put into practice to protect the research participants while interacting with them for data production. Bell (2005)

argues for the establishment of ethics committees which can ensure that no badly designed or harmful research is permitted. A credible research design involves the selection of participants, effective research strategies, and ensuring that all of the steps of the research adhere to research ethics.

During the planning and implementation of this research project due consideration was given to ethical issues relating to using learners as part of the data collection method. The researcher applied for ethical clearance from the University of KwaZulu-Natal to conduct this research at the school. In the application the researcher outlined the type of research that was going to done, the research methods and data collection instruments that were to be used. The application also included how ethical issues concerning participants were to be addressed. Once ethical clearance was issued, the data collection process began. The school principal granted the researcher permission to use the school as the research facility, in accordance with ethical guidelines that were presented to him. Learners were assured that they were not compelled to participate in this research project.

The researcher first had to get permission from the adult under whose authority the learner was during the context of the research, and secondly from the learners themselves (Cohen et al., 2000). Letters of consent were sent to parents of all Grade 10 IT learners (Appendix E). The consent form outlined the research title, including its broad aims and purposes. The consent form also assured participants of absolute confidentiality. Assuring confidentiality is a very important aspect in getting participants to answer truthfully. Seeking consent was necessary as it protects both the learner and researcher from any problems that may arise, and also provides

proof of the authenticity of the data collected and the processes used (Cohen et al., 2000).

## 4.10 Limitations of the study

The study involved only Grade 10 IT learners, whose responses could not represent the entire learner population at the school. The results of this study could not be generalised.  A further limitation to this study is that participants may not have been totally honest with the researcher, for various reasons such as shyness or wanting to protect privacy. Participants may have given responses which they considered appropriate, but which may not have been true or valid (De Vos, Strydom, Fouche & Delport,  2002).

## 4.11 Shortcomings and sources of error

Internet access to the IT laboratory was via a wireless connection from the library. At the beginning of the year there was no access the Internet from the IT centre, yet the rest of the school (administration and library) had Internet access. The technician was called in and found out that the antennas had been struck by lightning. This took about a month to repair. Prior to the data collection, when learners tried logging in it took too long to even access the school's website, yet alone the LMS.  Many computers froze while trying to access the school's website.  This caused a bit of frustration for the learners.  At a meeting with the school's service provider, the principal and the IT teacher, it was decided to upgrade the ADSL line from 522 Kps to 4096 Kps.  The service provider also provided uncapped Internet access and

moved the school website to a faster server. As a result access to the LMS was much faster than before.

All of these setbacks caused a delay in the actual data collection, and also impacted negatively on the learners' attitudes towards access to the LMS. They felt that the problem was the LMS and not the Internet connection. It would have been a lot less confusing had this problem been sorted out beforehand.

## 4.12 Conclusion

This chapter discussed the methodology used in the study. It also discussed the instruments used in the data collection: questionnaires, focus group interviews and informal observation. Ethical considerations were also discussed. The advantages and challenges accompanying the use of mixed research methods were highlighted. The limitations of the study were also discussed.

The next chapter analyses, presents and interprets the findings of the study.

# Chapter Five: Data analysis and interpretation

## 5.1 Introduction

Chapter five provides a summary of the analysis of the data gathered during the research process. This analysis presents data and arguments from the observation, group interviews and questionnaires used to collect the empirical evidence.

## 5.2 Applying diffusion theory

According to Rogers (1995), people's attitudes towards a new technology are a key element in its diffusion. As discussed in Chapter two, the characteristics (attributes) of an innovation influence an individual's decision to adopt or reject an innovation (Rogers, 1995). Rogers (2003) stated that five attributes impact on a person's choice to adopt an innovation: relative advantage, compatibility, trialability, observability, and complexity. Rogers termed these the "perceived attributes" of innovations. The questionnaire was used to operationalise Rogers' five factor theory on innovation adoption. The first 25 questions of the survey (Appendix A) were based on Rogers' (1995) model of the five characteristics (attributes) of an innovation.

A Likert scale was used to determine learners' attitudes towards these attributes. Learning-related questions, interactive questions and technology-related questions were employed to assess the impact and context of adoption of the LMS by learners. All of the questions were answered on a Likert scale. Data from the questionnaire

were captured on Microsoft Excel. The questionnaire has been summarised with learners' responses under the following headings: 'Strongly disagree', 'Disagree', 'Neutral', 'Agree', and 'Strongly agree'. In the discussion percentages are used to indicate learner responses.

## 5.2.1 Relative advantage of using a LMS

Rogers (2003, p. 229) defines relative advantage as the "degree to which an innovation is perceived as being better than the idea it supersedes". To measure relative advantage the researcher used five statements to determine whether or not the LMS is a useful innovation (Table 2). According to Rogers (2003), the higher the perceived relative advantage, the more likely it is that the innovation will be adopted. Table 2 gives learners' responses in percentages for relative advantage.

| Relative advantage | Strongly disagree | Disagree | Neutral | Agree | Strongly agree |
|---|---|---|---|---|---|
| Using the LMS saves time | | | 7 | 32 | 61 |
| The LMS is a positive innovation | | | 4 | 35 | 61 |
| The LMS makes learning more meaningful | | | 21 | 32 | 47 |
| The LMS makes it more convenient to communicate with my teacher and friends | 4 | | 7 | 25 | 64 |
| The LMS is a fast and efficient way of getting information | | | 7 | 43 | 50 |

**Table 2: Relative advantage of the LMS**

Table 2 indicates that the majority of the learners agreed that the LMS is useful; 96% agreed with the statement that the LMS is a useful innovation in that it saves time,

and 61% of these strongly agreed. The possible reason for the majority of the learners' responses about the LMS saves time and is positive, fast and efficient is due to the fact that once they were logged into the system, they were able to access the content without experiencing any difficulty.  The lesson content, whether a PowerPoint presentation or browsing the Internet for information, presented very few problems. This can be corroborated from the statements made by learners during their interviews when they were asked the question "Did you experience any problems when using the LMS?"  These were some of the responses:

- *"No I did not have any problems";*

- *"No problems";*

- *"No not the LMS. It was just the server".*

The learners' emphatic and unequivocal responses to the question indicate their strong support for the LMS. In this context we can surmise that the LMS is a progressive innovation.

From the observation, it was noted that the learners managed to access the relevant tools rapidly and efficiently. Whilst 79% agreed that the LMS contributed meaningfully to their learning, 21% of learners did not feel strongly enough that the LMS has contributed to their learning.  Since not all learners are technology savvy and this was their first experience using a LMS to learn, it ought to be expected that there would be a percentage of learners who were unsure about how the LMS contributed to their learning. Also, the concept "meaningful learning" may be interpreted differently by different learners, and therefore many learners preferred to remain neutral.  It is important to note though that they did not disagree.

Playing a dual role (educator and researcher) also helped during the observation process, because learners indicated informally how impressed they were with the LMS and questioned why they were not exposed to it any earlier.  This was evident from the response of one of the interviewees during the group interview when he stated that he "*did not know why we didn't introduce it earlier."*

The findings indicate that there was a positive response to all five statements for relative advantage. Analysis of data from the questionnaire indicates that the LMS is a useful innovation and that Rogers' relative advantage is favoured as one of the characteristics of the innovation.

### 5.2.2 Compatibility of the LMS

Rogers (2003, p. 15) defines compatibility as the "degree to which an innovation is perceived as consistent with the existing values, past experiences and needs of potential adopters". Furthermore, Rogers (2003) stated that if the innovation is perceived as an extreme change, then it will not be compatible with past experiences and is less likely to be adopted.  This second component of Rogers' model was assessed by whether the LMS would require the participants to change their work habits.  Again the researcher used five statements to determine compatibility of the LMS with the participants, and Table 3 outlines learners' responses to them in percentages.

| Compatibility | Strongly disagree | Disagree | Neutral | Agree | Strongly agree |
|---|---|---|---|---|---|
| I look forward to receiving emails from my friend on the LMS | | 4 | 17 | 29 | 50 |
| I am eager to respond to the discussion group on the LMS | | 4 | 35 | 25 | 36 |
| The LMS is compatible with the way I like to work | | 11 | 10 | 25 | 54 |
| Using the LMS would require me to change my study habits | 4 | 18 | 10 | 29 | 39 |
| Using the LMS increases my interaction with the subject content | | 4 | 11 | 21 | 64 |

**Table 3: Compatibility of the LMS**

The results reveal the LMS is a compatible innovation since the majority of the learners responded positively to all five conceptual measures of compatibility. As can be determined from table 3, 85% (64% Strongly agree, 21% Agree) of the learners agreed that by using the LMS, their interaction with the subject content increased. Learners interacted with the subject content on a one-to-one basis. Each learner worked independently and progressed from one section to the next at their own pace, thus increasing their interaction with the content and at the same time making learning more meaningful. The statement *"using the PowerPoint from the LMS helped me to learn better instead of sitting and reading a textbook"* made by one of the learners during the interview process supports the fact that learners were engaged in meaningful learning.

Every day many learners spend countless hours immersed in popular technologies such as Internet and email. It is not surprising that Internet access with email facility has taken up space in many educational institutions and is fast becoming a reality in and out of the classroom. Seventy-nine per cent of the learners looked forward to

receiving emails on the LMS, and the same percentage found the LMS compatible with the way they like to work. Our new generation of learners is demonstrating the impact of having developed in the digital era; digital technologies are a fully integrated aspect of their lives (Green & Hannon, 2007).   Many learners own mobile devices with Internet connectivity and email access, and as a result can identify with LMS technology. This could be a possible reason why they found the LMS so compatible. Sending and receiving emails whilst in a class via the LMS was a first for this group of learners, and therefore they found it exciting. Another contributing factor could be that these learners study IT and are exposed to technology (Internet access) and are familiar with use of the computer as compared to a learner who does not do IT.

This group of learners was previously not exposed to a LMS, and since this is a new technology to the approach of teaching and learning, 68% (29% Agree, 39% Strongly agree) of learners agreed that use of the LMS would change their study habits. It was evident though their facial expressions and informal conversations that learners were impressed that they had access to up-to-date and current information at the click of a button.  Many learners felt that traditional use of a textbook can now be replaced by use of a LMS. As one of the interviewees stated *"the information was up to date rather than using textbooks which were printed years ago with outdated equipment".*

Table 3 shows that 35% of the learners were neutral regarding the discussion group on the LMS.  It is possible that in the initial stages that these learners were afraid to express their ideas since it was their first experience. There were learners with

diverse learning abilities in the class, not all comfortable with expressing their views for the entire group to read. For some of the learners the discussion group (which many referred to as a chat group) would be an alternative for them to say what they wanted and not be afraid. However, most of the learners (25% Agree, 36% Strongly agree) indicated that they were eager to participate in the discussion group. These learners were eager to write something, even if was not related to the topic of discussion, and from my observation this was an opportunity to write what they wanted without being interrupted. Waiting and replying to responses from the other learners prompted more learners to participate in the discussion. The learners were totally surprised that the educator also participated in the online discussion in class. When asked which specific tool they found the most beneficial when using the LMS, learners responded as follows:

- *"The group discussion everybody contributed ... had a friend to contact"*;

- *"It's online and you can see what is happening"*;

- *"The chat was interesting"*;

- *"We can contribute to the discussion and ask questions to the teacher which she answered".*

Observation revealed that the learners were notably excited (evident in the comments they made amongst each other) about the use of the LMS. At the end of each lesson, as the learners left the class, they would casually ask questions like: *"Why did we not use this sooner"* and "*Why don't we use this in all subjects*?". This confirmed that there was a positive attitude toward the LMS.

The overall mean for compatibility is 74.4% (agree and strongly agree), indicating that this characteristic has been favoured positively, and the LMS is compatible with the learners' needs. A positive response also indicates that there will be an increase in the adoption rate of the LMS, with more learners wanting to adopt use of it.

## 5.2.3 Trialability of the LMS

Rogers (2003, p. 16) defined trialability as "the degree to which an innovation may be experimented with on a limited basis". This may include trying out parts of a program or having the opportunity to watch others using a new program. Rogers (2003) added that trialability is positively related to the likelihood of adoption. The statements that tested trialability are seen in Table 4, which gives the learners' responses to the statements in percentages.

| Trialability | Strongly disagree | Disagree | Neutral | Agree | Strongly agree |
|---|---|---|---|---|---|
| I am not worried about making mistakes by clicking on the wrong item when I use the LMS | 11 | 18 | 29 | 21 | 21 |
| I can practice using the LMS at a comfortable pace | | 4 | 6 | 11 | 79 |
| The LMS can be easily tried out | | | 25 | 32 | 43 |
| I am not hesitant to use the LMS even though I make mistakes | | | 11 | 32 | 57 |
| The LMS does not intimidate me | | 4 | 18 | 32 | 46 |

Table 4: Trialability of the LMS

It seems that the majority of the learners were comfortable working and experimenting with the LMS on a trial basis. From Table 4, it can be seen that 89% (32% Agreed, 57% Strongly agreed) of them agreed that they can use the LMS at a

comfortable pace, and that even though they made mistakes they were not hesitant to continue to use the LMS. Learners were not intimidated by the LMS because of their exposure to digital technology in and out of school. As mentioned earlier, this group of learners is advantaged because they study IT and as a result are exposed to a variety of programs and user interfaces. Responses from the interview also indicated that learners managed to work comfortably with the LMS. When asked what challenges they faced when using the LMS in the classroom, one learner said *"No there were no challenges for me, everything went smoothly and I was able to access everything",* and another responded "*I understood what you said so there were no challenges for me*". Similarly, another felt that *"there's no challenges at all because it was simply written and it was like straightforward stuff where you can just click and go to the next slide so you know what you are going through".*

One of the few challenges faced was connectivity. Since many learners were using the LMS simultaneously, the server became sluggish and the Internet kept disconnecting. Initially many learners indicated that it was too time-consuming to get logged into the LMS, and as a result they became frustrated. This was purely a technical problem. The server hosting the school's website and the Internet bandwidth were both slow. After some changes were made this was rectified, and thereafter very few problems were experienced with regard to gaining access to the LMS. Few learners experienced problems with their username and passwords. After this problem was overcome, all learners were able to access the LMS without any difficulty. This was validated by the following responses from learners during the interview process when asked what challenges they experienced:

- *"Nothing with the LMS itself ... but connectivity"*;

- "*I think it will only be speed of the modem which is sometimes slow when there are too many learners using LMS ... the speed slow*";

- "*When using the LMS I had no problems just that the Internet server kept disconnecting*";

- "*... sometimes I couldn't log into my account because the password was incorrect and as a result sometimes the time wasn't enough to complete tasks*".

Few learners (29%) were worried about making mistakes by clicking on the wrong item. Learners who were unsure either asked their friends next to them or the educator before proceeding. The observation process provided evidence of this. After a while they adapted to the interface of the LMS and progressed unhindered using it at their own pace.

It seems that the characteristic of trialability has been positively received by the learners. Trialability positively correlated to the rate of adoption, thus contributing to increased use and possible adoption of the LMS.

### 5.2.4 Observability of the LMS

Rogers (2003, p. 6) defined observability *as:* "the degree to which the results of an innovation are visible to others". Table 5 reflects the responses of learners to the statements used to test the observability of the LMS, in percentages. According to Rogers (2003), if the observed effects are perceived to be small or non-existent, then the likelihood of adoption is reduced.

| Observability | Strongly disagree | Disagree | Neutral | Agree | Strongly agree |
|---|---|---|---|---|---|
| I have seen other subjects in my school make use of a LMS | 57 | 18 | 14 | 4 | 7 |
| I have seen other schools make use of a LMS | 61 | 32 | 7 | | |
| I have seen the use of a LMS on television | 65 | 21 | 14 | | |
| I am aware of a LMS being used in a university | 50 | 25 | 7 | | 18 |
| I have not seen a LMS before | 50 | 7 | 4 | 14 | 25 |

**Table 5: Observability of the LMS**

The summary of responses as tabulated in Table 5 indicates that most learners in general had not seen or used a LMS previously. Table 5 shows that none of the learners had heard of other schools that made use of a LMS or seen one used on television. Seventy-five per cent of the learners were not aware of use of a LMS at a university. This may be substantiated by responses from the interview process. Of the 28 learners interviewed, 25 responded with an unequivocal *"No!"* when asked if they had previously used a LMS. A small number (only 3 learners) indicated that they were only exposed to a LMS in the IT class when it was first introduced: *"no not until we started the programme at our school in our IT class"*; *"no only in our IT class"*; and "*no only when you taught it to us"*. It can therefore be concluded that all learners interviewed had no previous experience with a LMS, indicating that the LMS is relatively new to the teaching and learning process.

Eighteen per cent indicated that they had seen the use of am LMS at a university. These learners may have family members who are currently using am LMS to study or to lecture. Eleven per cent of the learners indicated that they had seen other

subjects in their school use a LMS. This is possible because the school currently has six e-learning centres which make use of CMSs to teach Mathematics, Physical Science and Life Sciences. These learners, however, do not have hands-on experience with this program; the teacher uses the CMS to project the content via a data projector.

The statement "I have not seen a LMS before" was written in the negative, and only 39% of the learners agreed with this. This implies that the other 61% disagreed with the statement, meaning that they had seen a LMS before (4% were neutral). This is, however, not in keeping with the previous four statements. Learners may have misinterpreted this statement, because it is a contradiction to when the majority emphatically said they were not aware of the use of a LMS at school, on television or at a university. Since this is only one of the five statements that showed a contradiction, the observability construct is still positively received.

This study is conducted on the basis that the learners have not used a LMS previously, and it stands to reason that a fair percentage will indicate that they have not seen a LMS in use. Table 5 shows that the observability characteristic clearly indicates that a LMS is a relatively new domain and learners have not been adequately exposed to a LMS since more traditional means of teaching and learning have taken precedence, despite the rapid popularity in and growth of technology. According to Rogers (2003), if observability is positively received then the rate of adoption is greater. Even though majority of the learners had not previously seen a LMS in use, they were still positive to its adoption. The reason for this may be because they were eager to have a new technology introduced into the classroom – more especially a technology that they can identify with because of email, chat, and Internet access. Traditionally these tools were not allowed in the classroom, and now

the learners are using them to supplement their learning. Learners in the digital era are so up-to-date with new technological devices (such as cell phones, iPads, etc.) that even though they have not observed a LMS in use, they experienced minimal problems integrating it into the classroom.

### 5.2.5 Complexity of the LMS

Rogers (2003, p. 242) explains complexity as the "degree to which an innovation is perceived as relatively difficult to understand and use". Innovations that are perceived as complex are less likely to be adopted. The five measures used to examine complexity of the use of the LMS can be seen in Table 6, which indicates the learners' responses in percentages.

| Complexity | Strongly disagree | Disagree | Neutral | Agree | Strongly agree |
|---|---|---|---|---|---|
| Interacting with the LMS is frustrating | 68 | 15 | 17 | | |
| The LMS is user-friendly | | | 7 | 25 | 68 |
| The LMS is too complex for me | 79 | 21 | | | |
| I am confident in my ability to use the LMS | | | 7 | 29 | 64 |
| When using the LMS I find it easy to navigate from one screen to another | | 4 | 17 | 29 | 50 |

Table 6: Complexity of the LMS

Complexity was tested with a mixture of positive and negative statements. The statistics show a balance between the positive and negative responses, in favour of showing that the LMS is not a difficult tool to use. None of the learners agreed that

the LMS was too complex (21% Disagreed, 79% Strongly disagreed). In keeping with this, 93% (29% agreed, 64% strongly agreed) indicated that they were confident in using the LMS. Observation showed that this was a true reflection, because the overwhelming majority of learners were able to navigate through the LMS without any difficulty. They were able log in with their user name and password and then access the content without needing any assistance from their peer or the educator.

Five learners (17%) indicated that their interaction with the LMS was frustrating. These learners included those who experienced technical problems as mentioned previously, such as loss of Internet access and problems with logging into the LMS or computer-related problems. Whilst navigating through the content learners sometimes had to access the Internet, and because there was a drop in signal learners showed some signs of anxiety. During the group interview process learners were asked to discuss what problems or challenges they had experienced when using LMS. These were some of the responses:

- *"No did not have any problems"*;

- *"The connectivity also gave us a problem but we eventually connected"*;

- *"No besides the Internet getting cut off"*;

- *"Nothing with the LMS itself ... but connectivity"*.

These responses clearly support the figures in Table 6. The complexity of a technology affects how well that technology diffuses into a social network system, because if the technology is easy to use more people are likely to adopt it. Findings from this study support this statement, and Table 6 shows that the LMS was quite easy to use and thus likely to be widely adopted. The complexity construct showed positive results from the majority of the learners.

The findings thus far have shown how the constructs in the DOI model fared positively, and thus can be used to predict the diffusion of a LMS. This study analysed issues surrounding adoption of a LMS using DOI to test its adoption amongst Grade 10 secondary school learners. Five major constructs (relative advantage, compatibility, trialability, observability and complexity) were used to test impact on attitudes and trust regarding use of a LMS and to determine how attitude would impact on intention to use it. From the results it could be said that the relative advantage of using a LMS, how compatible it was with the lifestyle of the learners, whether the LMS could be tested before consistent use, how much had been registered about the LMS by the learners, and how hard it was to use were issues that influenced users' attitude towards their intention to use it. Since all of these constructs have an impact on attitude, it follows that the LMS is in keeping with the learners' lifestyle and would assist in adoption of a LMS amongst the learners.

## 5.3 Applying the UTAUT

For the sake of continuity, an overview of the UTAUT (Venkatesh et al., 2003) will once again be highlighted. The UTAUT is an attempt to improve the different information system models on technology adoption. The UTAUT provides us with an opportunity to enhance our understanding of user acceptance of a technology. The constructs that were common to the UTAUT and other models were extracted and used for this study. According to Venkatesh et al. (2003) seven constructs appeared to be significant direct determinants of intention of usage in one or more of the individual models examined. Of the seven constructs, Venkatesh et al. (2003) theorise that four will play a significant role as direct determinants of user

acceptance and usage behaviour, and these are: performance expectancy, effort expectancy, social influence and facilitating conditions.

This study did not take into consideration gender and age as moderating factors as shown in the UTAUT model. The average age of the learners was 16 years, and all learners were from Grade 10. The questionnaire operationalised each of these constructs for user acceptance and user behaviour, with several statements used to measure performance expectancy, effort expectancy, social influence and facilitating conditions. Similar to DOI, learning-related questions, interactive questions and technology-related questions were employed to assess user acceptance and usage behaviour.

All of the questions were answered on a Likert scale. Data from the questionnaire were captured on Microsoft Excel and represented in columnar graphs. Analysis of the results for each of the four UTAUT constructs follows.

### 5.3.1 Performance expectancy

Performance expectancy is defined as the degree to which an individual believes that using the system will help him or her to attain gains in job performance (Venkatesh et al., 2003). The relative advantage construct from DOI pertains to performance expectancy. Performance expectancy was tested using the following statements: a) I find the LMS useful in my studies; b) Using the LMS enables me to accomplish tasks more quickly; c) If I use the LMS I will increase my chances of getting a better grade; d) Using the LMS motivates me to learn; and e) Using the LMS increases my productivity. Figure 3 represents the learner responses on performance expectancy.
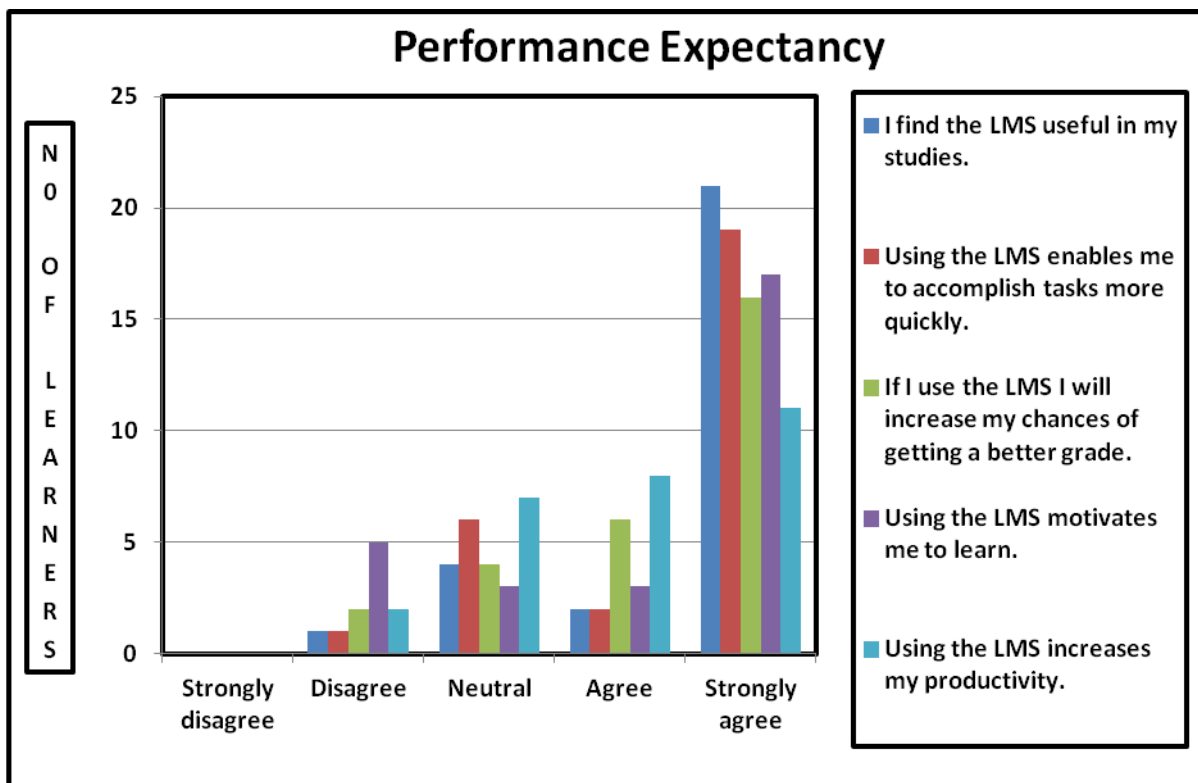
**Figure 3: Performance expectancy**

Figure 3 illustrates the frequencies and corresponding numbers of learners for perceptions with respect to performance expectancy. As can be seen, the learners tended to believe that the LMS was a useful and productive tool; however, there was a slight tendency (6 out of 28 learners) to be neutral in terms of their perception that the LMS will enable them to accomplish more tasks quickly, and that the system increases their productivity. This was also evident in the researcher's observation and interaction with the learners. As mentioned earlier, a few learners experienced technical problems in accessing the Internet and as a result could not access the LMS. This was time-consuming and could be a possible reason why some learners remained neutral.

However, the following comments from the group interviews support the data collected from the questionnaire:

- "*It was much easier to do work and it saves a lot of time...*";

- "*You can find out more information easily, it is better to learn it, makes you want to learn*";

- "*Quicker as I said, saves us time plus it is much easier to work with*".

As stated earlier, performance expectancy correlates to relative advantage from DOI and the data collected from relative advantage is similar to that for performance expectancy. These findings confirm the results of performance expectancy in the UTAUT, which were significant for participants' behavioural intentions. The findings suggest that the intention to use the LMS is likely to increase if a learner perceives the LMS to be useful. Performance expectancy, that is the expected benefits gained by using the LMS, had a significantly positive effect on intention to use the LMS. From this we can conclude that attitudes have an effect on the relationship between performance expectancy and intention to use the LMS. Thus, the influence of performance expectancy on intention was partly explained by attitudes. Furthermore, attitudes create a link between performance expectancy and intention to use the LMS. Nevertheless, performance expectancy had a strong effect on intention to use.

## 5.3.2 Effort expectancy

Effort expectancy is defined as the degree of ease associated with the use of the system (in this case the LMS) (Venkatesh et al., 2003). The complexity construct from DOI captures the effort expectancy. The following statements were employed to test effort expectancy: a) My interaction with the LMS is clear and understandable; b) I find the LMS easy to use; c) Working with the LMS is fun; d) It would be easy for me to become skilful at using the system; and e) Learning to operate the LMS is easy for me. Figure 4 illustrates the learners' responses on effort expectancy.
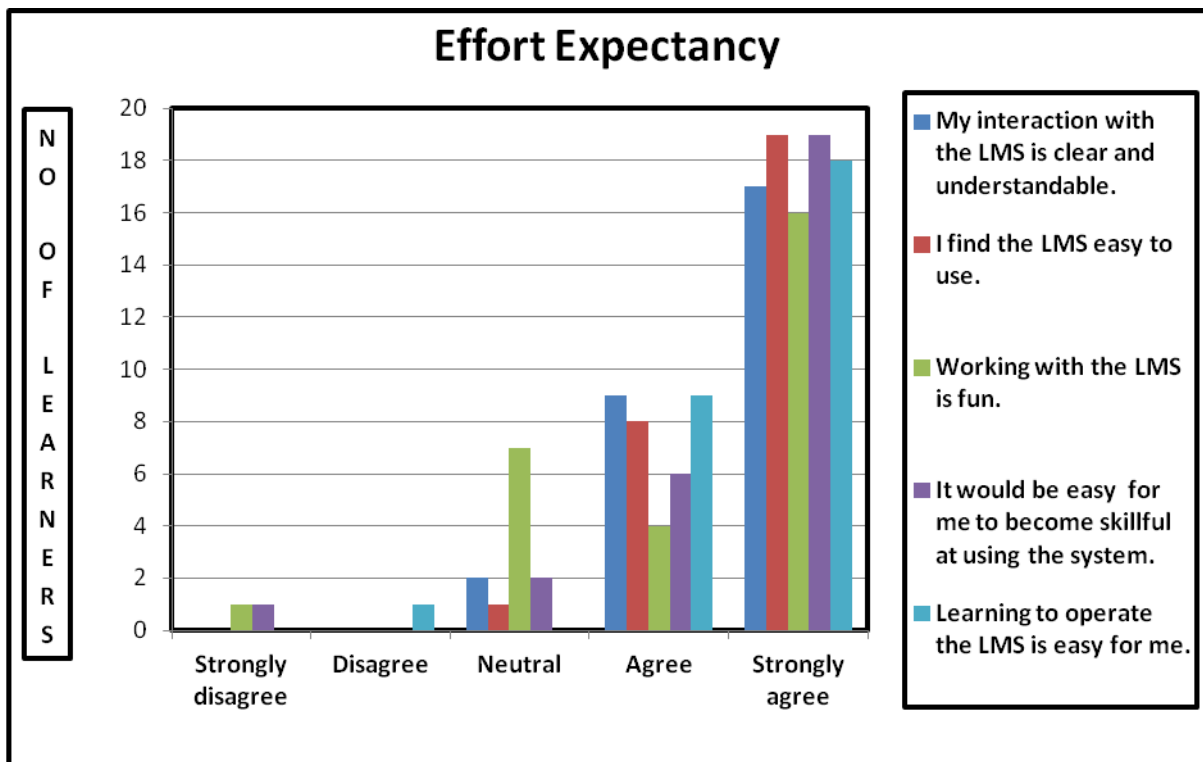


**Figure 4:  Effort expectancy**

It appears that the learners tend to agree that the LMS is understandable, easy to become skilful in, and easy to learn. Moreover, they tend to strongly agree that the LMS is easy to use. The data suggest that the learners surveyed tended to believe that the LMS was a good idea and that they liked to use it, however, a small

percentage (25%) were neutral in terms of perceiving that working with the LMS was fun. Once again, this may be attributed to the technical problems experienced by the learners.

It was evident during the observation process that the majority of the learners did have fun using the LMS. They found it easy to use and understood exactly what to do. Interview responses that support this are:

- *"Yes it was much easier to learn from"*;

- *"It was easy to learn from there, was no need for textbook"*;

- *"You could actually learn while using the LMS, which is not only fun but very useful to us; as we do our activities we benefit from it, especially the PowerPoint presentations".*

Not surprisingly, given today's learners' exposure to technology, the learners did not find it difficult to use the LMS. The relationship between effort expectancy and intention to use the LMS was very similar to that for performance expectancy. Effort expectancy had a positive influence on intention to use the LMS.

### 5.3.3 Social influences

Social influence is defined as the degree to which an individual perceives the importance of others' opinion with respect to use of a new system (Venkatesh et al., 2003). Social influence as a direct determinant of behavioural intention is

represented as image in DOI.  Image is "the degree to which use of an innovation is perceived to enhance one's image or status in one's social system" (Moore & Benbasat, 1991, p. 195).   Prior researchers have claimed that social influence is significant in shaping personal intention to use new technology (Moore & Benbasat, 1991; Venkatesh & Davis, 2000).   The following statements were used to assess social influences: a) I will use a LMS because my teacher prefers me to use it; b) I will use a LMS to impress my friends; c) I will use a LMS because my peers are pleased when I contribute through the LMS; d) Using a LMS is considered to be one of the latest learning technologies; and e) Other learners expect me to keep up with technology by using a LMS.

Figure 5 represents the learners' responses to social influences.
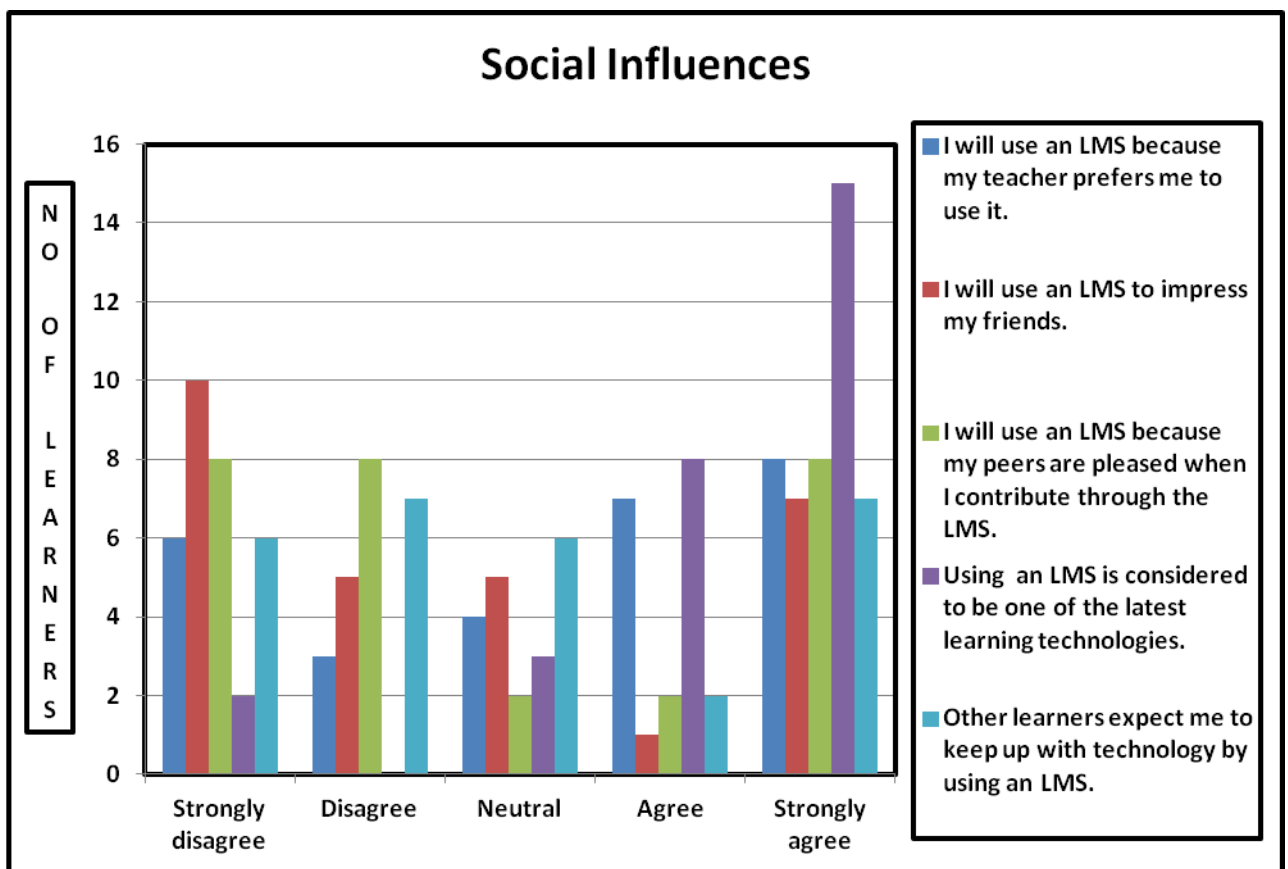


**Figure 5: Social Influences**

Interestingly, Figure 5 shows that the learners may not be influenced by others who think they should use the LMS, but they strongly agree that the LMS is one of the latest learning technologies (82% Agreed). This may be so because the LMS is a new form of classroom technology to this group of learners. The interviews, however, did not elicit substantial data related to the effect of social influence on intended or actual use of the LMS.

Social influences play an important role in determining acceptance of the LMS. The data show that learners are enthusiastic about the use of the LMS and that this enthusiasm has a positive influence on such use. Learners indicated that they were not using the LMS just to impress their friends but because they felt that it contributed to their learning. Social influence is the degree to which a user perceives the importance of others' opinion with respect to LMS use; it also plays a significant role in the intention to use a LMS.


## 5.3.4 Facilitating conditions

Facilitating conditions are defined as the degree to which an individual believes that an organisation and technical infrastructure exist to support the use of the system (Venkatesh et al., 2003). This definition blends in with the compatibility construct from DOI. The following statements were used to examine the learners' attitude towards facilitating conditions:  a) I have access to the computer laboratory; b) The LMS is compatible to other applications I use (such as MS Powerpoint, MS Word, etc.; c) I have access to the internet; d) I have been trained to use the LMS; and e) There is someone available to assist when I experience difficulties with the LMS.

Figure 6 represents the learners' responses to facilitating conditions.
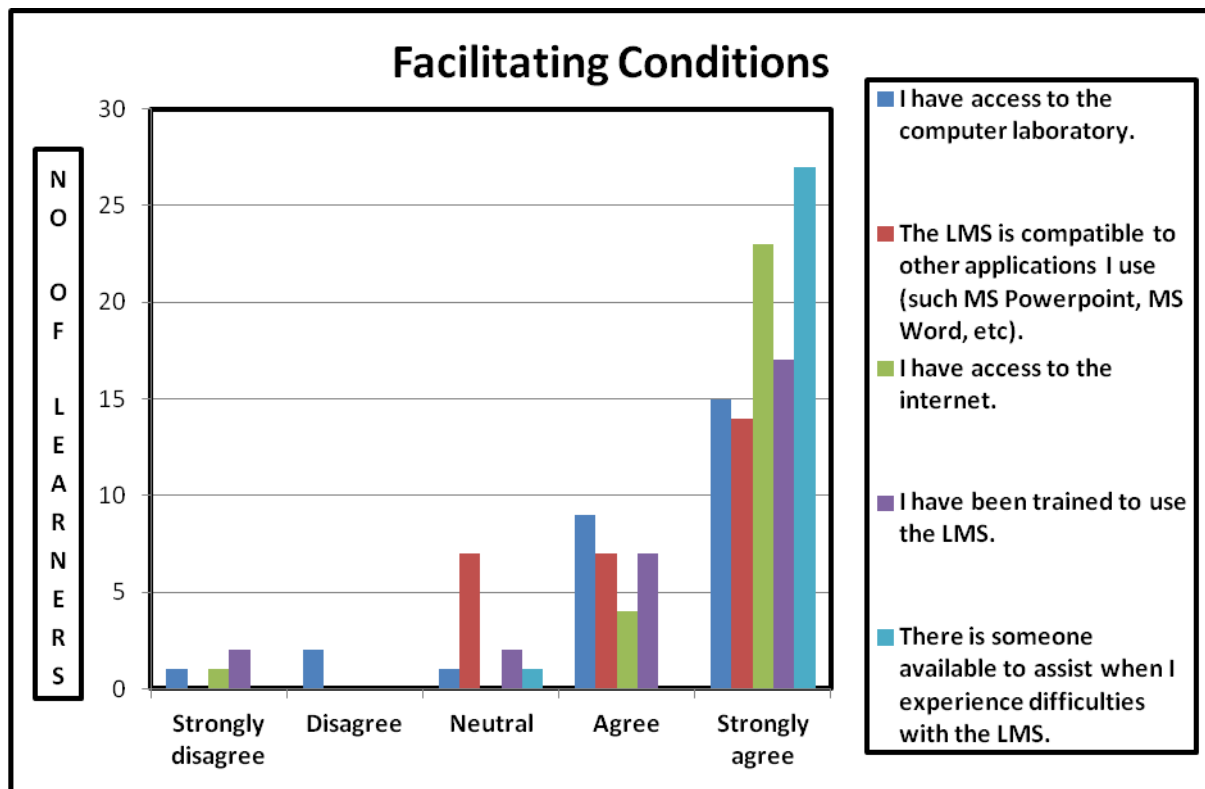


**Figure 6: Facilitating conditions**

Figure 6 supports the learners' perceptions that they have the necessary resources, knowledge and support to use the LMS. The degree to which an individual believes that organisational and technical infrastructure exists to support system use will determine the extent of facilitating conditions with respect to use. The facilitating conditions that will assist learners in the use of the LMS are fast Internet connection, easy access to the IT centre during breaks and after school, and availability of an IT technician. Eighty-seven per cent of the learners agreed that they had access to the computer laboratory and 96% indicated that they had access to the Internet. During the interview learners indicated that initially there were problems in connecting to the

Internet and accessing the LMS; these were subsequently rectified, as indicated in the following responses:

- *"The internet signal was dropping continuously but this problem was solved eventually"*;
- *"The connectivity also gave us a problem but we eventually connected"*;
- *"Not serious problems but because the entire class tried logging into it at the same time it was quite slow".*

The positive responses to performance expectancy, effort expectancy, social influences and facilitating conditions show that the LMS is a useful innovation, and increase the likelihood of adoption of a LMS as a learning tool in the classroom.

## 5.4 Thematic analysis

The analysis of the interview responses was guided by Miles and Huberman's (1994) analysis model, including transcribing and identifying themes. The section below provides key concepts derived from the theoretical framework, which were looked at in detail by the researcher during the classroom observation and interview process on use of a LMS in teaching IT.

### 5.4.1 Access to current information

The learners were unanimously in favour of the LMS being a beneficial learning tool. Many learners felt that the LMS made learning more interesting and enjoyable and that there was no need for textbooks. Learners stated that they had access to

information that was current and relevant thus making learning easier and meaningful. During the interview one learner stated that *"the information was up-to-date rather than using textbooks which were printed years ago"*.

### 5.4.2 Networking:  Forming connections or network creation

This component addresses how students learn in the digital age.  According to the observations, the use of the LMS to encourage independent and networking learning was evident. The researcher observed learners connecting to sources of information and visiting websites to access information. The LMS may be identified as a networked technology that affords learners a wide range of resources and potentially greater access to information than a book. This is what Siemens (2004) refers to as forming connections between sources of information. The more frequently websites are visited, the more connected a learner can be.

On the other hand, Siemens (2004) maintains that learning may reside in non-human appliances such as LMSs, but that it is important to know where to get the right information at the right time so that knowledge and learning continue to develop. Many learners felt that *"learning from a computer is better than learning from a textbook"*. Learning may still occur from the interaction of learners with objects such as computers, and therefore there is a need for the integration of a LMS, and nurturing and maintaining connection is needed to facilitate continual learning (Siemens, 2004).  This suggests that the acquisition of new information should be continuous because the learning process never ends.

### 5.4.3 Collaboration

The researcher observed that the LMS could facilitate active collaboration to a large extent; learners were simultaneously able to share information and other sources of information such as the Internet through the LMS. Collaborative instruments such as the discussion were used throughout the research period. Although e-mails via the LMS were not encouraged as a communication tool, a few learners did make use of them. These learners enjoyed using e-mail to communicate, one stating that "*the e-mail was also very nice because we had another means of communication with our peer and educator*". A few learners e-mailed the educator after school hours via the LMS asking for help.

Learners expressed their excitement about the LMS because of the ability to go online and participate in a chat while still in class, to gather more information and ask questions, which they considered very helpful. When asked what they found most beneficial when using the LMS, the response was unanimously in favour of the discussion forum (also referred to as chat) being the most popular tool. Many learners felt that it made learning more interesting and enjoyable. Learners interacted with their peers via the chat and felt that *"everybody could share their opinions"* and *"communicate with each other about what new things we learnt on the LMS"* thereby enhancing their knowledge. It allowed the learners to communicate and collaborate with each other and with the educator.

Woodill (2007) argues that a LMS allows for learner participation which could not exist with traditional face-to-face teaching and learning. The researcher also noted during observation that the learners indicated that the LMS can encourage active

participation. The integration of this technology in the classroom increased learner activity and learning in the form of peer social interaction. Learners are able to share learning experiences and improve the level of understanding (Birch & Burnett, 2009). The LMS also allowed for communication between the learners and educator. Furthermore, learners can chat and discuss information at any time to facilitate the development of their learning.  The information can also be accessed any time, and because learners now own cell phones with Internet connectivity, the world is their classroom. This statement is backed by a comment made by one of the learners: *"what I like about the LMS is that you can use it at home, you can use it at school, and you can use it anywhere"*.  The question and answer (quiz) was also beneficial because learning in that way was more interactive than learning from a written document, and assisted them in preparing for the examinations.

### 5.4.4 Addressing diverse needs of learners

This aspect involves the process of learning, considering a variety of learners' learning styles and catering for individual differences, their interests and personal background (Glover & Miller, 2001).  According to Siemens (2004), individual learners have a variety of learning experiences and understandings.  Schools admit learners from different cultural backgrounds. As a result, learners bring different experiences to the classroom.  During their interactions with their peers online, these learners may learn from their friends as they share common learning experiences and understandings. The use of these multimedia features and PowerPoint presentations reinforced concepts and supported the learners in understanding concepts.  One learner commented that *"using the PowerPoint from the LMS helped*

*me learn better instead of sitting and reading a textbook"*. This became evident when learners were able to complete a variety of activities which they were able to follow and work on appropriately.

Prior to commencement of each lesson a quick question and answer session was conducted to confirm that learners understood the content from the previous day. Learners showed a deep understanding of the content – this was noted in their responses to the questions asked. When asked how the LMS contributed to their learning, many learners stated that it was easier, fun, and the information was summarised compared to the conventional methods.

During the research period it was observed that the LMS integration could also allow learners to work at their own pace, and differentiated teaching for differing-ability groups of learners could possibly be accommodated. When files and activities were available, learners began learning on their own. Some learners did explore readings and online quizzes, while others waited to be led by the educator. Nonetheless, this highlights one great opportunity of the LMS: online learning provides learners with a great deal of autonomy, i.e. the choice of when, where, and how to learn (Kearsley, 2000).

## 5.5 Conclusion

The aims of this research study were to determine:

- The learners' attitudes when using a LMS;
- The learners' experiences when using a LMS;
- How learners use a LMS to support their learning; and

- The benefits learners derive when using the different tools in the LMS.

The findings revealed by the study are now summarised according to each of these research questions.

### 5.5.1 Research Question One: *What are the attitudes of learners when using a LMS as a technological tool in the classroom?*

The DOI and UTAUT models were used to determine learners' attitudes towards the LMS. Learners were asked in the questionnaire whether they perceived the LMS to be useful to them and responses showed strong agreement with the positively worded statements and strong disagreement with the negatively worded statements. The overall perception (taking both kinds of statements into account) from the questionnaire was that learners felt that the LMS was a useful innovation. The majority of learners perceived that their use of LMS would improve their performance in the classroom. During interviews learners overwhelmingly indicated that the LMS was a positive innovation and that they would unreservedly embrace its use in other learning areas as well.

The positive responses to the DOI constructs suggest that the use of the LMS was important to the lifestyle of the respondents. The use of the LMS firmly belongs to the modern way of doing things. Survey data suggest that learners were confident that they had the resources necessary to use the LMS. Learners of today come to class equipped with a myriad of wired devices such as cell phones, laptops and iPods. They are constantly in touch, motivated by and responding to their changing world with the spontaneous exchange of knowledge.

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Responses to the DOI constructs showed that the LMS was quite easy to use and likely to be more widely adopted. A majority of the learners indicated the LMS was one the latest technologies that they had been exposed to. The learners' attitudes towards the LMS positively and significantly affected their intention to use the LMS. The findings showed that attitudinal dispositions have a significant influence on the use of the LMS. The five attitudinal constructs have strong influences on adoption and intention to use the LMS. Analysis for compatibility revealed that the LMS technology was compatible with the lifestyle of the learners. The study revealed that use of a LMS is not a widespread or current practice at secondary school level, although research has shown its widespread use in higher education. These findings have shown the impact and the efficacy of the DOI model in the diffusion of the LMS in the classroom.

The UTAUT constructs showed unequivocally the learners' intention to use the LMS. The survey findings suggested that learners felt that their performance could be strongly enhanced by their personal use of the LMS. This confirmed that the LMS would be appropriate to support learning. The interviews elicited data from learners about how the LMS contributed to their learning. Learners' comments were related to the general use of the LMS rather than their personal use of it. The survey findings suggested that learners associated relatively low effort with use of the LMS. As with the performance expectancy measure, interview data suggested that the types of tools learners preferred were based on their attitudes related to ease of use. Survey data suggested that learners were extremely confident that the facilitating conditions (i.e. availability of resources) supported their use of the LMS. Interview data

complemented these findings, with specific areas where the facilitating conditions were insufficient (i.e. access to the Internet, hardware performance).

This study analysed issues surrounding the adoption of a LMS using DOI and the UTAUT to test its adoption amongst Grade 10 IT learners.  Nine major constructs: relative advantage, complexity, compatibility, observability, trialability, performance expectancy, effort expectancy, social influence and facilitating conditions were used to test impact on attitude and efficacy regarding use of the LMS, and to determine how attitude would impact on the intention to use it.  The attitude of the learners would later affect his/her intention to use the LMS.  From the results it could be said that the abovementioned constructs influence users' attitudes towards their intention to use a LMS. The majority of respondents showed a positive attitude towards the use of the LMS and considered it to be a viable innovation and instructional tool for the classroom.

### 5.5.2 Research Question Two: *What are the learners' experiences when using a LMS?*

As mentioned earlier, of the 28 learners interviewed 25 responded that they unequivocally had not used a LMS previously.  This overwhelming majority indicates that the LMS is relatively new to the learners, as well as to the teaching and learning process.   This was their first experience of the use of a LMS.

The majority of the learners agreed that the LMS was a beneficial learning tool.  Many learners felt that it made learning more interesting and enjoyable.  There was no need for textbooks and the information that could be accessed was summarised in a stimulating manner.  This also saved time.  Learners felt that the information was

current and relevant – making learning easier. The information can also be accessed any time, and because learners now own cell phones with Internet connectivity the world is their classroom.

The chat proved to be a favourite tool amongst the respondents.  This was evident from an analysis of the user logs available on Moodle (LMS).  Learners could also interact with their peers via the chat, which encouraged collaboration and active participation.  The learners were also exposed to a quiz and an online assignment. They preferred these tools because learning was more interactive than learning from a written document.  Learners found that the chat was more beneficial as they could share opinions and communicate effectively, thereby enhancing their knowledge.

Most of the learners would prefer using a LMS in other learning areas as well because they felt that it made the process of learning easier.  The LMS also provided relevant information to enhance learning. Some of the concerns expressed were that not all learners are computer literate or have access to a computer.

On the point of improving the LMS, one of the recommendations was to improve the rate of connectivity.  It was also recommended that the interface be more colourful so as to suit the teenage style (many felt it was too plain).  The majority of learners were satisfied with the LMS and would not change anything about it.

It was clear that the majority of learners did not experience any difficulty when using the LMS. One of the very few challenges faced was connectivity as the internet signal was not strong.  Since many learners were using the LMS it was sluggish and the Internet kept disconnecting.  Another issue cited was a problem with the password; this was easily resolved and learners could then log on with ease. Problems were technical rather than experiential.

When asked how the LMS contributed to their learning, positive outcomes through the use of the LMS were stated.  All of the learners felt that it made learning easy as it provided a summarised version of the information they sought.  They also felt that it was exciting, more interactive and efficient.  Besides the chat, the PowerPoint presentations proved to be highly popular and very well received by learners.  The fact that the LMS is interactive and saves time was also well received by learners.  There were no specific answers as to what they liked least about the LMS.  Most of the learners liked every aspect of the LMS.  Just the problem of connectivity to the server and the appearance (it not being so attractive) were two concerns.

The learners were unanimous in their recommendation of use of the LMS.  They felt that it greatly enhanced the learning process, saved them valuable time and was relatively simple to use.  Learners would unhesitatingly recommend the LMS as a tool in the very dynamic process of teaching and learning.

### 5.5.3 Research Question Three: *How do learners use a LMS to support their learning?*

Moodle keeps detailed logs of all activities that students perform (Rice, 2006). Logging is record-keeping that can keep track of what materials learners have accessed. Moodle logs every click that learners make for navigational purposes, and has a modest log-viewing system built into it. Log files can be filtered by course, participant, day and activity. The teacher can use these logs to determine who has been active in the course, what they did, and when they did it. Teachers can easily get full reports of the activities of individual learners, or of all learners for a specific activity. Activity reports for each student are available with details about each module

(last access, number of times read) as well as a detailed story of each learner's involvement. Logs show the activity in the class for different days or times. This can be useful to check to see if everyone has done a certain task, or spent a required amount of time online with certain activities.

The log data showed that learners accessed the relevant content/activity when they were instructed by the teacher during class time, and it was evident that some learners accessed it outside school time as well. Some learners accessed the content more times than others, which was evident in the log reports. The advantage of the LMS is that it allowed learners to go back as many times as they wanted to reinforce content and concepts.

Table 7 below and overleaf shows an extract from a log report on class activity.

| Course | Time | Course full name | Action | Information |
|--------|------|-----------------|--------|-------------|
| IT10 | 2011 March 24 2:26 | Shailin Govender | user view all | |
| IT10 | 2011 March 24 2:24 | Shailin Govender | forum view forum | News forum |
| IT10 | 2011 March 24 2:23 | Shailin Govender | course view | Information Technology - Grade 10 |
| IT10 | 2011 March 24 0:20 | Avikaar Sonlall | course view | Information Technology - Grade 10 |
| IT10 | 2011 March 23 23:59 | Jivesh Soma | course view | Information Technology - Grade 10 |
| IT10 | 2011 March 23 23:59 | Jivesh Soma | forum view discussion | Your Expectations |
| IT10 | 2011 March 23 23:59 | Jivesh Soma | forum view forum | News forum |
| IT10 | 2011 March 23 23:59 | Jivesh Soma | course view | Information Technology - Grade 10 |
| IT10 | 2011 March 23 23:58 | Jivesh Soma | user view all | |
| IT10 | 2011 March 23 23:57 | Jivesh Soma | course view | Information Technology - Grade 10 |
| IT10 | 2011 March 23 23:57 | Jivesh Soma | forum view forum | News forum |
| IT10 | 2011 March 23 23:57 | Jivesh Soma | course view | Information Technology - Grade 10 |
| IT10 | 2011 March 23 23:30 | Radhika Rugubeer | course view | Information Technology - Grade 10 |
| IT10 | 2011 March 23 23:21 | Radhika Rugubeer | chat report | Introduction to Hardware |
| IT10 | 2011 March 23 23:21 | Radhika Rugubeer | chat view | Introduction to Hardware |
| IT10 | 2011 March 23 23:21 | Radhika Rugubeer | course view | Information Technology - Grade 10 |
| IT10 | 2011 March 23 23:20 | Radhika Rugubeer | forum view forum | News forum |
| IT10 | 2011 March 23 23:15 | Radhika Rugubeer | forum view discussion | Your Expectations |
| IT10 | 2011 March 23 23:15 | Radhika Rugubeer | course view | Information Technology - Grade 10 |
| IT10 | 2011 March 23 23:08 | Radhika Rugubeer | url view | Introduction to Hardware and Software |
| IT10 | 2011 March 23 23:08 | Radhika Rugubeer | course view | Information Technology - Grade 10 |
| IT10 | 2011 March 23 22:42 | Shailin Govender | course view | Information Technology - Grade 10 |

| IT10 | 2011 March 23 22:42 | Shailin Govender | url view | Introduction to Hardware and Software |
| IT10 | 2011 March 23 22:39 | Shailin Govender | chat report | Introduction to Hardware |
| IT10 | 2011 March 23 22:39 | Shailin Govender | chat view | Introduction to Hardware |
| IT10 | 2011 March 23 22:36 | Mariska Harispersad | chat view | Introduction to Hardware |
| IT10 | 2011 March 23 22:36 | Mariska Harispersad | course view | Information Technology - Grade 10 |
| IT10 | 2011 March 23 22:32 | Mariska Harispersad | chat report | Introduction to Hardware |
| IT10 | 2011 March 23 22:31 | Mariska Harispersad | chat talk | Introduction to Hardware |
| IT10 | 2011 March 23 22:30 | Mariska Harispersad | chat view | Introduction to Hardware |
| IT10 | 2011 March 23 22:29 | Mariska Harispersad | course view | Information Technology - Grade 10 |
| IT10 | 2011 March 23 22:03 | Shailin Govender | url view | Introduction to Hardware and Software |
| IT10 | 2011 March 23 22:02 | Shailin Govender | course view | Information Technology - Grade 10 |
| IT10 | 2011 March 23 22:02 | Shailin Govender | url view | Introduction to Hardware and Software |
| IT10 | 2011 March 23 21:26 | Shailin Govender | url view | Introduction to Hardware and Software |
| IT10 | 2011 March 23 21:26 | Shailin Govender | course view | Information Technology - Grade 10 |
| IT10 | 2011 March 23 21:25 | Shailin Govender | chat view | Introduction to Hardware |
| IT10 | 2011 March 23 21:25 | Shailin Govender | course view | Information Technology - Grade 10 |
| IT10 | 2011 March 23 21:22 | Shailin Govender | chat view | Introduction to Hardware |
| IT10 | 2011 March 23 21:20 | Shailin Govender | course view | Information Technology - Grade 10 |
| IT10 | 2011 March 23 19:52 | Radhika Rugubeer | course view | Information Technology - Grade 10 |
| IT10 | 2011 March 23 19:51 | Radhika Rugubeer | chat view | Introduction to Hardware |
| IT10 | 2011 March 23 19:51 | Radhika Rugubeer | course view | Information Technology - Grade 10 |
| IT10 | 2011 March 23 19:40 | Lerusha Reddy | course view | Information Technology - Grade 10 |
| IT10 | 2011 March 23 13:40 | Pranav Chetty | chat talk | Introduction to Hardware |
| IT10 | 2011 March 23 13:40 | Juran Odiar | chat talk | Introduction to Hardware |
| IT10 | 2011 March 23 13:40 | Shailin Govender | chat talk | Introduction to Hardware |
| IT10 | 2011 March 23 13:40 | Theolan Maistry | chat talk | Introduction to Hardware |
| IT10 | 2011 March 23 13:40 | Y Mudaly | chat talk | Introduction to Hardware |
| IT10 | 2011 March 23 13:40 | Mariska Harispersad | chat view | Introduction to Hardware |

Table 7: Extract from log report on class activity

The above log report is only part of the entire report for that day – it was too long to show the entire report. The rest of the report shows the same type of activity for other learners. Table 7 shows different learners accessing different activities on the LMS during school hours, and how they use the various tools in the LMS to support/supplement their learning. One of the tools that the learners enjoyed thoroughly was the chat. The table shows evidence of a chat that took place between the learners and the teacher. During the observation it was noticed that learners were thrilled that the teacher was part of the discussion. They mentioned during the interview that they could consult with the educator if they did not

understand something. This is excellent, because some learners feel afraid of asking questions in class but are more comfortable communicating via the chat. It also shows details as to how many times each learner viewed a particular source of information and what activities they participated in.

Others accessed the LMS outside the classroom, after school hours. It allowed for anytime-anyplace learning. If learners were inattentive in class, they had the opportunity to go back to the content at any time. An example of learners accessing the LMS outside the classroom is evident in the log report shown in Table 8.

| Course | Time | Course full name | Action | Information |
|---|---|---|---|---|
| IT10 | 2011 March 29 0:24 | Yuveshan Subramoney | url view | PowerPoint Presentation on Types of Computers |
| IT10 | 2011 March 29 0:21 | Yuveshan Subramoney | course view | Information Technology - Grade 10 |
| IT10 | 2011 March 29 0:19 | Yuveshan Subramoney | chat report | What software do you have on your computer? |
| IT10 | 2011 March 29 0:18 | Yuveshan Subramoney | chat report | What software do you have on your computer? |
| IT10 | 2011 March 29 0:18 | Yuveshan Subramoney | chat view | What software do you have on your computer? |
| IT10 | 2011 March 29 0:18 | Yuveshan Subramoney | chat view | What software do you have on your computer? |
| IT10 | 2011 March 29 0:17 | Yuveshan Subramoney | course view | Information Technology - Grade 10 |
| IT10 | 2011 March 29 0:05 | Yuveshan Subramoney | url view | Examples of Software |
| IT10 | 2011 March 29 0:05 | Yuveshan Subramoney | course view | Information Technology - Grade 10 |
| IT10 | 2011 March 29 0:03 | Yuveshan Subramoney | url view | Introduction to Hardware and Software |
| IT10 | 2011 March 29 0:02 | Yuveshan Subramoney | course view | Information Technology - Grade 10 |
| IT10 | 2011 March 29 0:01 | Yuveshan Subramoney | url view | Introduction to Hardware and Software |
| IT10 | 2011 March 29 0:00 | Yuveshan Subramoney | course view | Information Technology - Grade 10 |
| IT10 | 2011 March 29 0:00 | Yuveshan Subramoney | url view | Introduction to Hardware and Software |
| IT10 | 2011 March 28 23:54 | Yuveshan Subramoney | course view | Information Technology - Grade 10 |
| IT10 | 2011 March 28 23:50 | Lerusha Reddy | course view | Information Technology - Grade 10 |
| IT10 | 2011 March 28 23:48 | Yuveshan Subramoney | chat report | Introduction to Hardware |
| IT10 | 2011 March 28 23:48 | Yuveshan Subramoney | chat report | Introduction to Hardware |
| IT10 | 2011 March 28 23:48 | Yuveshan Subramoney | chat view | Introduction to Hardware |
| IT10 | 2011 March 28 23:47 | Yuveshan Subramoney | course view | Information Technology - Grade 10 |
| IT10 | 2011 March 28 23:46 | Yuveshan Subramoney | resource view | Hardware Images |
| IT10 | 2011 March 28 23:46 | Yuveshan Subramoney | course view | Information Technology - Grade 10 |
| IT10 | 2011 March 28 23:46 | Yuveshan Subramoney | chat view | Introduction to Hardware |
| IT10 | 2011 March 28 23:37 | Yuveshan Subramoney | url view | Introduction to Hardware and Software |
| IT10 | 2011 March 28 23:37 | Yuveshan Subramoney | course view | Information Technology - Grade 10 |
| IT10 | 2011 March 28 23:23 | Yuveshan Subramoney | url view | Introduction to Hardware and Software |

**Table 8: Extract from log report**

This report shows that the learner accesses the different activities such as the chat, resource view, and course view during the late hours of 28 March 2011. This clearly shows that the learners are using the LMS after school hours to support their learning.

### 5.5.4 Research Question Four: *What benefits do learners derive from the use of the different tools in the LMS?*

The following benefits were derived from the learners' interaction with the LMS: improved communication (collaboration), interactive participation, enhanced accessibility of resources, a supportive environment, and enhancement of independent learning. The advantage of the chat is that it is real-time and the learners can discuss their experiences with their friends and teacher. New technological advances in the digital age such as video-conferencing and use of emails, chat rooms and discussion forums facilitate students' collaboration (Siemens, 2004). Learners found it easy to identify with the chat interface because they are currently exposed to various other social networking sites such Facebook and Mxit. They therefore found it compatible with their way of life.

Participating in the chat also allowed for interactive participation. Learners were actively involved in the lesson, whether it was the chat or accessing a PowerPoint presentation or an external link to the Internet. Since the LMS allowed learners to access the Internet for information related to the topic, it enhanced the accessibility of resources and at the same time served as a supportive environment.

There are no time constraints associated with information accessibility with a LMS in place. By its nature the LMS makes content available 24/7 from any location with Internet access. The learning process could take place anywhere and at any time. Betts (1998) reasons that the inclusion of technology in the curriculum has established virtual communities, e-learning environments and distance learning, all of which facilitate learning anywhere and anytime and improve learner accountability and the quantity of electronic resources for pedagogical purposes.

A number of learners can use the LMS at any given time; each learner has his/her own login details to access it. Learners worked independently through the different activities, thus encouraging independent learning. According to Hennessy, Wishart and Whitelock (2007), learners will encounter multimedia presentations, rich interaction and independent activities. The findings of this study showed that the learners found the LMS easy, efficient and an enjoyable way to learn.

This chapter presented a detailed analysis of the data gathered from the various sources of data collection. The research questions were then answered.

The next chapter provides a detailed discussion of the findings. The discussion is based on the principles of connectivism, as discussed in the literature review (Chapter three).

# Chapter Six: Discussion of research findings

## 6.1 Introduction

This chapter discusses the data based on the guided analysis using a conceptual framework adapted from the theory of connectivism propounded by Siemens (2004). Themes that emerged from the data analysis relate to the principles of connectivism as discussed in the literature review chapter. Five of the seven principles of connectivism are used to discuss the research findings.

## 6.2 Discussion

### 6.2.1 Learning and knowledge rests in diversity of opinions

Effective learning occurs in an ecology of diverse opinions and views "I know" as "we know as a team" (Siemens, 2004). Diversity is evident in the sources of information, and diversity was present in the discussion forum. The discussion forum was used when the learners and teacher had to discuss with each other, over a set period of time, a specific question or topic relevant to the subject content. In the discussion forum learners were able to dialogue with each other in order to learn. As Yilmaz (2008, p. 168) states: "dialogue within a community engenders further thinking … learners (rather than teachers) are responsible for defending, proving, justifying, and communicating their ideas to the classroom community. Ideas are accepted as truth only as they make sense to the community and thus rise to the level of 'taken-as-shared'". Also, because the learners are exposed to a variety of sources, there are

various opinions from the different authors regarding a specific topic.  As a result the learners are encouraged to collaborate and develop critical-thinking skills.

Henri and Lundgren-Cayrol (as cited in Benmimoun & Trigano, 2010) state that collaborative learning is a learning activity that occurs when a group of learners having a common purpose share ideas and opinions, and each learner is a source of information, motivation, interaction and mutual help, resulting in each one  benefiting from the contribution of the others. The ability to collaborate is a very important skill required to succeed in a distributed learning environment, and the majority of learners indicated during the interview that the discussion group was most beneficial. They found it so beneficial because they knew that via the discussion forum they had the support of the teacher and their colleagues. Furthermore, learners who are hesitant to speak in class may use the discussion forum to express their ideas and thoughts freely without a 'live' audience (Fryer, 2002).  These learners are the ones who struggle with the format of traditional classroom, yet thrive on the discussion forum (Bailey, 2003a, 2003b). Learners indicated through their interview responses that if they needed assistance, all they had to do was ask for it via the forum.

This is supported by  Siemens (2007, p. 65)  when he states that "the ability not only to access and assess but also to dialogue about information shifts the learner presence from consumer to active agent who connects, forms, and creates a personal knowledge and learning network". The learners using the LMS to learn develop skills in discussion, reasoning, interpretation, and reflection. The LMS gave the learners an opportunity to utilise the Internet and to expand their knowledge in the classroom discussions. The learners' discussions and communications while conducting this research have been observed to be very impressive.  There was also

a substantial amount of interaction and collaboration noted in the learners' online messages, providing evidence of learner support within the LMS. These findings are consistent with prior studies using LMSs to support teaching and learning (Lonn, 2010; Mafata, 2009).

## 6.2.2 Learning is a process of connecting specialised nodes or information sources

The complexity of functioning in today's environment requires forming connections amongst specialised nodes. Siemens (2004) defines a node as any object or human being that can be explored for information. Nodes are part of the larger network and vary in size and strength depending on the concentration of information and the number of individuals who are navigating through particular nodes (Downes, 2008a-c). Learners learn better when they are able to retrieve information from sources such as people, libraries or textbooks. In this study, nodes refer to the individual learners. Every learner represents a unique source of information and thought. Learners participated in group discussions because they know they are exposed to more information because of the number of participants. When working as a group learners are more comfortable to share their opinions and think critically about what they have got to say.

In this digital age the use of technology such as a LMS (with its chat rooms, discussion forum components and emails)  allows for continuous retrieval of information from potential sources (while inside and outside the classroom) at any time (Siemens, 2004). Learners have access to the LMS outside the classroom and learners may consult with their friends and teacher outside of the classroom time using the LMS. This allows for any time, any place learning and the learners have

access to help whenever a need arises. During the interview learners indicated that they had access to the LMS outside school, and if they had missed a lesson they could catch up at home.

Rashid et al. (2002) and Lorenzetti (2003) also agree that the LMS provides a learning and teaching environment 24 hours a day. Learners can use the LMS anytime after traditional school hours or even during the breaks to do revision or send an email to the teacher. This can be interpreted in connectivism as having broader reach within the group of learners due to their connecting themselves. When using the LMS the learners are systematically guided and at the same time they become more independent in their learning, giving them the freedom to learn at their own pace.

### 6.2.3 Learning may reside in non-human appliances

The pace of information generation is a challenge for learners to keep up with. Learners therefore tend to lean on technology to an extent, such that they can make use of the vast amounts of information available to them. Siemens (2004) insists that learning may reside in non-human appliances. According to Siemens (2004), such non-human appliances may include networked computers, cell phones and all other digital appliances. This aspect of connectivism is attractive because it incorporates internetworked technologies (non-human appliances) such as the LMS into teaching and learning.

Networked computers may have ample information relevant for pedagogical purposes. These non-human resources (the computers, Internet links and the LMS)

were beneficial to the learner because he/she could use all of these resources for exploration of additional information to supplement that provided by their teacher on the LMS. This is exactly why we should integrate the use of the LMS to support our teaching and learning in the classroom. The integration of the LMS into the classroom also encouraged the development of responsibility in the learners.

### 6.2.4 Nurturing and maintaining connections is needed to facilitate continual learning

Learning through connections has increased due to internationalisation of education, and it is the driving force in developing education internationally. It is critical not only to maintain existing connections but also to cultivate new ones. It has made knowledge the central focus of human development due to the belief that knowledge can be distributed across information networks and be stored in a variety of digital formats (Siemens, 2008a).

One of the themes that emerged in the research findings is collaboration. This refers to interaction with others, especially in groups, to solve problems that enhance knowledge construction through the addition of visual information and other multimedia features. Daily observations of learner reactions, questions and discussions showed that the LMS allows sharing of information and sources of information with learners. The teacher searched for information from the Internet and created a link via the LMS; once the link was established the content was discussed with the whole class.

Another characteristic that the researcher observed was the ability of the LMS to give assistance to learners by displaying information on the LMS interface, displaying illustrations, models and pictures which were used to unfold concepts gradually by clicking on the link and revealing them as they were discussed, to avoid confusion.  In some instances the educator used PowerPoint presentations to give a summary of the main points of the lessons taught.   Some of these PowerPoint presentations had been adapted from  the  internet  and  the  learners  had  to participate in collaborative discussion forums.  This encourages willingness to share and critically discuss aspects of practice and curiosity of concepts in a learning environment (Loucks-Horsley, Hewson, Love, & Stiles, 1998).

### 6.2.5 Currency (accurate, up-to-date knowledge) is the intent of all connectivist learning activities

Connectivism espouses that learners must be exposed to the most recent and accurate knowledge, but in practice they may experience it as a weakness because learners are faced with an overload of information and have to take into consideration the reliability and validity of the information. In the classroom activity learners had to seek out current information regarding the latest developments in hardware and software, reflect, critique and make decisions. Learners had to do this using a URL link that the teacher had set up in the LMS.

The research findings show that a number of learners preferred using the LMS to learn rather than a textbook. They found the LMS stimulating and hands-on, and they had access to up-to-date, current information, unlike that found in traditional

textbooks which has becomes outdated, especially where IT is concerned.  The textbooks cannot keep up with latest developments in IT.

Services such as Google books and scholarly open access initiatives were available to learners. Connectivism emphasises two important skills that contribute to learning: the ability to seek out current information and the ability to filter secondary and extraneous information (Siemens, 2008b). Information is constantly changing. Its validity and accuracy may change over time, depending on the discovery of new contributions to a subject.  The learner's understanding and ability to learn about a subject in question will also change over time.

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## 6.3 Networking and forming network connections

Networking refers to how learners learn in the digital age, which involves learners connected to everyone and everything. Connectivism emphasises the creation of networks to support distributed learning. These networks can be enabled by technology such as email, discussion forums and websites, search engines, plug-ins and  file-uploading (Kearsley, 2000). Networked learning focuses on the connections between learners, learners and educators, and learners and the information as well as resources used in their learning.  Networking or forming connections was evident during the observation sessions.

The log report showed that the educator made use of the LMS to encourage independent learning and networked learning, whereby learners would connect with other learners from the class as well as to the Internet. This was made possible by

making use of e-mails, discussion forums, Internet links, online assignments and a quiz. These are features that can extend collaboration, especially e-mails (O'Leary, 2006). The e-mail facility was used by learners to contact the teacher to ask for help; all learners had Internet connected computers at their homes.

Learners had opportunities to get information in the classroom by visiting websites and searching the web. Learners needed to find data that they could then organise and manipulate so that a conclusion could be reached and evidence provided so that they were able to learn the section on hardware and software with understanding. According to Siemens (2004) the capability of learners to distinguish between important and unimportant information is vital to allow learners to make informed decisions. Coincidentally, the eighth principle of connectivism describes that "decision making is itself a learning process. Choosing what to learn and the meaning of incoming information is seen through the lens of a shifting reality. While there is a right answer now, it may be wrong tomorrow due to alterations in the information climate affecting the decision" (Siemens, 2005a, p. 24). This challenges the learners to critically analyse the information they research and make appropriate decisions.

We are entering a new interconnected, networked world where more and more people are gaining access to the web and its ever-growing body of knowledge. The introduction of information and communication technology (ICT) in education represents an important part of South African Government's strategy to improve the quality of learning and teaching across the education system. The Government's intention is to focus on learning and teaching for a new generation of young people

who are growing up in a digital world and are comfortable with technology. Our schools must reflect these realities.

The South African Department of Education is in favour of promoting e-education. e-Education is about connecting learners to other learners and providing platforms such as the LMS for learning. e-Education connects learners and teachers to better information, ideas and one another via effective combinations of pedagogy and technology (Asmal, 2003). What better way to do this than to integrate the use of a LMS into teaching and learning? Open source LMSs such as Moodle are freely available, and schools should take advantage of the potential of this technology to improve teaching and learning.

To encourage positive learning in the classroom an environment favourable to building these networks is essential. The environment must be conducive to creating networks that are capable of managing and filtering a vast amount of information distributed across network nodes (Siemens, 2007). This environment should include the following attributes (Siemens, 2007): (a) flexibility to allow the student to create a personalised learning network; (b) availability of a myriad of tools allowing for network creation; (c) promotion of decentralised learning; (d) provision of safety measures to allow students (especially younger students) to work within a protected environment deterring access to deleterious information; (e) promotion of simplicity and continued use of the learning network; and (f) tolerance of trial and error. The use of the LMS in the classroom more than adequately creates an environment appropriate to what Siemens describes above. The LMS caters for the diverse

learning needs and styles of all learners by providing opportunities for them to interact with and create meaningful curriculum content.

Connectivism is an intriguing approach to understanding learning that forces us to ask some really interesting questions about what it means to learn, how we learn, and what constitutes a well-learned individual. By conceptualising learners as nodes within a community of information and concepts, the emphasis of education turns largely from "know-how" and "know-what" to "know-where" (Siemens, 2005b). Most cognition theories accept that non-human tools or artefacts mediate knowledge or act as sources of knowledge, but none go so far as to claim that appliances constitute actual learning (Desmarais, n.d). Verhagen (2006) is, however, not convinced that learning can reside in non-human appliances. In critiquing Vehagen's (2006) conception, Siemens (2004) strongly argues that learning can occur from non-human appliances, from the use of computers and all other digital appliances. Siemens argues that "knowledge does not only reside in the mind of an individual, knowledge resides in a distributed manner across a network, learning is the act of recognizing patterns shaped by complex networks. These networks are internal, as neural networks, and external, as networks in which we adapt to the world around us" (Siemens, 2006, p.10).

Networked computers may have relevant information for learning. There are also search engines which learners could use for the retrieval of additional information to supplement that provided by the teacher. Based on personal experiences of and interactions with the LMS, the researcher agrees with Siemens' (2004) argument that chat rooms, discussion forums and emails could promote collaborative learning.

This confirms Howard's observations that learners who collaborate in discussion boards develop confidence and gain deeper understanding (Howard, 2003).

To provide a complete picture there must some mention of the limitations of using a LMS in the classroom. Some may argue that technology like the LMS may be a distraction to the learners, preventing them from learning and using their critical-thinking skills.  In addition, learners are exposed to an overload of information and concerns about the validity/credibility of online resources.  The advantages of using a LMS in the classroom, however, outweigh the limitations.  The research findings show that the LMS is simple to use, user-friendly, efficient, and allows for any time, anywhere learning. The LMS is not the solution to all problems in the classroom, but it provides an opportunity for learners and teachers to increase the technological innovation in our classrooms and therefore we (teachers and learners) should use it effectively.  Learners who are technology savvy manage their lives with cell phones and instant messaging and also try to manage education digitally, and therefore should not be deprived of access to the latest innovations that  support teaching and learning.

Apart from the LMS being a positive innovation in terms of creating a networked learning environment, the findings show that learners had a positive attitude towards the use of a LMS. The learners found the LMS easy to use, efficient and innovative. It also provided them with support, thereby enhancing their learning experience.

## 6.4 Implications for teaching and learning

The research findings show that the learners were unaware of the use of a LMS in schools. Integration of a LMS into the classroom can enhance teaching and learning. Learners unhesitatingly recommended the LMS as a tool in the very dynamic process of teaching and learning. They felt that it greatly enhanced the learning process, saved them valuable time and was relatively simple to use.  A large number of learners stated that the LMS made the process of learning easier and provided relevant information to enhance learning.

There was overwhelming agreement to the use of the LMS in other learning areas as well, but some concerns were expressed regarding this because of low levels of computer literacy and of access to a computer with Internet.  Very few of the learners experienced operational problems, and one of the few challenges they faced was network failure due to slow Internet connection.

The learners were adequately exposed to the LMS and had an idea of the potential of integration of the LMS in teaching and learning.  They were also aware of the possible technical problems that they could encounter, and need to be tolerant in order to effectively implement the LMS as a support tool in teaching and learning.

## 6.5 Conclusion

This chapter discussed the research findings based on the principles of connectivism.  The discussion included an argument for the adoption of a LMS to support teaching and learning.  The subsequent chapter is the final chapter, which includes a summary and recommendations for teaching and learning.

# Chapter Seven: **Summary, Recommendations and Conclusion**

## 7.1 Introduction

This chapter concludes the study and presents the recommendations and a summary based on the findings. The conclusions were based on research findings on the learners' experiences of using a LMS in the classroom.

## 7.2 Summary

The objective of the study was to investigate the use of a LMS to support teaching and learning. The study aimed to answer the following research questions: a) What are learners' attitudes when using a LMS? ; b) What are learners' experiences when using a LMS?; c) How do learners use a LMS to support their learning?; and d) What benefits do learners derive from the use of different tools in the LMS? As stated in Chapter five, it was evident that learners were very positive about their experiences with the LMS, and their positive attitudes will make learners more interested in adopting this new technology, more willing to learn using the LMS, and more willing to cope with the problems of the LMS. Since much research on LMSs has been done at tertiary level, the findings of this research augur well for ICT integration in teaching and learning at secondary school level.

## 7.3 Summary of findings

The LMS is evolving rapidly, becoming a more flexible and interactive part of the classroom. As technology improves, the LMS will continue to evolve over time. The educational importance of this study is focused on learner perceptions. The results of this study will help teachers understand learner perceptions regarding the adoption and diffusion of a LMS in a traditional classroom. The methodology employed in this study demonstrated a valid and reliable method for evaluating the adoption and diffusion of a LMS as a supportive tool in the classroom. The results contribute to the growing body of literature related to the technology adoption and delivery strategies in the classroom. Learners' attitudes to and experiences of the use of this LMS offer a crucial window into learner success in this environment, and serve as a vital focus of study.

Based on the learners' attitudes and their experiences when using the LMS in the classroom, data analysis shows that the learners had the knowledge of how to use a LMS in IT and of its potential and challenges in teaching and learning. The research findings revealed that the LMS not only supported teaching and learning but also enhanced the teaching and learning experience of this selected group of learners. The LMS provided access to a variety of learning resources, initiated collaborative learning via the discussion forum, encouraged independent learning, created an environment for learner diversity and increased interaction and peer learning amongst the learners. The learners indicated that the only minor setback in implementing the LMS were the technical problems surrounding Internet connectivity.

The e-education policy goal is that "every South African learner in the general and further education and training bands will be ICT capable (that is, use ICT confidently and creatively to help develop the skills and knowledge they need to achieve personal goals and to be full participants in the global community) by 2013" (Asmal, 2003, p.19). Asmal (2003, p.15) defines e-education as "connecting learners to other learners, teachers to professional support services and providing platforms for learning". The use of the LMS in education therefore qualifies as forming part of and is e-education. As outlined in the literature review studies have shown steady growth in the use of LMS in education. Supporting studies (Murphy & Lindner, 2001; Rivera et al., 2002; Lim, 2002; Jones & Jones, 2005; Lim & Sudweeks, 2006; Govender & Govender, 2009; Mafata, 2009) have shown that the LMS can be used in the classroom to support teaching and learning.

The research findings indicated that the learners had a positive attitude towards the use of the LMS to support teaching and learning. The numerous observation sessions revealed that learners arrived promptly to class eager to start the lesson, and it was a task to get them to leave. This was an indication that the learners looked forward to and enjoyed using the LMS. The data show that the LMS is a beneficial and supportive tool for teaching and learning.

## 7.4 Recommendations for teaching and learning

In order to achieve the e-education goal mentioned above and as described by Asmal (2003), within the specified time frame, it is recommended that schools become more actively involved in introducing e-education to support teaching and

learning. One way of doing this is by introducing use of the LMS in the classroom. The LMS enables teaching material to be sourced, managed, accessed and/or delivered, and there are many of them available on the market. It is recommended that as a starting-point schools make use of an open source LMS since they are easily available and cost-effective.

Over the last few years Government, the private sector, parastatals and nongovernmental organisations have responded positively to the challenge of bridging the digital divide. Initiatives have amongst others included the following:

- Mindset, a non-profit organisation, developed content resources and made them available via satellite television, Internet multimedia and print supplements; and

- An Educational Portal initiated by the Department of Education provides digital content resources (Asmal, 2003).

E-mail facilities are beginning to be used more extensively as a management and administrative resource in many schools and also in limited cases as a teaching and learning resource. Internet access is becoming more common, but the use of the Internet for teaching and learning purposes is very limited due to high connectivity and telecommunication costs, lack of local content and examples, and inadequate technical and pedagogical support at local levels. However, as in most parts of the world, the South African education and training system has to respond to the pressures and challenges posed by the information revolution. It is for this reason that Government has a strong commitment to ICT in education. Its effects in an educational context inspire and challenge us as teachers, to think differently about our classrooms and the potential of the new digital technologies in terms of pedagogy and curriculum (Asmal, 2003).

The Department of Education has paved the way to introduce e-learning into our classrooms; schools should take advantage of this and make a head-start by making use of a LMS to support teaching and learning.

## 7.5 Conclusion

Previously most knowledge was gained through a hands-on, face-to-face interaction within the classroom. Today the incredible connectivity of the digital world allows for access to data, resources and collaboration without physical proximity or a need to actually handle materials or interact in person. Digital technology is breaking down the barriers of traditional teaching and learning. However no one tool will meet all needs in the classroom. The researcher believes that if the recommendations can be put into place, the LMS has a place in the classroom. The use of the LMS provides an innovative way to complement the traditional student-teacher interaction. The use of the LMS will increase learner access to existing resources and create opportunities for collaboration and independent learning. To meet the needs of all learners in various stages of their learning, a multi-faceted (holistic) view of learning must be considered. The LMS provides a personal learning environment and tools to cater for the diverse learning needs of the learners of today.

The introduction of the use of LMS in our schools to support teaching and learning will not only create new possibilities for our learners to engage in new ways of learning, but also provide them with digital media (which have taken over the information society). Exposure to the latest digital technology such as the LMS has dramatically changed the learning and teaching process, and expanded new learning

opportunities and access to educational resources beyond those of the traditional classroom.

Further research must be conducted by academics to investigate both learner and teacher experiences when using a LMS in the classroom.  It is evident that the LMS is a useful innovation and a supportive tool in teaching and learning.

# References

Agarwal, R., & Prasad, J. (1997). The Role of Innovation Characteristics and Perceived Voluntariness in the Acceptance of Information Technologies. *Decision Sciences, 28*(3), 557-582.


Alavi, M. (1994). Computer-mediated collaborative learning: An empirical evaluation. *MIS Quarterly, 18*(2), 159-174.


Allen, I.E., & Seaman, J. (2007). *Online nation: Five years of growth in online learning.* Retrieved August 20, 2010, from http://sloanconsortium.org/publications/survey/pdf/online_nation.pdf


Al-Qeisi, K.I. (2009). *Analyzing the Use of UTAUT Model in Explaining an Online Behaviour: Internet Banking Adoption.* Retrieved July 28, 2011, from http://dspace.brunel.ac.uk/bitstream/2438/3620/1/KholoudThesis.pdf


Arbaugh, J. B., Godfrey, M.R., Johnson, M., Pollack, B.L., Niendorf, B., & Wresch, W. (2009). Research in online and blended learning in the business disciplines: Key findings and possible future directions. *Internet and Higher Education, 12,* 71-87.


Aronson, J. (1994). A Pragmatic View of Thematic Analysis. *The Qualitative Report, 2*(1). Spring. Retrieved July 21, 2011, from http://www.nova.edu/ssss/QR/BackIssues/QR2-1/aronson.html


Asmal, K. (2003). *Draft White Paper on e-Education: Transforming Learning and Teaching through ICT.* Pretoria: Department of Education.

Ayub, A.F.M., Tarmizi, R.A., Jaafar, W. M.W., Ali, W.Z.W., & Luan, W.S. (2010). Factors influencing students' use a Learning Management Portal: Perspective from Higher Education Students. *International Journal of Education and Information Technologies, 4*(2), 100-108.

Bailey, J. (2003a, March). *From the beltway: online learning is a must.* Scholastic Administrator [Online]. Retrieved November 2011 from http://www.scholastic.com/administrator/march03/features.asp?article=beltway

Bailey, J. (2003b, November December) Get a fix on e-learning: Scholastic Administrator [Online]. Retrieved November 2011, from http://www.scholastic.com/administrator/novdec03/articles.asp?article=ask

Bannan-Ritland, B. (2005). *Online learning: Concepts, strategies, and applications.* Upper Saddle River, NJ: Pearson Prentice Hall.

Bassett E., & Burndt, C. (2006). *Beyond course management systems.* EDTECH: Focus on Higher Education October/November 2006. Retrieved January 24, 20011, from http://www.edtechmag.com/higher/october-november-2006/tech-outlook-2.html

Bates, T. (2006). *Technology, e-learning and distances education.* New York: Abingdon.

Bell, J. (1993). *Doing your Research Project. Guide for First-time Researchers in Education and Social Science.* (2nd ed.). Milton Keynes. Open University Press: Buckingham. Philadelphia.

Bell, J. (2005). *Doing your Research Project: A guide for first-time Researchers in Education, Health and Social Science (Ed.).* London: Open University press.

Benmimoun, A., & Trigano, P. (2010). *Adaptive and Collaborative Learning using netUniversity, an interoperable LMS/LCMS.* Retrieved December 15, 2011, from http://www.intechopen.com/source/pdfs/8734/InTech-Adaptive_and_collaborative_learning_using_netuniversity_an_interoperable_lms_lcms.pdf

Bersin, J., & Howard, C., O'Leonard,K., & Mallon, D. (2009). *Learning management systems 2009: Facts, practical analysis, trends and provider profiles.* Oakland, CA: Bersin & Associates.

Betts, K. S. (1998). An institutional Overview: Factors influencing faculty participation in distance education in the United States: An institutional study.
*Online Journal of Distance learning Administration*, *1*(3).
Retrieved August 24, 2011, from ://www.westga.edu/~distance/betts13.html.

Birch, D., & Burnett, B. (2009). Bringing academics on board: Encouraging institution- Wide, diffusion of e-learning environments. *Australasian Journal of Educational Technology*, *25*(1), 117-134. Retrieved February 9, 2011, from http://www.ascilite.org.au/ajet/ajet25/birch.

Boeree, G.C. (2007). *Personality Theories: An Introduction.* Retrieved April 12, 2010, from http://webspace.ship.edu/cgboer/personalityintroduction.html

Broadbent, B. (2002). *ABCs of e-Learning: Reaping the benefits and avoiding the pitfalls.* San Francisco: Jossey-Bass.

Browne, T., Jenkins, M., & Walker, R. (2006). A Longitudinal Perspective Regarding the Use of VLEs by Higher Education Institutions in the United Kingdom. *Interactive Learning Environments*, *14*(2), 177-192.

Campus Computing Project (2002).  The 2002 National Survey of Information Technology in U.S. Higher Education. *Campus Portals Make Progress; Technology Budgets suffer Significant Cuts.*  Retrieved January 21, from http://www.campuscomputing.net/sites/www.campuscomputing.net/files/2002-CCP.pdf

Carter, D. (2009).  *Blackboard-angel deal gives pause to some.*  Retrieved August 30, 2010, from http://www.eschoolnews.com/news/top-news/?I=58675

Caudill, J. (2009). *Implementing an Open Source Learning Management System for an Institution of Higher Education.*  Retrieved July 20, 2011, from http://www.journaleic.com/article/view/3439/2490

Chang, M. M. (2007). Enhancing web-based language learning through self-monitoring.  *Journal of Computer-Assisted Learning*, *23*, 187-196.

Chen, L., Gillenson, M., & Sherrell, D. (2002). Enticing online consumers: An extended technology acceptance perspective. *Information and Management*, *39*(8): 705-719.

Cohen, L., Manion, L., & Morrison, K. (2000). *Research Methods in Education* (5th ed.).  London: Routledge Falmer.

Cole, J., & Foster, H. (2007). *Using Moodle.* (2nd ed.). O'Reilly Media Inc. Retrieved August 30, 2010, from http://docs.moodle.org/en/Using_Moodle_book.

Conole, G. (2004). *E-learning: The Hype and the Reality.* Retrieved May 25, 2010, from http://eprints.soton.ac.uk/9734/1/conole-2004-12.pdf

Dalsgaard, C. (2006). *Social software: E-learning beyond learning management systems.* European Journal of Open, Distance and E-Learning. Retrieved June, 20, 2011 from http://www.eurodl.org/materials/contrib/2006/Christian_Dalsgaard.htm
Davis, F.D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology.  *MIS Quarterly, 13*(3), 319-339.

Davis, F.D., Bagozzi, R.P., & Warshaw, P.R. (1989). User Acceptance of Computer Technology:  A comparison of two Theoretical models. *Management Science*, *35*(8), 982-1003.

Deloitte & Touche, LLP (2007). *2006 Canadian technology fast 50 winners.* Retrieved February 15, 2010, from http:www.deloitte.com

Denzin, N.K., & Lincoln, Y.S.  (2003). Introduction: The discipline and practice of qualitative research. In N.K. Denzin & Y.S Lincoln (Eds.), *The landscape of qualitative research: theories and issues* (pp.1-45). Thousand Oaks, CA: Sage.

Desmarais, P. (n.d). *The Intersection of Educational Theory and the Practice of Instructional Design.* July 21, 2011 from https://sites.google.com/a/boisestate.edu/edtech504/paul-desmarais

De Vos, A.S., Strydom, H., Fouche, C.B. & Delport, C.S.L. (2002). *Research at grass roots: For the social science and human services professions.* (2nd ed.). Cape Town: Van Schaik Publishers.

Dougiamas, M., & Taylor. P. (2003). *Moodle: Using Learning Communities to Create an Open Source Course Management System.* Retrieved March 12, 2011 from http://dlc-ubc.ca/wordpress/fergusonmelanie/files/2011/08/moodle-using-learning-communities-to-create-an-open-source-course-management-system.pdf

Downes, S. (2008a, April 18). *Seven Habits of Highly connected People.* Retrieved June 4, 2010, from http://www.elearnmag.org/subpage.cfm?section=opinion&article=97-1

Downes, S. (2008b, November 16). *The future of Online Learning Ten Years On.* Retrieved June 4, 2010, from http://halfanhour.blogspot.com/2008/11/future-of-online-learning-ten-years-on_16.html

Downes, S. (2008c). *Places to go: Connectivism & Connective Knowledge.* Retrieved June 4, 2010, from http://www.innovateonline.info/index.php?view=article&id=668

Elgort, I. (2005). *E-learning adoption: Bridging the chasm.* Paper presented at the 22nd Annual Conference of the Australasian Society for Computers in Learning in Tertiary Education (ASCILITE). Brisbane, Australia. Retrieved September 11, 2010 from http://www.ascilite.org.au/conferences/brisbane05/blogs/proceedings/20_Elgort.pdf

Ellis, R. K. (2009). *Learning circuits - Field guide to learning management systems.* Alexandria, VA: American Society for Training and Development.

Fichman, R.G. (1992). *Information technology diffusion: A review of empirical research.* Retrieved October 3, 2011 from http://tx.liberal.ntu.edu.tw/SilverJay/Literature/!Adoption/Fichman_1992_ICIS_IT_Diff_Review.pdf

Fryer, W. (2002, June). *Online courseware. Technology and Learning.* Retrieved November 12, 2011 from http://www.techlearning.com/db_area/archives/WCE/archives/wescours.htm

Gaskell, G. (2000). *.A practical Handbook.* In M.W.Bauer & G. Gaskell (Eds.). *Qualitative researching with Text, Image and Sound.* London: Sage.

Gibbons, S. (2005). Library course-management system: An overview. *ALA Library Technology Reports, 41*(3), 7-11.

Giesbrecht, N. (2007). Connectivism: Teaching and learning. Retrieved April 2, 2010, from http://sites.wiki.ubc.ca/etec510/Connectivism:_Teaching_and_Learning

Glover, D. & Miller, D. (2001). Running with Technology: The pedagogic impact of the large-scale introduction of interactive whiteboards in one secondary school. *Journal of Information Technology for Teacher Education, 10* (3), 257-276.

Govender, D. & Govender, I. (2009). Using Learning Management Systems (LMS) to support learning. In I. Gibson et al. (Eds.), *Proceedings of Society for Information Technology & Teacher Education International Conference 2009* (pp. 1843-1853). Chesapeake, VA: AACE.

Gower, B. & Barr, H.  (2005). *Tutor perceptions of Moodle Learning Management Systems.*  New Zealand: Waikato Institute of Technology.

Green, H., & Hannon, C. (2007). *Their Space: Education for a digital generation.* Retrieved October 14, 2011, from http://www.demos.co.uk/files/Their%20space%20-%20web.pdf

Hall, J. (2003). *Assessing Learning Management Systems.* Retrieved August 26, 2011 from http://www.clomedia.com/content/templates/clo_feature.asp?articleid=91&zoneid=29

Hatch, E. (1998).  *Discourse and Language education.*  New Jersey: Prentice Hall.

Hawkins,  B.L., & Rudy, J.A. (2008). *Fiscal year 2007 summary report.* Educause core data service. Boulder, CO: Educause. Retrieved September 11, 2010, from http://net.educause.edu/ir/library/pdf/PUB8005.pdf

Hawkins, B.L., & Rudy, J.A. (2009).  *Fiscal Year 2007 Summary report.* Educause core data service. Retrieved May 11, 2009, from http://net.educause.edu/ir/library/pdf/PUB8005.pdf

Hennessy, S., Wishart, J., & Whitelock, D. (2007). Pedagogical approaches for technology- integrated science teaching. *Computers & Education*, *48*(1), 137-52.

Henning,  E., van Rensburg, W., & Smit, B. (2004).  *Finding Your Way in Qualitative Research.* Pretoria: Van Schaik Publishers.

Holland , J., & Campbell, J. (2005).  Introduction: Bridges and Fences for Combined Methods. In. J. Holland & J. Campbell (Eds.), *Methods in Development Research: Combining Qualitative and Quantitative Approaches* (pp. 21– 5).  Warwickshire: ITDG Publishing.

Howard, Y. (2003). "Developing Learner-Friendly Courseware for TESOL: A Preliminary Investigation." *Teaching English with Technology*, vol. 3, issue 4, http://www.iatefl.org.pl/call/j_course15.htm.

Huysamen, G.K. (2001).  *Methodology for the Social and Behavioral Sciences.* Cape Town: Oxford University Press.

Ismail, S. (2009). *Students' Acceptance in Using Blog as Learning Tool in an International Private University.* Retrieved June 12, 2011, from http://academia.edu/Papers/in/Acceptance_Models

Ismail, S. (2010). *International Students Acceptance on using Social Networking Site to Support Learning Activities.* Retrieved October 14, 2011 from http://www.ucsi.edu.my/cervie/pdf/paperV1N2Edu3.pdf

Joint Information Systems Committee & Universities and Colleges Information Systems Association. (2003a). *Managed learning environment activity in further and higher education in the UK.* Retrieved September 19, 2010, from http://www.jisc.ac.uk/uploaded_documents/mle-study-final-report.pdf

Joint Information Systems Committee & Universities and Colleges Information Systems Association. (2003b). *Virtual learning environment activity in further and higher education in the UK.* Retrieved September 19, 2010, from http://www.jisc.ac.uk/uploaded_documents/VLE-in-FE.pdf

Johnson, B. & Turner, L. A. (2003). Data Collection Strategies in Mixed Methods Research. In A. Tashakkori & C. Teddies (Eds.), *Handbook of Mixed Methods in Social and Behavioral Research.* Thousand Oaks: Sage Publications.

Jones, G.H., & Jones, B.H. (2005). A comparison of Teacher and Student Attitudes Concerning and Effectiveness of Web-based Course Management Software. *Educational Technology & Society*, *8*(2), 125-135.

Jones, D., & Muldoon, N. (2007). The teleological reason why ICTs limit choice for university learners and learning. In *ICT: Providing choices for learners and learning. Proceedings ASCILITE Singapore 2007.* Retrieved September 12, 2010 from http://www.ascilite.org.au/conferences/singapore07/procs/jones-d.pdf

Kalingo A.E., Burchard, R.B., & Trojer, L. ( 2007). An interactive e-Learning Management System (e-LMS): A Solutions to Tanzanian Secondary School's Education. *Proceedings of World Academy of Science, Engineering and Technology*, *2*(1), 1-257.

Karahanna, E., & Straub, D. (1999). The psychological origins of perceived usefulness and ease of use. *Information and Management, 35*(3) 237-250.

Kats, Y. (2010). *Learning Management System Technologies and Software Solutions for Online Teaching: Tools and Applications.* River College, USA: IGI Global.

Kearsley, G. (2000). *Online Education: Learning and Teaching in Cyberspace.* Wadsworth: Thomson Learning.

Kearsley, G. (2000). Developments in Learning. In H.H Adelsberger., B. Collis & J.M Pawlowski (Eds.), *Handbook on Information Technologies for Education and Training*. New York: Springer.

Kempfert, T. (2003). UW selects Desire2Learn as its new e-learning system. *Teaching with Technology Today*, *9*(7). Retrieved November 20, 2011 from http://www.wisconsin.edu/ttt/articles/d2l.htm

Kerr, B. (2007). *Criticism of Connectivism*. Retrieved 23 March, 2011, from http://billkerr2.blogspot.com/2006/12/challenge-to-connectivism.html

Kirkwood,  A. (2009). E-Learning:  don't  always get what you hope for. *Technology, Pedagogy and Education*, *18*( 2), 107-121.

Kop, R. & Hill, A. (2008). Connectivism: Learning theory of the future or vestige of the past. *International Review of Research in Open and Distance Learning, 9*(3). Retrieved                November                15,                2010                from http://www.irrodl.org/index.php/irrodl/article/view/523/1103

Krefting, L. (1991). Rigor in qualitative research: The assessment of trustworthiness. *American Journal of Occupational Therapy,* 45(3), 214-222.

Kvavnik, R., & Caruso, J. (2005).  E*CAR study of students and technology 2005: Convenience, connection, control and learning*.  Boulder, CO: EDUCAUSE Center for Applied Research.

Lakhan, S.E., & Jhunjhunwala, K. ( 2008). Open Source Software in Education – Academia has adopted open source software for some online learning initiatives because it addresses persistent technical challenges. *Educause Quarterly*, 2, 32-40.

Legris, P., Ingham, J. & Collerette, P. (2003) Why people use information technology? A critical review of the technology acceptance model. *Information and management*, 40, 191-204.

Li, J.P. and R. Kishore.  (2006). "*How Robust is the UTAUT Instrument? A multigroup Invariance Analysis in the Context of Acceptance and Use of Online Community Weblog Systems"*, Proceedings of the 2006 ACM SIGMIS CPR Conference on Computer Personnel Research, 183 – 189.

Liao, H.A. (2005)**.**  Communication Technology, Student Learning, and Diffusion of Innovation*. College Quarterly*, 8(2).    Retrieved  November  21,  2010  from http://www.collegequarterly.ca/2005-vol08-num02-spring/liao.html

Liaw, S. (2008). Investigating students' perceived satisfaction, behavioural intention, and effectiveness of e-learning:  A case study of the Blackboard system. *Computers & Education*, *51*(2), 864-873.

Lim, D.H. (2002). Perceived Differences Between Classroom and Distance Education: Seeking Instructional Strategies for Learning Applications. *International Journal of Educational Technology*, 3(1). Retrieved October 13, 2011 from http://www.ed.uiuc.edu/ijet/v3n1/d-lim/index.html

Lim, H.L., & Sudweeks, F. (2006). *Student perceptions of participation opportunities in online synchronous tutorials*. Retrieved July 13, 2009, from http://www.formatex.org/micte2006/pdf/1486-1490.pdf

Lokken, F. (2009). *2008 distance education survey results: Tracking the impact of e-Learning at community colleges*. Washington, DC: Instructional Technology Council.

Lonn, S., & Teasely, S.D. (2009). Saving time or innovating practice: Investigating perceptions and uses of Learning Management Systems. *Computers & Education*, 53, 686-694.

Lonn, S. (2010). Finding the "Learning" in Biology Students' Use of Learning Managements Systems. Retreived August 12, 2010 from https://ctools.umich.edu/access/content/group/research/papers/ICLS2010/ICLS2010_Lonn_Poster.pdf

Lorenzetti, J.P. (2003). *Thinking inside the box. Scholastic Administrator*. Retrieved November 12, 2011 from http://www.scholastic.com/administrator/march03/features.asp?article=insidebox

Loucks-Horsley, S., Hewson, P., Love, H., & Stiles, K. (1998). *Designing professional development for teachers of science and mathematics*. Thousand Oaks, CA: Corwin Press.

Lynch, M. M. (2004). *Learning Online: a guide to success in the virtual classroom*. London: Routledge Falmer.

Macchiusi, L., & Trinidad, S. (2001). *Information and Communication Technologies: The Adoption by an Australian University*,
retrieved April 20, 2011, from http://lsn.curtin.edu.au/tlf/tlf2001/macchiusi.html.


Mafata, M.P. (2009). *Investigation of the use of learning management systems in educational technology modules: A case study.* Retrieved May 10, 2011, from http://researchspace.ukzn.ac.za/xmlui/bitstream/handle/10413/1157/Mafata_Mafata_Paul_2009.pdf?sequence=1

Mangan, K. (2008). Chronicle of Higher Education. *Courtroom showdown begins in blackboard's patent dispute with desire2Learn*. Retrieved August 20, 2011, from http://chronicle.com/article/Courtroom-Showdown-Begins-in/500/

Marchewka, J.T., Liu,C., & Kostiwa, K. (2007). An application of the UTAUT Model for Understanding Student Perceptions Using Course Management Systems. *Communications of HMA*, *7*(2), 93-104.

McConachie, J., Danaher, PA., Luck, J., & Jones, D. (2004). Central Queensland University's Course Management Systems: Accelerator or brake in engaging change? *Studies in Learning, Evaluation Innovation and Development*, *1*(2), 19-31.

McMillan, J. H., & Schumacher, S. (2001). *Research in Education: A Conceptual Introduction* (5th Ed.). New York: Longman.

McMillan, H. J., & Schumacher, S. (2006). *Research in Education: Evidence-Based Inquiry ( Ed.).* New York: Pearson.

McMillan, J.H., & Wergin, J.F. (2002). *Understanding and Evaluating Educational Research.* Columbus: Merrill Prentice Hall.

Mendoza, L., Pérez, M., Díaz-Antón, G., & Grimán, A. (2006). Tailoring Rup for LMS Selection: A Case Study. *CLEI Electronic Journal*, 9(1), 1-15.

Miles, M.B. & Huberman, A.M. (1994). *Qualitative Data Analysis*, USA, SAGE Publications.

Mitchell, D., Clayton, J., Gower, B., Barr., H & Bright, S. (2005). *E-Learning in New Zealand institutes of technology/polytechnics: Final Report.* Retrieved September 14, 2010, from http://cms.steo.govt.nz/NR/rdonlyres/D64DCCF7-7B3C-4B44-94AB-E72CF833B433/0/WINTECExecSummary.pdf

Moore, G.C. & Benbasat, I. (1991). Development of an Instrument to Measure Perceptions of Adopting an Information Technology Innovation. *Information Systems Research*, 2(3), 192-222.

Mouton, J. (2001). *How to Succeed in Your Masters and Doctorial Studies*: A *South African Guide and Resource Book.* Pretoria: Van Schaik Publishers.

Mouton, J. & Marais, H.C. (1994). *Basic concepts in the methodology of the social sciences.* Pretoria: Human Sciences Research Council.

Murphy, T.H., & Lindner, J.R. (2001). *Building and Supporting Online Learning Environments Through Web Course Tools: It Is Whippy, But Does It Work?* Retrieved November 12, 2010 from http://agnews.tamu.edu/saas/Murphy.htm

Nanayakkara, C. (2007). A model of User Acceptance of Learning Management Systems: a study within Tertiary Institutions in New Zealand, *Educause Australasia 2007.* Retrieved July 5, 2011, from http://www.caudit.edu.au/educauseaustralasia07/authors_papers/Nanayakkara-361.pdf

Naveh, G., Tubin, D., & Pliskin, N. (2010). Student LMS use and satisfaction in academic institutions: The organizational perspective. *Internet & Higher Education*, *13*, 127-133.

NCODE-FLA. (2002). Retrieved October 3, 2002, from: http://ncode.mq.edu.au/papers/lmsSurvey.doc

Neuman, W. L. (2006). *Social Research Methods: Qualitative and Quantitative Approaches* (6th ed.). Boston: Pearson Education.

Organization for Economic Co-operation and Development (2005). *E-Learning in Tertiary Education: Where do we stand?* Paris, France: Centre for Educational Research and Innovation, Organisation for Economic Co-operation and Development.

O'Leary, R. (2006, April). Teacher, what is a Blackboard? *In Touch,* pp.30-31.

Olufemi, O. (2007). *Learning Management System (LMS and Virtual Learning.* Retrieved 25 April, 2011, from, http://www.webupon.com/services/learning-management-system-LMS-and-virtual-learning

Patton, M.Q. (2002). *Qualitative Research and Evaluation Methods.* (3rd ed.). London: Sage Publications.

Paulsen, M.F. (2002). An Analysis of Online Education and Learning Management System in the Nordic Countries. *Online Journal of Distance Learning Administration*, *5*( 3). Retrieved March 11, 2009, from http://www.westga.edu/~distance/ojdla/fall53/paulsen53.html

Perkins, M., & Pfaffman, J. (2006). Using a course management system to improve classroom communication. *The Science Teacher*, *73*(7), 33-37.

Rashid, N. A binti, A., Majid, O.B., & Yen, C.S. (2002). *E-learning Management System for Secondary School in Malaysia.* Paper presented at International Conference on the Challenges of Learning & Teaching in a Brave New World: Issues & Opportunities in Borderless Education. Retrieved March 15, 2009, from http://eprints.usm.my/10941/1/E-Learning_Management_System_for_Secondary_School_in_Malaysia_(PP_Sains_K omputer)).pdf

Rice, W. H. (2006). Moodle e-learning course development. A complete guide to successful learning using Moodle. Birmingham: Packt Publishing.

Rivera, J.C., McAllister, M.K., & Rice, M.L. (2002). A comparison of Student Outcomes & Satisfaction Between Traditional & Web Based Course Offerings. *Online Journal of Distance Learning Administration*, 5(3), 727 – 735.

Rogers, E.M. (1995). *Diffusion of innovations. (*4th ed.). New York: Free Press

Rogers, E.M. (2003). *Diffusion of innovations. (*5th ed.). New York: Free Press

Sanchez-Franco, M.J. (2010). WebCT - The quasimoderating effect of perceived affective quality on an extending Technology Acceptance Model. *Computers & Education*, *54*, 34-46.

Schmidt, K. (2002). The web-enhanced classroom*. Journal of Information Technology, 18*(2), 2-6.

Seale, J., & Mence, R.R. (2001). *An Introduction to Learning Technology within tertiary education in the UK*. Association for Learning Technology. Oxford Brookes University: Headington UK.

Seddon, P.B., Staples, S., Patnayakuni, R., & Bowtell, M. (1999). The dimensions of information systems success*. Communication of the Association for Information Systems*, *2*(20), 2-60.

Seidman, I. (1998)*. Interviewing as Qualitative Research: A Guide for Researchers in Education and the Social Sciences* (2nd ed.). New York: Teachers College Press.

Siemens, G. (2004). *Connectivism: A learning Theory for the Digital Age*. Retrieved April 7, 2008, from http://www.elearnspace.org/Articles/connectivism.htm

Siemens, G. (2005a). *Connectivism: Learning as a network-creation*. Retrieved March 28, 2011, from http://www.elearnspace.org/Articles/networks.htm

Siemens, G. (2005b). *Connectivism: A Learning Theory for the Digital Age.* Retrieved January 30, 2010, from http://www.itdl.org/journal/jan_05/article01.

Siemens, G. (2006, November 12). *Connectivism: Learning theory or pastime of the self-amused*? Elearnspace blog. Retrieved January 15, 2011, from http://www.elearnspace.org/Articles/connectivism_self-amused.htm

Siemens, G. (2007b). Creating a learning ecology in distributed environments. In T. Hug (Ed.), *Didactics of microlearning* (pp. 53-68). New York: Waxmann Verlag.

Siemens, G. (2008a). *About: Description of connectivism. Connectivism: A learning theory for today's learner, website*. Retrieved March 11, 2011, from http://www.connectivism.ca/about.html

Siemens, G. (2008b). *Learning and knowing in networks: Changing roles for educators and designers.* Paper 105, University of Georgia IT Forum. Retrieved March 21, 2011, from http://it.coe.uga.edu/itforum/Paper105/Siemens.pdf

Spicer, N. (2004). Combining qualitative and quantitative methods. In C. Seale (Ed.), *Researching Society and Culture* (pp. 294-302). New Delhi: Sage Publications.

Stiles, M. (2007). Death of the VLE?: a challenge to a new orthodoxy. *Serials*, *20*(1), 31-36.

Sun, P., Tsai, J.R., Finger, G., Chen, Y., & Yeh, D. (2008). What drives a successful e-Learning? An empirical investigation of the critical factors influencing learner satisfaction. *Computers & Education*, *50*(4), 1183-1202.

Surry, D. (1997*). Diffusion Theory and Instructional Technology.* Retrieved April 20, 2011, from, http://www2.gsu.edu/~wwwitr/docs/diffusion/.

Tashakkori, A., & Teddlie, C. (2003). *Handbook of Mixed Methods in Social and Behavior Research.* London: Sage Publications.

Ullman, C., & Rabinowitz, M. (2004). *Course management systems and the reinvention of instruction.* Technological Horizons in Education Journal. Retrieved January 20, 2011, from http://thejournal.com/articles/17014

Venkatesh, V., Morris, M.G., Davis, G.B., & Davis, F.D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27(3), 425-478.

Venkatesh, V. & Davis, F.D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science*, *46*(2), 186-204.

Verhagen, P. (2006*). Connectivism: A new learning theory?* Retrieved June 20, 2011, from http://www.4shared.com/office/ddZv-naA/Connectivism_a_new_learning_th.html

Wagner, C., & Du, H.S. (2005). *Learning with Weblogs: An Empirical Investigation.* Retrieved 14 June, 2011, from http://www.computer.org/comp/proceedings/hicss/2005/2268/01/22680007b.pdf

Walker, R. (1985). *Doing Research: A handbook for teachers.* Cambridge: University Press.

West, R.E., Waddoups, G., & Graham, C.R. (2007). Understanding the experiences of instructors as they adopt a course management system. *Education Technology Research and Development, 55*, 1-26.

Wiburg, K.M. (2003). *Teaching with Technology: Designing Opportunities to learn.* Toronto: Thomson Wadsworth.

Williams,M. (2008). *Connectivism – Desig*n. Retrieved April 7, 2010, from http://design.test.olt.ubc.ca/Connectivism

Witt, P.L. ( 2003). Enhancing classroom courses with internet technology: Are course web sites the trouble? *Community College Journal of Research and Practice, 27*(5), 429-438.

Woodill, G. (2007). *Evolution of Learning Management Systems.* Retrieved April 12, 2010, from, http://www.downes.ca/post/39972?author=Gary%20Woodill

Yilmaz, K. (2008). Constructivism: Its theoretical underpinnings, variations, and implications for classroom instruction. *Educational Horizons, 86*(3), 161-172.

# Appendix A: Questionnaire

Thank you for accepting this questionnaire. The information you provide will be used solely for the purpose of an academic research project for a Masters of Education thesis at UKZN. This questionnaire is confidential and will not be used to identify you as an individual. We appreciate you assisting us by completing this questionnaire. The results of this research will enable us to implement and adopt LMS's in our schools. Please be honest when completing the following details. Please sign to indicate that you have read this and give your informed consent to participate in this research project. You may withdraw your consent and your data at any time.

Many thanks for your co-operation.

1.  NAME OF SCHOOL : _____

2.  GENDER :  | MALE | FEMALE |

3.  **Please indicate your reaction to each of the following statements by circling the number that represents your level of agreement or disagreement with it. Make sure you respond to every statement.**

| NO. | Statement | Strongly Agree | Disagree | Neutral | Agree | Strongly Disagree |
|-----|-----------|----------------|----------|---------|-------|-------------------|
| 1 | Using the LMS saves time. | 1 | 2 | 3 | 4 | 5 |
| 2 | The LMS is a positive innovation. | 1 | 2 | 3 | 4 | 5 |
| 3 | The LMS makes learning more meaningful. | 1 | 2 | 3 | 4 | 5 |
| 4 | The LMS makes it more convenient to communicate with my teacher and friends. | 1 | 2 | 3 | 4 | 5 |
| 5 | The LMS is a fast and efficient way of getting information. | 1 | 2 | 3 | 4 | 5 |

| 6 | I look forward to receiving emails from my friend on the LMS. | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| 7 | I am eager to respond to the discussion group on the LMS. | 1 | 2 | 3 | 4 | 5 |
| 8 | The LMS is compatible with the way I like to work. | 1 | 2 | 3 | 4 | 5 |
| 9 | Using the LMS would require me to change my study habits. | 1 | 2 | 3 | 4 | 5 |
| 10 | Using the LMS increases my interaction with the subject content. | 1 | 2 | 3 | 4 | 5 |
| 11 | I am not worried about making mistakes by clicking on the wrong item when I use the LMS. | 1 | 2 | 3 | 4 | 5 |
| 12 | I can practice the using the LMS at a comfortable pace. | 1 | 2 | 3 | 4 | 5 |
| 13 | The LMS can be easily tried out. | 1 | 2 | 3 | 4 | 5 |
| 14 | I am not hesitant to use the LMS even though I make mistakes. | 1 | 2 | 3 | 4 | 5 |
| 15 | The LMS does not intimidate me. | 1 | 2 | 3 | 4 | 5 |
| 16 | I have seen other subjects in my school make use of a LMS. | 1 | 2 | 3 | 4 | 5 |
| 17 | I have seen other schools make use of a LMS. | 1 | 2 | 3 | 4 | 5 |
| 18 | I have seen the use of a LMS on television. | 1 | 2 | 3 | 4 | 5 |
| 19 | I have seen the use of LMS at a university. | 1 | 2 | 3 | 4 | 5 |
| 20 | I have not seen a LMS before. | 1 | 2 | 3 | 4 | 5 |
| 21 | Interacting with the LMS is frustrating. | 1 | 2 | 3 | 4 | 5 |
| 22 | The LMS is user-friendly. | 1 | 2 | 3 | 4 | 5 |
| 23 | The LMS is too complex for me. | 1 | 2 | 3 | 4 | 5 |
| 24 | I am confident in my ability to use the LMS. | 1 | 2 | 3 | 4 | 5 |

| 25 | When using the LMS I find it easy to navigate from one screen to another. | 1 | 2 | 3 | 4 | 5 |
|----|---------------------------------------------------------------------------|---|---|---|---|---|
| 26 | I find the LMS useful in my studies. | 1 | 2 | 3 | 4 | 5 |
| 27 | Using the LMS enables me to accomplish tasks more quickly. | 1 | 2 | 3 | 4 | 5 |
| 28 | If I use the LMS I will increase my chances of getting a better grade. | 1 | 2 | 3 | 4 | 5 |
| 29 | Using the LMS motivates me to learn. | 1 | 2 | 3 | 4 | 5 |
| 30 | Using the LMS increases my productivity. | 1 | 2 | 3 | 4 | 5 |
| 31 | My interaction with the LMS is clear and understandable. | 1 | 2 | 3 | 4 | 5 |
| 32 | I find the LMS easy to use. | 1 | 2 | 3 | 4 | 5 |
| 33 | Working with the LMS is fun. | 1 | 2 | 3 | 4 | 5 |
| 34 | It would be easy for me to become skilful at using the system. | 1 | 2 | 3 | 4 | 5 |
| 35 | Learning to operate the LMS is easy for me. | 1 | 2 | 3 | 4 | 5 |
| 36 | I will use a LMS because my teacher prefers me to use it. | 1 | 2 | 3 | 4 | 5 |
| 37 | I will use a LMS to impress my friends. | 1 | 2 | 3 | 4 | 5 |
| 38 | I will use a LMS because my peers are pleased when I contribute through the LMS. | 1 | 2 | 3 | 4 | 5 |
| 39 | Using a LMS is considered to be one of the latest learning technologies. | 1 | 2 | 3 | 4 | 5 |
| 40 | Other learners expect me to keep up with technology by using a LMS. | 1 | 2 | 3 | 4 | 5 |
| 41 | I have access to the computer laboratory. | 1 | 2 | 3 | 4 | 5 |
| 42 | The LMS is compatible to other applications I use (such MS Power-point, MS Word, etc). | 1 | 2 | 3 | 4 | 5 |
| 43 | I have access to the internet. | 1 | 2 | 3 | 4 | 5 |

| 44 | I have been trained to use the LMS. | 1 | 2 | 3 | 4 | 5 |
| --- | --- | --- | --- | --- | --- | --- |
| 45 | There is someone available to assist when I experience difficulties with the LMS. | 1 | 2 | 3 | 4 | 5 |
| | | | | | | |

This questionnaire is confidential and will not be used to identify you as an individual.

I hereby give permission that my responses may be used for academic research purposes.

…………………………………

Signature

## Appendix B: Interview Schedule

1. Have you previously used a LMS?

2. Did you experience any problems when using the LMS?

3. What did you find most beneficial when using the LMS?

4. Which specific tool (discussion group, presentation, etc) did you find most useful?

5. Why did you prefer to use these tools?

6. Would you prefer to use a LMS in other learning areas as well?

7. What recommendation/s would you make to improve the LMS?

8. What are some the challenges that you faced when using the LMS in the classroom?

9. How has the use of the LMS contributed to your learning?

10. What did you like most about using a LMS?

11. What did you like least about using a LMS?

12. Would you recommend the use of a LMS at all?

# Appendix C: Observation Schedule

|  | NOTES |
|---|---|
| 1. Do learners experience any problems when logging into the LMS? |  |
| 2. Are learners able to navigate from one tool to the other? |  |
| 3. Can learners rectify an incorrect choice of tool? |  |
| 4. Do learners show signs of eagerness when using the LMS? |  |
| 5. Do learners show signs of boredom/frustration when using the system? |  |
| 6. Are there any difficulties that learners experience when using the LMS? |  |
| 7. Are learners able to achieve the aims of a task given via the LMS? |  |
| 8. Are learners actively involved in the lesson? |  |
| 9. Is there any evidence to indicate that the use of the LMS is facilitating the learners understanding the lesson? |  |
| 10. Do learners seem to enjoy using the LMS? |  |
| 11. Do learners unintentionally log- off the LMS? |  |
| 12. Do learners exit the LMS correctly? |  |
|  |  |

# Appendix D: Letter of Permission

**LETTER OF CONSENT**

**Dear Parent/Guardian,**

**Greetings to you**

My name is Mrs Y. Mudaly and I am an educator at Wingen Heights Secondary School. I am presently completing my Masters degree in Computer Science Education at the University of Kw-Zulu Natal. One of the criteria for completing my degree is to conduct a research-study based on my chosen field of research.

My research study investigates the perceptions of learners towards the use of a learning management system in the classroom.

My research title is:

"***An investigation into the use of a Learning Management System (LMS) as a tool to support teaching and learning in a Grade 10 Information Technology class".***

The research involves your child using a LMS in class, completing a questionnaire and participating in an interview process. All ethical considerations will be strictly adhered to at all times. All information provided will be maintained in strict confidence. Please note that participation in this research is voluntary and your child/ward may withdraw from participating at any time if he/she feels the need to do so. Furthermore, your consent is needed for your child to participate in the abovementioned research study. If you consent to your child being part of this research please sign the form below.

Thank you for your assistance. If you have any queries, you may contact my supervisor, Dr. D.W.Govender (031 2603428).

Yours Sincerely

_____
Y.Mudaly
--------------✂--------------✂--------------✂--------------✂--------------✂--------------✂--------------✂

**Declaration**

I, _____parent/guardian of
_____ give consent for his/her participation in the abovementioned research project. I understand that participation is voluntary and that my child's/ward's name will not be used in the write-up of this project.

.................................................        ........................

PARENT/GUARDIAN                                                          DATE

## Appendix E: Letter to Department of Education and Culture

41 Becton Drive
Malvern
Durban
4093

28 February 2011

Department of Education and Culture

Dear Sir/Madam

**RE: APPLICATION FOR PERMISSION TO CONDUCT RESEARCH AT WINGEN HEIGHTS SECONDARY SCHOOL:  SHALLCROSS**

I am a student at the University of Kwa-Zulu Natal.  I am currently completing my Masters Degrees in Computer Science Education.

My student number is 207 524 483

Details of my supervisor are as follows :

Dr. D.W. Govender:  Tel:  031 2603428
Email :  govenderd50@ukzn.ac.za

In order to complete my degree, I need to conduct a research study based on my chosen field of research at the school at which I am teaching, ie. Wingen Heights Secondary.

My research study investigates the attitudes/perceptions of learners towards the use of a Learning Management System in teaching and learning.

My research title is :

" *An investigation into the use of a Learning Management System (LMS) as a tool to support teaching and learning in a Grade 10 Information Technology class".*

As an educator at Wingen Heights Secondary, I seek your permission to conduct this research study at the above-mentioned school.  Confidentiality and anonymity is assured and all ethical considerations will be strictly adhered to.

Thanking you in anticipation of your favourable response.

Yours Sincerely

_____                                    _____

RESEARCHER:  MRS Y MUDALY                                    DATE

CONTACT NUMBER:  CELL:        0845786738

HOME:     031 4640105

## Appendix F: Letter to Principal

41 Becton Drive
Malvern
Durban
4093

28 February 2011

The Principal
Wingen Heights Secondary
1 Wingen Walk
Shallcross
4093

Sir,

I am a Masters of Education Student at the University of Kwa-Zulu Natal.  My research title is "***An investigation into the use of a Learning Management System (LMS) as a tool to support teaching and learning in a Grade 10 Information Technology class".***

The outcome of the research should provide valuable information which will contribute to the use of a Learning Management System (LMS) in the classroom.  A LMS in the Grade 10 Information Technology class will be implemented as a tool to facilitate teaching and learning.  An observation of the use of this learning management system will be conducted during the lesson/s.  Learners will have to complete a questionnaire and participate in an interview as part of this research study.

As an educator at Wingen Heights Secondary, I seek your permission to conduct this research study at our school.  Confidentiality and anonymity is assured and all ethical considerations will be strictly adhered to.

Thanking you in anticipation of your favourable response.

Yours Sincerely

_____                                  _____

RESEARCHER:  Y.MUDALY                                        DATE

CONTACT NUMBER:  CELL:      0845786738

                                         HOME:    031 4640105

# Appendix G: Ethical Clearance – UKZN

**UNIVERSITY OF KWAZULU-NATAL**

*University of KwaZulu-Natal*
*Research Office*
*Govan Mbeki Centre*
*Westville Campus*
*University Road*
*Chiltern Hills*
*Westville*
*3629*
*South Africa*
*Tel No: +27 31 260 8200*
*Fax No: +27 31 260 2384*
*E-mail : naidoos4@ukzn.ac.za*

07 February 2011

Mrs Y Mudaly
School of Education
EDGEWOOD CAMPUS

Dear Mrs Mudaly

**PROTOCOL:  An investigation into the use of a learning management (LMS) as a support tool to teaching and learning in a Grade 10 Information Technology class**
**ETHICAL APPROVAL NUMBER:  HSS/0014/2011 M:  Faculty of Education**

In response to your application dated 04 February 2011, Student Number: **207524483** the Humanities & Social Sciences Ethics Committee has considered the abovementioned application and the protocol has been given **FULL APPROVAL.**

**PLEASE NOTE:  Research data should be securely stored in the school/department for a period of 5 years.**

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully

**Professor Steve Collings (Chair)**
**HUMANITIES & SOCIAL SCIENCES ETHICS COMMITTEE**

SC/sn

cc: Dr. D W Govender (Supervisor)
cc: Mr. N  Memela

| | **Postal Address:** | | | |
|---|---|---|---|---|
| Telephone: | Facsimile: | | Email: | Website: www.ukzn.ac.za |
| Founding Campuses: | ▇ Edgewood | ▇ Howard College | Medical School | ▇ Pietermaritzburg | ▇ Westville |

# Appendix H:  Clearance Letter: DOE (KZN)

**kzn education**

Department:
Education
KWAZULU-NATAL

**YOGAMBAL MUDALY**
**41 BECTON DRIVE**
**MALVERN**
**4093**

| | |
|---|---|
| Enquiries: | Sibusiso Alwar |
| Date: | 22 February 2011 |
| Reference: | 0019/2011 |

**PROPOSED RESEARCH TITLE: An Investigation into the Use of Learning Management (LMS) as a Support Tool to Teaching and Learning in a Grade 10 Information Technology Class**

Your application to conduct the above-mentioned research in schools in the attached list has been approved subject to the following conditions:

1. Principals, educators and learners are under no obligation to assist you in your investigation.

2. Principals, educators, learners and schools should not be identifiable in any way from the results of the investigation.

3. You make all the arrangements concerning your investigation.

4. Educator programmes are not to be interrupted.

5. The investigation is to be conducted from 01 February 2011 to 28 February 2012.

6. Should you wish to extend the period of your survey at the school(s) please contact Mr Sibusiso Alwar at the contact numbers above.

7. A photocopy of this letter is submitted to the principal of the school where the intended research is to be conducted.

8. Your research will be limited to the schools submitted.

9. A brief summary of the content, findings and recommendations is provided to the Director: Resource Planning.

...dedicated to service and performance
beyond the call of duty.

KWAZULU-NATAL DEPARTMENT OF EDUCATION

POSTAL      Private Bag X9137, Pietermaritzburg, 3200, KwaZulu-Natal, Republic of South Africa

PHYSICAL    Office G25, 188 Pietermaritz Street, Metropolitan Building, PIETERMARITZBURG 3201

TEL         Tel. +27 33 341 8610 8611 | Fax +27 33 341 8612 | E-mail

10. The Department receives a copy of the completed report/dissertation/thesis addressed to:

The Director: Resource Planning
Private Bag X9137
Pietermaritzburg
3200

We wish you success in your research.

Kind regards

Dr SZ Mbokazi
**Acting Superintendent-General**

# Appendix I:  Letter of Permission

**kzn** education

Department:
Education
KWAZULU-NATAL

YOGAMBAL MUDALY
41 BECTON DRIVE
MALVERN
4093

| | |
|---|---|
| Enquiries: | Sibusiso Alwar |
| Date: | 22 February 2011 |
| Reference: | 0019/2011 |

## PERMISSION TO INTERVIEW LEARNERS, EDUCATORS AND DEPARMENTAL OFFICIALS

The above matter refers.

Permission is hereby granted to interview Departmental Officials, learners and educators in selected schools of the Province of KwaZulu-Natal subject to the following conditions:

1. You make all the arrangements concerning your interviews.
2. Educators' programmes are not interrupted.
3. Interviews are not conducted during the time of writing examinations in schools.
4. Learners, educators and schools are not identifiable in any way from the results of the interviews.
5. Your interviews are limited only to targeted schools.
6. A brief summary of the interview content, findings and recommendations is provided to my office.
7. A copy of this letter is submitted to District Managers and principals of schools where the intended interviews are to be conducted.

The KZN Department of education fully supports your commitment to research:

**An Investigation into the Use of Learning Management (LMS) as a Support Tool to Teaching and Learning in a Grade 10 Information Technology Class**

It is hoped that you will find the above in order.

Best Wishes

Dr SZ Mbokazi
**Acting Superintendent-General**

...dedicated to service and performance
beyond the call of duty.

KWAZULU-NATAL DEPARTMENT OF EDUCATION

POSTAL : Private Bag X9137, Pietermaritzburg, 3200, KwaZulu-Natal, Republic of South Africa

PHYSICAL: Office G25; 188 Pietermaritz Street, Metropolitan Building, PIETERMARITZBURG 3201

TEL. Tel: +27 33 341 8610 8611 | Fax: +27 33 341 8612 | E-mail:

# Appendix J: List of Schools

**kzn** education

Department:
Education
KWAZULU-NATAL

YOGAMBAL MUDALY
**41 BECTON DRIVE**
**MALVERN**
**4093**

Enquiries: Sibusiso Alwar

Date: 22 February 2011

Reference: 00019/2011

**LIST OF SCHOOLS**

**1. Wingen Heights Secondary School**

Kind regards

**Dr SZ Mbokazi**
**Acting Superintendent-General**

...dedicated to service and performance
beyond the call of duty.