Cape Peninsula University of Technology

STUDENTS' PERCEPTIONS TOWARDS THE USE OF E-LEARNING PLATFORMS AT A UNIVERSITY IN CAPE TOWN

by

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Thesis submitted in partial fulfilment of the requirements for the degree

Master of Technology: Business Administration (Project Management)

in the Faculty of Business and Management Sciences

at the Cape Peninsula University of Technology

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Cape Town Campus

December 2021

DECLARATION

I, Confidence Kenalemang Komani, declare that the contents of this thesis represent my own unaided work, and that the dissertation/thesis has not previously been submitted for academic examination towards any qualification. Furthermore, it represents my own opinions and not necessarily those of the Cape Peninsula University of Technology.

Signed

16 November 2022

Date

ABSTRACT

The use of e-learning remains limited and can be considered as ineffective, due to a lack of evaluation from its users. Therefore, considering these factors is critical for effective e-learning in universities. The use of technology in education has brought social and digital improvement to both students and academics who are involved in the use of educational technologies. Information communication technology (ICT) is considered a vital tool to promote a different way of teaching that should be exploited to improve students' problem-solving skills, promote cooperation, communication, and lifelong learning.

This study aims to classify the key aspects that impact the efficacy of e-learning among engineering scholars at the selected university. Also, it aims to explore the common measurements for e-learning effectiveness in the higher learning environment, so as to identify technical barriers that impact e-learning use among engineering students. There is no uniform term to label the different types of e-learning as well as their uses. Scholars have generalized e-learning as a method of education where content is conveyed electronically, using information and communication technologies over the world wide web to enable the creation of cyber classrooms and digital collaborations among students, as well as for the transfer of learning content over multimedia such as satellite television, live streaming and audio.

In order to realise the aims of the research, the survey design method was chosen. A survey was disseminated online to the selected population of students, and the results were analysed. The results reflected that students generally had an optimistic outlook concerning the use of e-learning in their studies. Most students indicated that they enjoyed using the platforms and found them to be useful to their studies. They also stated that using e-learning enhanced communication and interaction both amongst each other and with their lecturers. Students also indicated that e-learning platforms contributed positively to their day-to-day experiences in their studies. It is important that universities and their stakeholders should take students' perceptions into consideration as their proficiency in e-learning and its usage are great contributors to educational development and e-learning effectiveness.

ACKNOWLEDGEMENTS

This research project reflects courage in its conquering what might have seemed challenging and sometimes impossible. I am truly grateful for the strength, support, and encouragement from everyone who contributed in one way or another to this work.

I am also grateful to the participants, friends and colleagues at the Cape Peninsula University of Technology who have given me feedback and encouragement. For the development and production of this thesis itself, I feel a deep sense of gratitude.

I wish to thank:

- My supervisor, Prof Bingwen Yan for his support and confidence in my ability to complete this work. Thank you for always making time to assist me. I could not have done this without you.
- My family for their unwavering support and believing in me, even when I didn't do so.

DEDICATION

To my mother Mpho Junior Bakgane for your unrelenting courage. To my husband Fungayi Komani for your unwavering support. To my daughter Ruvarashe Komani and my son Nashe Komani this is for you.

LIST OF ABBREVIATIONS AND ACRONYMS

ICT – Information Communication Technology

LMS – Learner Management Systems

CBT – Computer Based Training

CBL – Computer Based Learning

CAI – Computer Assisted Instruction

SNS – Social Network Sites

PLATO – Programmed Logic for Automatic Teaching Operation

DOE – Department of Education

VLE – Virtual Learning Environment

MOOC's – Massive Open Online Courses

TAM – Technology Acceptance Model

IDT – Innovation Diffusion Theory

UTAT – Unified Theory of Acceptance and Technology

UTAUT – Unified Theory of Acceptance and Use of Technology

BBL – Blackboard Learning

WebCT – Web Course Tools

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CHAPTER 1: INTRODUCTION TO THE STUDY

1.1 Introduction and Background of the Research

Technology use in education has brought social and digital improvement to both students and academics involved in the use of educational technologies (Lopes, 2014). Information Communication Technology (ICT) is considered as a crucial tool to promote a different way of teaching that should be exploited to improve students' problem-solving skills, promote cooperation, communication, and lifelong learning (Abdullah & Ward, 2016). E-learning has changed the way education takes place in tertiary institutions around the world (Chopra et al., 2019; Huda et al., 2019). Although it is not agreed upon when the term 'e-learning' might have been coined, Moore, et al. (2011) proposed that e-learning as a word, might have emerged during the early 1980s at what literature suggests was the dawn of online learning.

There are various definitions of e-learning in literature, due to different views, features as well as the usability of e-learning. There is no uniform term to label the different types of e-learning, as well as their uses. Thakkar and Joshi (2017) generalized e-learning as a method of education where content is conveyed electronically using information and communication technologies. Coleman (2011) further added that the uses of e-learning included the utilization of computers over the world wide web to enable the creation of web-based classrooms and digital collaborations among students, and the transfer of the curriculum over multimedia such as via satellite television, live streaming and audio.

It is unclear as to the exact time when e-learning was developed. Bezovski and Poorani (2016) averred that the early stages of e-learning might have emerged around the 1960s. Harasim (2006) added that this was followed with the use of e-mails and conferencing in university courses. In the 1980s, the first online courses were introduced in countries like Canada and the USA, which spearheaded large-scale online degrees, popularized after the emergence of the world wide web in the late 1990s and has since revolutionized how technology is used in education. The 1990s then brought the emergence of e-learning using networked technologies across Southern African institutions of higher learning (Ravjee, 2007). Since then, e-learning has evolved and advanced rapidly and now encompasses tools such as Learner Management Systems (LMS), mobile learning and social software such as virtual classrooms, podcasts, and blogs.

E-learning offers various benefits, hence its popularity among institutions of higher learning. Its implantation in higher learning for teaching and learning has presented several advantages (Alkharang & Ghinea, 2013). E-learning has its focus on the student and their needs which is

an important factor in the facilitation of education (Arkoful & Aibadoo, 2014). Furthermore, e-learning inherently requires that learners possess information technology competency and helps students to familiarize themselves with web-based technologies (Kattoua, et al., 2016). Another significant advantage of e-learning mentioned in many studies is the flexibility that e-learning offers as it avails education anywhere and at any time, thus reducing the high cost of education (Smedley, 2010).

1.2 Problem Statement

The introduction and uptake of e-learning in countries with developing economies has become widespread and is growing. Notwithstanding the perceived advantages of e-learning these countries continue to tackle e-learning system challenges such as internet access, poor ICT infrastructure, insufficient financial budgets, and lack of policy implementation (Hadullo, 2018). Students who are often from Information Communication Technology disadvantaged schools experienced challenges in adapting and using e-learning platforms for their studies (Msomi & Bansilal). These challenges especially affect engineering students using e-learning for their studies, some of the challenges include software incompatibility, not being able to upload certain file types as related to engineering software and therefore cannot effectively interact or maintain online engagement with the system (Thakker & Kaisare, 2020). In addition, students report difficulties with technical support and anxiety thus creating a barrier to using technology (Jamil, Sethi and Ali, 2016). The use of e-learning remains limited and can be considered as ineffective due to a lack of evaluation from its users therefore considering these factors is critical for effective e-learning in institutions of higher learning. As the main users of the various platforms engineering students' perceptions would be important in evaluating the platforms' effectiveness. However, there is not much research that encapsulates and describes the factors impacting e-learning usefulness in post-secondary education institutions in a developing country such as South Africa (Alariqi et al., 2019). Therefore, it is imperative for this study to be undertaken, to increase the use of e-learning platforms and thereby improve academic performance of students in the South African higher learning sector.

1.3 Research Aims and Objectives

The aim of the study was to investigate the perceptions of Mechanical engineering students towards the various e-learning platforms currently in use within the university. Furthermore, to determine the students' use of technology tools and how they affect their studies.

The introduction and uptake of e-learning in countries with developing economies has become widespread and is growing. Notwithstanding the perceived advantages of e-learning these countries continue to tackle e-learning system challenges such as internet access, poor ICT infrastructure, insufficient financial budgets, and a lack of policy implementation (Hadullo,

2018). The use of e-learning remains limited and is considered as ineffective due to a lack of evaluation from its users.

Therefore, considering these factors is critical for effective e-learning in institutions of higher learning. However, there is not much research that encapsulates and describes the factors impacting e-learning usefulness in post-secondary education institutions in a developing country such as Southern Africa (Alariqi et al., 2019). Therefore, it is imperative for this study to be carried out to determine the students' perceptions towards the use of e-learning at a selected university in the South African higher learning sector. This study aims to classify the key aspects that impact on the efficacy of e-learning among engineering scholars at the selected university.

In order to attain this, the research objectives are expressed as the following:

- Explore the common measurements for e-learning effectiveness in higher learning environment.
- Identify the technical barriers that impact on e-learning effectiveness among engineering students.
- Factors that affect the use of e-learning in the university.
- Contribute valuable recommendations on how e-learning usage can be improved with the selected university.

1.4 Research Questions

In line with the research objectives, the main research question is: "What is the effect of e-learning on students' academic performance among engineering students at a selected University in the Western Cape, South Africa?"

To answer the primary research question, this study focused on answering the following sub research questions:

- What common measurements are used for e-learning effectiveness in higher education environment?
- What are the technical barriers that impact on e-learning effectiveness among engineering students?
- What are the factors that affect the usage of e-learning in the university?
- How to improve the use of e-learning within the university?

1.5 Research Methodology

Taylor et al. (2015) defined a methodology as a way of addressing problems and how answers

are sought for a problem. The authors also described research methodology as the purpose of the research, assumptions and the researcher's interest will inform how the research will be carried out. The study adopted a systematic process for scientific and empirical methods that provides an understanding of problems, and through which related knowledge is createdwhich adds to the existing body of knowledge (Kothari, 2004). Research methodology describes how research is accomplished and is shaped by the interest in the research and theassumptions of the researcher and the purpose of the research (Taylor et al., 2015). The method that a researcher adopts depends on the research problem (Mohd Noor, 2008).

In this study, a quantitative approach will be employed as it allowed the researcher to collect data using a questionnaire and therefore the data could be represented numerically (Muijis, 2010). Quantitative data is often analysed using various types of statistical analysis formulae or software (Struwig & Stead, 2013). McCusker and Gunaydin (2015) added that a quantitative method quantifies data rather than the use of text data in a qualitative research method. This study explored the student's perceptions of e-learning usage. Therefore, the researcher was able to analyse the opinions from a large group of students statistically, in relation to the effectiveness of the e-learning.

1.5.1 Population

A population is defined as a complete group of possible respondents targeted by a research study (Jha, 2014) and the groups from which the data is to be collected (Kaushik & Mathur, 2014). The aim of the study was to determine whether the students' use of technology tools affected their studies. The population in this study were the students. The researcher identified a specific population of engineering students in the Mechanical Engineering department from first year to BTech study, since the current learning system is mainly online. Thus, all students are engaged in using e-learning technologies. Consequently, it is the researcher's assumption that their experience would give better informed answers or data. The target population of the study is currently 6,637 students registered in the Faculty of Engineering and the Built Environment and 250 Permanent Academic Staff Members.

1.5.2 Sampling

Sampling takes place when a researcher investigates part of a larger population by choosing a portion of that population called a sample and then uses the results obtained from that investigation to make statements that apply to the overall population (Salkind, 2010). The representativeness of a sample hinges on three factors namely, the sampling methodology, the size, and the response rate of the participants of the study (Acharya et al., 2013). Sampling includes two main methods, non-probability, and probability sampling. Researchers who undertake quantitative studies mostly apply probability sampling; this study undertook

probability sampling. Probability sampling is a method where each entity or member of a general population has a possibility of being chosen as part of the sample, although the rationale behind this method is to generate a representative sample; perfection is not guaranteed but it means that most random samples are likely to represent the targetpopulation (Nardi, 2018). In the context of this study, simple random sampling was chosen.

1.5.3 Sampling size

According to Mellenbergh (2019), when the probability sampling method is utilized, the researcher will choose units from the target population using a random process. Calculations were computed to estimate corresponding population limits with the use of sampling. The target population of the study is 1,608 registered students, therefore a sampling interval of 10 was used, so the sample size was 161. In this regard, the researcher aimed for 200 in order to achieve at least 161. Thus, the sample size was 200 students who are registered in the Mechanical Engineering program.

1.5.4 Data collection instrument

Questionnaires are quantitative data collection instruments. According to Zohrabi (2013), questionnaires can include both closed and open-ended questions. This type is otherwise known as a semi-structured questionnaire. Krosnick and Presser (2009) argued that the questionnaire might have ranked or rated questions. In quantitative studies, close-ended questionnaires that allow participants to make a choice from a list of options are often used. A closed-ended Likert scale questionnaire was adopted for a quantitative data collection, where the purpose of using a Likert-scale was to seek the extent of the students' use of e-learning tools.

1.5.5 Data collection

To achieve the objectives of the research, the process of collecting data and the method of analysis was important. Data collection is the method of collecting data from participants in a manner that could best respond to the research questions (Paradis et al., 2016). Data collection techniques whether primary or secondary, are often employed to gather information from existing datasets (Harrel & Bradley, 2009). In this study, data was collected using a 5–point Likert-scale style questionnaire that was used to collect quantitative data via an online link. The online questionnaire was designed using Google Docs and was disseminated to the students' emails by sending them the links to the questionnaire.

1.5.6 Ethical consideration

Flick (2015) emphasized that research is an ethical enterprise and that researchers must

follow guidelines while conducting research. In this study, the ethical issues were considered carefully in the research process. The researcher obtained ethical clearance from the selected University, as well as written permission to undertake the study in the Department of Mechanical Engineering. To protect the welfare of the participants in the study, the researcher followed ethical principles throughout.

The participants were provided with a written informed consent email that requested their consent and permission to take part in the research. In the email participants were informed that they needed to click on the link and that they understood and agreed to take part in the survey. The consent email contained the procedure of consent where the participants were informed that their participation was voluntary and could be withdrawn at any time and for any reason. Participants were informed that whether they took part in the survey or chose not to take part at any point this would by no means harm their relationship with the selected university. This ensured that the participants could join in the research without any pressure.

In addition, the confidentiality and anonymity of the participants was always upheld, and the questionnaire did not require any biographical details from the participants. The respondents were informed that the information provided in the questionnaire would be kept confidential and anonymous to guarantee the participants' right to privacy. Also included in the consent email was a brief description of the study and its purpose, as well as the duration which would be approximately 20 minutes.

As part of the consent form, the participants were informed that the data provided would be stored securely and that no markers, email or IP addresses would be stored as an identifier of any participant. Participants were invited on the form to contact the researcher should they have any questions about the research before or during the study. The researchers contact details were included on the form. The introductory part of the questionnaire reiterated the information that was on the consent form.

1.6 Significance of the Study

The proposed study is relevant in many ways in that to the best of the researcher's knowledge the study is a first of its kind in the Faculty of Engineering. In addition, the study envisages identifying key factors that impact on e-learning efficacy among engineering students. It is the researcher's expectation that the findings of this study will contribute towards aspects of e-learning that engineering students find effective in their academic study, to inform the IT department how they might best invest in educational technologies in the future.

The research findings could provide insight into various e-learning platforms that students and the universities authority could adopt at the university. In addition, the outcomes could guide

students and universities conclusions on the barriers to successful e-learning experiences and suggest how to best use e-learning effectively. The research findings could advise the university management to prioritize e-learning as a way of strengthening technology skills for students by further equipping academics with a new way to complement and enhance the transfer of knowledge to students.

1.7 Chapter Classification

This study contains the following chapters.

Chapter 1: Introduction. This chapter provides a background to the study, and describes the research aims and objectives, the research problem, delimitations of the study, the research methodology and design, limitations of the study and ethical considerations.

Chapter 2: Theoretical System/Literature Review. This chapter explored ICT, and provided an e-learning overview, the structural features of e-learning, common measurements for e-learning effectiveness, the technical barriers that impact e-learning effectiveness, and Students' perceptions towards e-learning use.

Chapter 3: Research Design and Methodology. Included in this chapter were the research design and techniques, the problem statement, research aims, objectives and questions, population, sampling, the data collection instrument, data collection and analysis, and the data reporting system.

Chapter 4: Research Findings and Analysis. This chapter provides the analysis, the interpretation and reporting of data, and conducts the research results and discussion.

Chapter 5: Final Conclusions and Recommendations. This chapter will contain a summary of the findings, recommendations, limitations, and conclusions.

1.8 Conclusion

This chapter provided an overall introduction to the study. The background to the study was provided, and the researcher then provided an overview of e-learning and explained the context and history of e-learning, as it pertains to the study being undertaken in an institution of higher learning. The research aims and objectives were highlighted and the research methodology to be used for the study was set out by highlighting research approaches, to ensure alignment with the study's aims and objectives. The subsequent chapter will focus on the literature review of what scholars have researched regarding student's perceptionstowards the use of e-learning.

CHAPTER 2: THE LITERATURE REVIEW

2.1 Introduction

In the previous chapter the introduction and background of the study were discussed. The problem statement, research questions and objectives of the study were stated. The research methodology was also highlighted. In this chapter the researcher will examine the research problem statement by laying out the subject of e-learning from a theoretical standing. To address the research questions of the study, the chapter will first address the key concepts of e-learning as well as expand on what e-learning encompasses in the setting of higher learning. Included in this study is the description of the fundamentals of e-learning and its features and how they apply to institutions of higher learning.

A brief historical background is provided to contextualize the development of e-learning through its various stages. In addition, this chapter will focus on the basic models employed to assess the effectiveness of e-learning, which led to expanding and defining the common measurements used to evaluate it. The chapter also address the technical barriers to e-learning, the factors that impact on the use of e-learning platforms and last, the chapter proposes improvements that could be implemented to enhance e-learning usage within the university. The chapter then concludes with lessons learnt.

2.2 Definitions of Key Concepts

E-learning – Is learning that takes place using computers and other multimedia over the web and various other forms of ICT to support learning (Clark & Mayer, 2016).

Educational Technology – Is the integrated use of technology, traditional educational theory, and practice to facilitate teaching and learning with the creation, management and use of technology and educational resources to improve students' academic performance. It includes any technology used to complement blended learning (Kennedy, 2018).

Information Communication Technology (ICT) – Refers to the various components in information technology, such as telecommunication, wireless technology, computer systems and multimedia peripherals that allow users to save, send, access and manipulate information (Aibara, 2017).

Learner Management Systems (LMS) – LMS are software applications enabled by the internet used by most institutions of higher learning to distribute educational content, manage teaching and learning and in some cases provide distance learning (Freire et al., 2012).

Learning Culture – Is a conducive atmosphere of learning set by values and practices to encourage and develop knowledge and competence in order to achieve good academic performance (Masitsa, 2005).

2.3 E-learning Overview

E-learning has changed the way lectures take place in institutions of higher learning around the world. According to Sangra et al. (2012) e-learning was defined from different standpoints by experts, where one school of thought stated that e-learning is the use of technology in a lecture room setting and the other school claims it could be an answer to the enhancement of distance learning using the internet as an integral part of communication. Another perspective mentioned in the literature differentiated e-learning in two ways, first the concept of distance learning where course materials are conveyed using technology, and second blended learning where e-learning was used to complement and enhance face-to-face learning through technology to facilitate education (Arora & Mehta, 2018).

In addition, Almarabeh (2014) described e-learning as the use of ICT such as the world wide web, computers, cell phones, and platforms such as LMS, blogs and social media, to facilitate teaching and learning. Some perspectives from researchers such as Sawhney (2012) stated that e-learning is an 'umbrella term' used to describe online technology to disseminate education in a purely online mode, as well as being an addition to face-to-face learning.

Arasteh et al. (2014) emphasized that e-learning enabled students from all backgrounds to take courses online using the internet and web services, despite their geographical location. Shin and Downing (2011) asserted that e-learning should be student centred in its design to create an interactive and easily customizable interface, to allow self-pacing and increase efficiency within the system.

E-learning is distinct in that it is contextualized according to the environment whereby it is utilized and thus the various definitions of e-learning (Asabere & Enguah, 2012). Millham et al. (2014) asserted that e-learning was necessary as it facilitated the progression of how students could fare better in their assessments, it also helps students with self-discipline and encourages active participation, which brings about better learning outcomes.

Based on the abovementioned definitions of e-learning, it can be argued that this term generalises learning typologies that use the internet, electronic technology and multimedia as a medium to disseminate education that enhances teaching and learning. Furthermore, e-learning can be used as a tool to overcome educational challenges that are linked to limited time, infrastructure, and the location of those in academia. The presumption is due to e-

learning being time and location independent, which therefore caters to a wider demographic. E-learning has become a vital part of higher education institutions as it allows communication to flow between students and the faculty using various means such as email, network libraries, and online journals (Mamattah, 2016).

2.3.1 Historical background of e-learning

E-learning enables the practical use of computer technology in teaching and learning in the information age. It is unclear as to the exact time when e-learning was developed. Bezovski and Poorani (2016) stated that the early stages of e-learning might have emerged around the 1960s with the introduction of Computer Based Training (CBT) and Computer Assisted Instruction (CAI); which later developed into Computer Based Learning (CBL). This technology was utilised both in education and for communication purposes. CBT then pioneered the Programmed Logic for Automatic Teaching Operation (PLATO) system, which formed the basic layout of modern e-learning, including graphic elements, text, forums, and chat rooms.

Dron and Anderson (2016) added that this was followed using e-mails and conferencing in university courses. The 1970s brought the emergence of personal computing which was learning with the assistance of a computer, which was largely a rigid repetition of activities. In the 1980s the first online courses were introduced in countries like Canada and the United States of America which spearheaded large-scale online degrees popularised after the introduction of the internet in the early 1990s and has since revolutionized how technology is used in education.

The early 1990s introduced CD-based training as another form of e-learning which was mostly utilised for Information Technology education and was later used to provide learning instructions to correspondence students to complement the initial use of web chat rooms. The advancement in the technology of both software and hardware brought on by the internet boom became widespread in the late 20th century, this is when the concept of e-learning was popularised and quickly grew into a learning trend. These developments brought the introduction of the first LMS named Cecil (Computer Supported learning system), which was launched in 1996 at the University of Auckland Business School (Bezovski & Poorani, 2016).

Due to the potential opportunities provided by e-learning, most nations of the world have invested huge financial and human resources to ensure that students are able to fully exploit and benefit from technology by adding e-learning usage to the traditional lecture room (Edumadze et al., 2017). The late 1990s then brought the emergence of e-learning, using networked technologies across Southern African institutions of higher learning (Ravjee, 2007).

Ng'ambi et al. (2016) stated that the early 2000's brought further advancement in technology which led to the normalisation of computer networks and introduced graphic communication such as emails and the internet for staff in academia. Universities were geared up to install and increase infrastructure to support the increasing requests by academics to utilise technology in lectures.

The use of educational technologies and e-learning started taking off in South Africa from around the mid to late 2000's in the form of LMS to support blended learning (Walker, 2018). In a country like South Africa with an emerging economy, the advent of e-learning brought about a complete change to educational technology practices, which in turn, brought about new policies, budgets, and a new vocabulary. To take advantage of this, the Department of Education (DOE), South Africa enacted a policy named the White Paper for e-education in 2003 (DOE, 2004). The White Paper focused on the use of ICT to improve the learning experiences and output of students.

The policy was implemented both at basic and tertiary levels in South Africa. E-learning has since initiated creative solutions in the educational technology era which has enabled organisations to enhance educational and training programmes (Esterhuyse & Scholtz, 2015). During this time, the discussion around the "digital divide" emerged, which at that time described the notion that there was a gap between those who had access to information communication technologies at a basic level such as personal computers and those who did not have it. To promote the uptake of e-learning and to minimise the "digital divide", some institutes of higher education in South Africa provided their students with electronic devices such as tablets and laptops (Shambare & Shambare, 2016).

From 2007 to 2010 mobile devices became popular among students in institutions of higher learning and 98 percent of students were found to be owners of mobile phones, although universities had not exploited the opportunity to utilise this trend in the classroom. It was found that 80 percent of students used their phones for study purposes (Czerniewicz & Brown, 2009). Preliminary literature in 2014, showed that the use of ICT in tertiary educationthroughout Southern Africa varied from one institution to the next, although all institutions hadreaped the benefits of e-learning, as outlined in the National Integrated ICT Policy, which wasinitially implemented in university libraries.

This was due to undefined goals given by service and solution providers, as well as misaligned strategies by governing bodies (National Integrated ICT Policy, 2014). With the rapid advancement of technology up to 2016, students in higher education also advanced in their consumption of technology and the scope of employing e-learning for academics grew beyond

the classroom and included social media platforms, video streaming platforms, blogs and podcasts, to enhance teaching and learning (Ng'ambi et al., 2016).

Since then, e-learning has evolved and advanced rapidly and now encompasses tools such as LMS, mobile learning, and social software such as virtual classrooms, podcasts and blogs. Academic undertakings in institutions of higher learning contribute greatly to an informed society through technology and knowledge enhancement; thereby improving the education system of the country. Thus, the South African national plan for Higher Education recognised the need for assimilation of ICT in universities not only to compete on a global stage, but in order to foster innovation, address educational imbalances and create conducive learning environments (Bagarukayo & Kalema, 2015).

Aparci (2015) reckons that notwithstanding the high cost of implementing e-learning, it reduces costs in the long run and encourages more students to register. Bulman and Fairlie (2016) proposed that there is a need to achieve higher educational outcomes, considering the substantial amount of money spent by policymakers, schools and families on technologies that support e-learning.

2.3.2 Structural features of e-learning

The fast-paced development of technology, interactive media, digital technologies, and the internet has significantly increased the provision of e-learning in higher education. This has promoted connections, collaborations and interactions amongst students and instructors and has opened the educational technology market, as well as improving the quality of learning by making facilities and services available (Kenan, 2015).

E-learning is contingent on the use of integrated networks and information and computer technologies through electronic equipment to convey course materials and information among those involved in education. Moreover, it includes features such as student administration, instructor planning, assessments, and evaluations.

E-learning may enhance and complement face-to-face learning and may even be used instead and it is also not dependant on instructor supervision. With various approaches that e-learning offers, teaching and learning may take place synchronously or asynchronously. E-learning also features complete management of lectures and the curriculum with the use of platforms such as LMS which facilitates independent learning and personalization, with a choice to be used within campuses and in any other location (Algahtani, 2011). Furthermore, e-learning technologies include a Virtual Learning Environment (VLE) and offer institutions in academia access to course materials according to their respective courses and subjects. This feature

allows for students with special needs to be able to pursue their studies from anywhere (Bhatia, 2011).

E-learning also uses multimedia that combines different kinds of information to support interaction amongst users and enable students to have complete control of their learning and creates an environment to enhance various technological platforms to support learning (Liaw & Huang, 2011). Babu and Sridevi (2018) contended that e-learning processes are internet-based. This establishes the distribution of learning resources and enables the flow of knowledge by way of online learning and creates not only flexibility for students but also overcomes barriers of distance and time.

E-learning can be categorised into three different pedagogical environments namely distance learning, e-learning and online learning. First, distance learning provides an education that is geographically independent by using information technology and the world wide web as an exchange medium between instructors and students. Although distance education has been used synonymously with e-learning in literature; Sangra et al. (2012) argued that this was not the case since the distance between students and instructors is not an essential feature of e-learning.

Additionally, differences can be found between online and blended learning as online learning is considered part of distance education. Blended learning, on the other hand, is a collaboration of classroom learning and web-based learning. It enhances the educational process as well as improves students' commitment as well as enable an interactive environment.

Types of e-learning and their features depend on how information is converted to content that changes the teaching and learning environment. Tartarashvili (2017) asserted that there are two types of e-learning used to aid and support the teaching and learning process by using electronic resources in the traditional face-to-face model.

Arkoful and Aibadoo (2014) added that this type of adjunct e-learning enables learners to gain social skills and independence. Furthermore, Arkoful and Aibadoo (2014) expressed that the other type of e-learning is pure e-learning, also known as wholly online, which is devoid of instructor and student interaction and feedback is provided via a system.

This form of e-learning comprises individualised and collaborative or interactive learning. Collaborative learning is online learning which includes asynchronous and synchronous (real-time) learning. Asynchronous (flex time) learning enables communication between instructors

and learners using mediums such as discussion forums and emails, notwithstanding time and geographical location.

This form of learning is devoid of instant feedback but is beneficial to the learner, as it allows flexibility. Synchronous learning on the other hand, requires that instructors and learners communicate at the same time, using tools such as chat apps, podcasts and audio broadcasting methods like webcasts, video streaming platforms such as YouTube and Skype, and using tools like Microsoft Office, thus providing instant feedback (Patil, 2014).

This is simplified in Figures 2.1 below as adapted from Algahtani (2011).

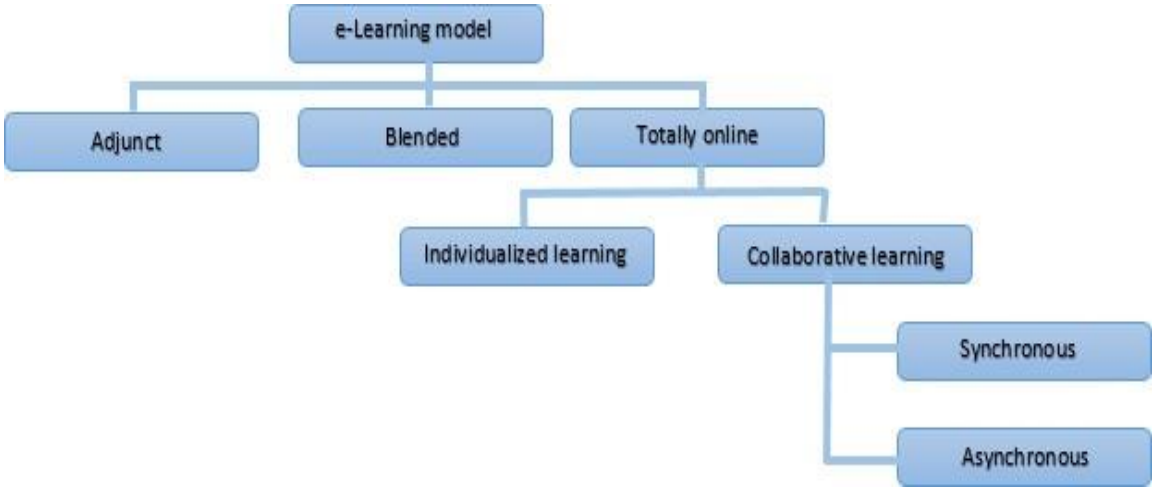

Figure 2.1: A model for e-learning
(Adapted from Algahtani, 2011)

The various terms within the e-learning environment depend on the researcher's specialisation and interest, which then brings the challenge of a widely acceptable definition for e-learning. (Arkorful & Abaidoo, 2015).

Authors have categorised the fundamentals of e-learning in four ways:

1) E-learning has its focus on technology, hence the use of computers, information communication technologies and the internet.
2) E-learning is a distribution-oriented system that has its emphasis on availing resources and not on results.
3) E-learning is a collaborative system that encourages communication and interaction among its users, and
4) E-learning presents an additional teaching and learning paradigm, which further enhances the existing educational standard (Arkorful & Abaidoo, 2015).

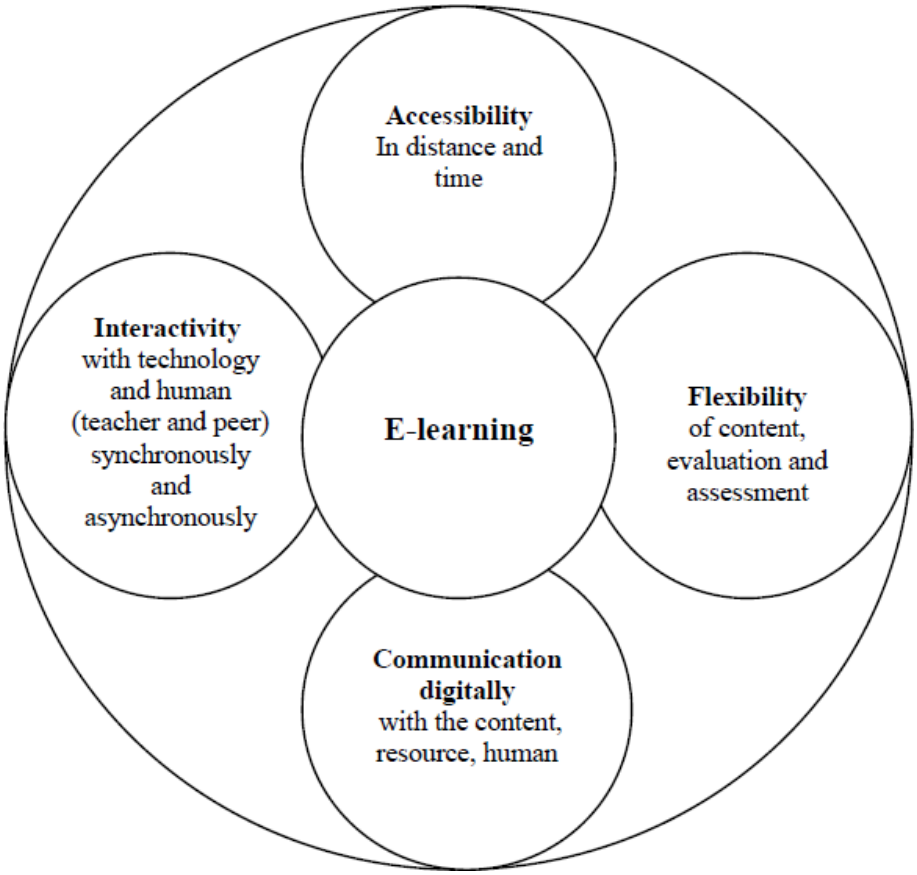

Figure 2.2: Vital characteristics of e-learning
(Adapted from Algahtani, 2011)

The main features of e-learning include a well-structured course design that enables instructors to facilitate curriculum and enhances meaningful learning that encourages a student and instructor collaboration, improved competencies, and information exchange (Chow & Shi, 2014). Another important feature is the technological aspect of e-learning that enables students to learn in various technological environments, where they can practise what they learn. Therefore, instructors are better able to assess teaching and learning through formal assessments, as well as assignments (Persico et al., 2014). This is simplified in Figure 2.2 above of the framework adapted by Algahtani (2011).

2.3.3 Types of e-learning platforms

According to Piotrowski (2010), an e-learning platform can be defined as a VLE which provides six activities including creation, organization, dissemination, communication, collaboration, and evaluations in the teaching and learning environment. It can be described as a fully automatic multi service offering platform, that is used to disseminate and support teaching and learning as it combines collaboration and communication tools, for teachers and learners to design and manage content using information communication technologies.

E-learning platforms now play a significant role in educational delivery systems that bridge

space, time and place issues that are linked to conventional courses offered by universities. As technology advances, the internet has become complementary to the on-the-go lifestyle of the modern student. E-learning platform usage in the classroom promotes the growing number of technology and internet users, thereby making education affordable and accessible and offers better networking capabilities (Ghavifekr & Mahmood, 2015). The sections below describe some of the e-learning platforms used in higher learning.

2.3.3.1 Learner Management Systems (LMS)

A LMS is an application that enables the organisation, documentation, storage, and dissemination of online and e-learning courses. LMS are applications enabled by the internet used by most institutions of higher learning, to distribute educational content, manage teaching and learning, and in some cases provide distance learning (Freire et al., 2012). LMS are now mainly web based as they allow the storage and the dissemination of various learning contents such as, but not restricted to video and audio material, video streaming, chat applications, blogs, assessments and assignments, as well as learning games.

LMS also offers a way for academic staff to share course notes and text electronically and give assessments and assignments to students to enhance teaching and learning. Due to interconnectivity, LMS supports the use of multimedia such as audio and video, which makes the platform interactive and collaborative (Rasheed, 2020). According to Altunoglu (2017), students found that LMS enabled them to partake in the significant role of taking charge of their education by making decisions, directing and contributing to their educational activities via these systems.

There are various LMS that have been developed and adopted in institutions of higher learning these include Moodle, Web CT, Blackboard and LAMS. Ssekakubo et al. (2011) mentioned that LMS had been implemented in institutions of higher learning in Sub-Saharan Africa and were found to be partially failing because of underutilisation; and therefore the perceived benefits could not be realised. Bagarukayo and Kalema (2015) in a study on the evaluation of e-learning usage in South African institutions of higher learning found conflicting levels of usage in terms of LMS.

Although most institutions had indeed implemented them, most were effectively using the platform, some were still at the teething stages whereas others were struggling to obtain a buy-in from various stakeholders. Due to the increase in investments by institutions of higher learning, the effectiveness of LMS must be evaluated to fully exploit their benefits.

2.3.3.2 Web 2.0 technologies

The dawn of the 21st century saw the introduction of what has been called Web 2.0 technologies, these platforms offered greater ability to the end-user enabling communication and control of information (Garrison, 2016). Bingimlas (2017) described Web 2.0 technologies as new forms of internet-based platforms that users utilise to create and share ideas and information. In addition, the platforms also enabled users to collaborate and interact among each other. Karkoulia (2016) mentions that there is an increase Web 2.0 applications, literature proposes that Web 2.0 platforms that are in use in education include Social Network Sites (SNS), video sharing and streaming sites such as YouTube. Social network technology includes web 2.0 technology in the form of forums, chat applications, video and picture sharing, which has become widely used by the youth. Its role in communication makes it veryappealing for the learning environment, especially in the sharing activity feature that capacitates it to be a platform for knowledge exchange and support for distributed learning (Othman et al., 2012).

Web 2.0 platforms have presented academia with many advantages; according to Tyagi (2012) not only do they move users from merely being consumers of content but they also become creators; thus, creating a need for collaborative and reproductive behaviour towards their use. Web 2.0 platforms encourage creative teaching methods and enable users to treat learning as a creative activity, to assist the initiation of personal learning communities, which also supports peer-to-peer learning, as well as informal education. Due to the participative nature of Web 2.0 tools, users can modify and revise content, which consequently gives them access to a wider audience as well as decentralising information and knowledge.

Web 2.0 tools are a powerful resource when included in educational practices that involve and allow creativity, innovation, and the exploration of information construction (Amin et al., 2016). Web 2.0 applications such as e-learning platforms, which have been found useful in tertiary education, with the perspective that students are digital natives and already make use of these platforms in most aspects of their daily life, thus their availability has created students with diverse information expectations about teaching and learning, as well as the creation of knowledge (Loh et al., 2016).

Several issues affect the application of Web 2.0 technologies in post-secondary education. These include first and foremost security and privacy when using social networks for teaching and learning, where institutions need to have stringent privacy policies in place, as well as definite security boundaries for interactions that take place over the internet while maintaining openness, access and sharing. Second technical support and infrastructure, such as lack of

a consistent power supply, lack of internet connectivity and hardware problems pose great constraints. The lack of trained staff and poor policy formulation, and implementation, are also significant issues. Overall Web 2.0 tools and applications have shown great benefits as an e-learning tool in institutions of higher learning and many studies have deemed them effective in their contribution to e-learning (Munguatosha et al., 2011).

2.3.3.3 Mobile learning

Mobile learning (M-learning) has become a significant component in e-learning as it enables students in higher learning to collaborate, innovate and share information, with the help of the internet to further develop technology (Abu-Al-Aish & Love, 2013). Recently, the number of mobile phone owners has increased greatly and the infiltrations of mobile devices internationally and in developing countries such as South Africa which has 91 percent usage of which 51 percent are smartphones, in comparison with the USA at 96 percent of which 77 percent are smartphones (Pew Research Centre, 2018). Similarly, in the less developed countries such as Kenya with mobile ownership of only 80 percent, the numbers are dominated by the youth between the ages of 18 to 29, of whom many are engaged in higher learning. Thus mobile phone technology would be a feasible mode of education in developing countries, as well as internationally.

Mobile technologies have been described as handheld electronic gadgets, which includes a range of devices such as smartphones, tablets, iPods, and portable digital assistants (PDAs). These gadgets have been hailed for their simplicity and the various functions that they offer to their users. The function of mobile devices has been integrated into teaching and learning and therefore enables various pedagogical functions such as the delivery of educational content, assessments, and assignments; as well as the ability to access virtual classrooms and discussion boards (Kalisa & Picard, 2017).

Al-Emran et al. (2016) added that mobile learning assists those in academia with daily academic work effectively and efficiently, as they constantly use small devices such as smartphones or other small technological devices. Students all over the world have mobile gadgets at their disposal, which enables educators to create platforms to offer open educational resources; thus, making education accessible and affordable (Ally & Prieto-Blázquez, 2014).

Some of the benefits of using mobile learning in education have been highlighted in the literature. These include accessibility, since various devices can access the same information at any given time, despite their differences, which makes mobile learning versatile as students

can use the resources anywhere and at any time. Mobile learning also promotes collaboration between students as well as academics, as information is easily shared and exchanged. The use of mobile devices in learning can also contribute to combating the digital divide, as it encourages more people to engage in mobile learning, and also encourages those who might have previously disengaged from education due to the lack of flexibility and simplicity in the traditional classroom (Nassoura, 2012).

2.3.3.4 Emerging trends: Massive Open Online Courses (MOOC's) and Gamification

In a sector with a changing landscape such as higher education, many institutions of higher learning have recognised the need to diversify their offering in terms of courses and this includes e-learning, blended learning and other emerging digital strategies. To remain attractive to potential learners, universities now offer a promise of better curricula and better digital infrastructure and support; that is now required to distribute education in the digital age (Morris, 2014).

MOOCs have been simply described as courses supported over the internet which accommodate a great number of students (Atiaja & Proenza, 2016). These modes of learning have been hailed as going beyond borders, race, class, and gender; thus, challenging the traditional classroom learning in universities.

These online courses are growing rapidly due to their accessibility and affordability. Some have become massive platforms such as Coursera, edX and Udemy to name a few These institutions offer courses that range across a wide range of academic subjects such as statistics, to specialties such as neuroscience and robotics; as well as arts and culture (Nath et al., 2014). The current engagement in MOOC's presents an opportunity to further develop and deliver open access courses and thus learn more about their prospects in online learning in the future and in the higher education sector. Despite their many benefits MOOC's cannot be a replacement for the current system of education because there is still a great need for a balanced education for students (Blackmon, 2016).

Gamification has found its way into higher learning due to the use of technology in the classroom and a move from the traditional lecture room to transforming digital learning environments. These digital environments allow teaching and learning to incorporate gaming elements that have been reported to encourage communication and motivate and promote competition as well as teamwork (Subhash & Cudney, 2018). Although games might not be used directly in education, their elements of game design are used in many contexts such as in higher education. The literature found that students generally had a good attitude towards

gamification in the social gamification context; thus, making it effective in teaching and learning (De-Marcos et al., 2017).

2.4 Measurements for e-learning in Higher Education

Scholars have assessed the effectiveness of e-learning from various perspectives ranging from information systems to pedagogy. Therefore, there has been great progress in the development of models to measure the effectiveness of e-learning systems, and these can be categorized into four common models namely the Technology Acceptance Model (TAM), the DeLone and McLean Information Systems Model (D&M), the user satisfaction models and finally the e-learning quality models (Al-Fraihat et al., 2018).

The TAM, Innovation Diffusion Theory (IDT) and the Unified Theory of Acceptance and use of Technology (UTAT) and the Delone and McLean's models of Technology (UTAUT) and the Delone and McLean's models are some of the information technology theories that have been used to examine the behaviour of users towards e-learning use.

Furthermore, studies have used these models to evaluate e-learning effectiveness (Mohammadi, 2015; Islam, 2014; Šumak et al., 2011). It is crucial to consider that e-learning systems are information systems that incorporate the human factor; namely, the end-users and non-human factors which comprise the various e-learning platforms. Therefore, it is crucial to examine e-learning systems in both perspectives (Al-Fraihat et al., 2019). This study will focus on the two most used models in e-learning effectiveness and common constructs found in the two models, as they relate to e-learning.

2.4.1 The Technology Acceptance Model

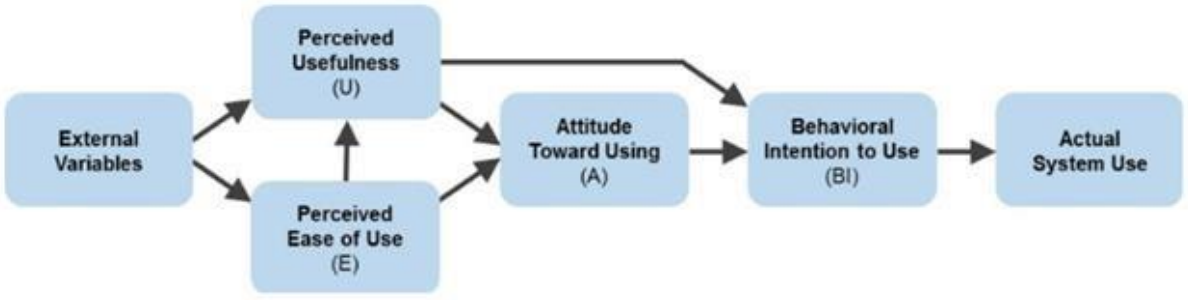

Figure 2.3: Technology Acceptance Model (TAM) (Davis, 1989)

The TAM was first configured by Davis et al. (1989) as a modification of the theory of reasoned action, which was originally developed by Ajzen and Fishbein in 1975 (Lai, 2017). This e-learning model has been utilised to assess many aspects of e-learning in universities and various other sectors. Concerning e-learning effectiveness in higher learning, the TAM has been used in the same way in terms of evaluation as IS system success (Tagoe, 2012;

Fathema et al., 2015). TAM consists of various constructs that are affected by external variables; namely, perceived usefulness (PU), perceived ease of use (PEOU), attitude towards use (A), behavioural intention to use (B) and last actual system use, as shown in Figure 2.3 above.

This model forecasts some constructs that predict user acceptance in various end-user computing technologies based on two factors: namely perceived ease of use and perceived usefulness (Abdullah & Ward, 2016). Some studies have shown that some of the constructs in the model have been found to be more outstanding than others and has indeed influenced the acceptance of e-learning systems.

Davis (1985) found that perceived usefulness (PU) is directly affected by perceived ease of use (PEOU) and in turn they both influence user attitude. The model hypothesizes that if users perceive an information system to be easy to use and is useful they are likely to accept, use and continue to use the system and therefore gain self-efficacy and an overall sense of self-control (Calli et al., 2013).

The model has also been extended in various contexts such as to address constructs in developing countries with different cultures, to assess user acceptance and continued use (Tarhini et al., 2013; Bere & Rambe, 2013). Various researchers have tested the validity of the model by testing the relationships among the constructs, tested in a wide spectrum of ICT application areas (Rahimi et al., 2018).

The model has been extended over time, given the fast-paced evolution of Information technology and the rapid development of various information systems. Those extensions led to the development of Technology Acceptance Model 2 (TAM 2), UTAUT, and Technology Acceptance Model 3 (TAM 3) (Venkatesh & Bala, 2008; Venkatesh & Davis, 2000; Venkatesh et al., 2003).

2.4.2 The Delone and McLean Information System Success Model

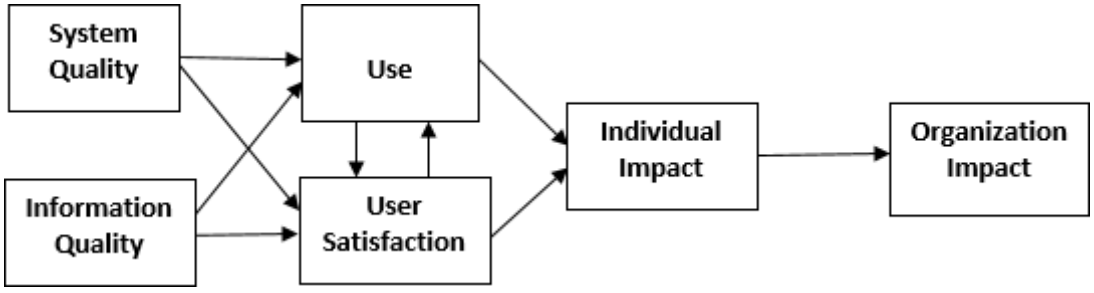

Figure 2.4: The Delone and McLean Information System Success Model (Delone & McLean, 1992)

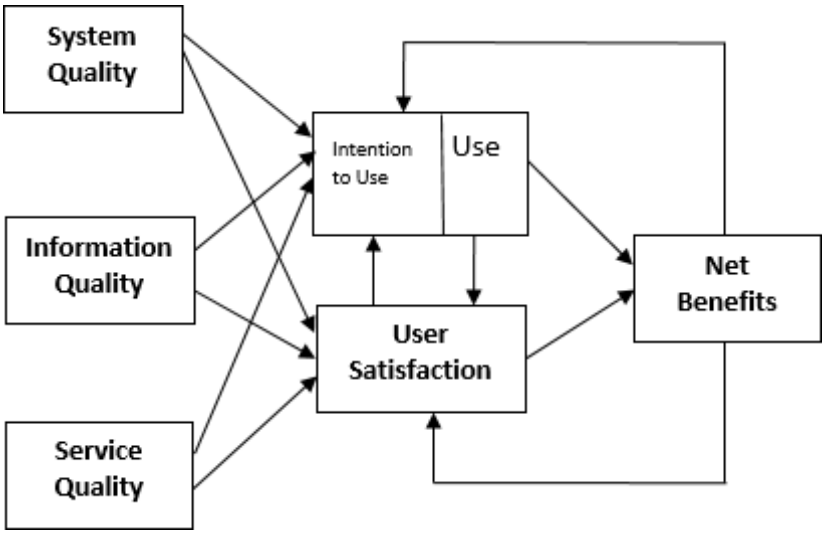

Figure 2.5: The Delone and McLean Extended Information System Success Model (Delone & McLean, 2003)

The Delone and McLean Information System Success Model (D&M) is commonly used in information systems, it was originally configured in 1992 and was later updated in 2003 (Delone & McLean, 1992; Delone & McLean, 2003). It has been widely applied to evaluate many information systems in both first world and developing countries, across various sectors, especially in the education sector (Mtebe & Raisamo, 2014).

The first configuration of the model comprises six factors namely system quality, information quality, use, user satisfaction, individual impact, and organizational impact, as seen in Figure 2.4 above (Delone & McLean, 2003). Later in 2003 the originators of the model updated it and added service quality as one of the main constructs and added the intention to use it as part of the output of all the main constructs (Delone & Mclean, 2003). The changes in the model as seen in Figure 2.5 above includes service quality, to highlight the significance of service. Intention of use was added to measure user attitudes as another way to measure, use and lastly, omit individual and organizational impact, which is replaced by the net benefits factor (Urbach & Müller, 2012).

Delone and Mclean (2003) insisted that it is imperative to view the evolution of e-learning development from an information system standpoint, as both innovations endeavour to meet the needs of end-users; hence the need to constantly extend or adjust the model. Many researchers extended the model to measure various aspects of the success and effectiveness of e-learning systems that were implemented in institutions of higher learning (Hassanzadeh et al., 2012; Mtebe & Raisamo, 2014). The D&M Information System Success Model found common use in successfully measuring e-learning system effectiveness; and many studies have found it to be valid and reliable (Islam, 2014; Al-Fraihat et al., 2018).

2.4.3 Common constructs in e-learning effectiveness evaluation

Perceived Ease of Use can be described as the level to which a user of an information technology system needs little to no effort to complete the tasks at hand (Davis, 1989). Faqih and Jaradat (2015) stated that users are likely to form an impression early-on of how easy it is to use a system, based on factors related to their general beliefs such as experience with using the system, computer anxiety and an enabling environment. Studies also show that the apparent ease of use influences the users' intention to continue to use the e-learning system, in the case of online learning (Ozturk et al., 2016). Furthermore, studies on the effects of perceived usefulness and ease of use on continuance intention concluded that the perceived ease of use positively influences a users' intention to continue to use e-learning (Hamid et al., 2016; Abdullah & Ward, 2016).

2.4.3.1 Perceived usefulness

Many scholars have examined the role that perceived usefulness plays in how e-learning systems are used. It has been cited as the main construct in the TAM and has been used to assess the efficacy and continued use of e-learning systems (Lee et al., 2014). Perceived usefulness has been described as how much a user of a system trusts that the system in use can improve performance. Hence, it measures the validity and dependability of this construct in the use of information systems (Davis, 1989).

Perceive usefulness has been approached in different ways in literature, one way being to measure e-learning success. Scholars have examined the role that perceived usefulness of a concept plays when assessing e-learning systems in studies such as Joo et al., (2011), and Alsabawy et al., (2016). They found that perceived usefulness is an effective construct to measure e-learning success. Another study that inspected the concepts of the information system model in e-learning systems in Sub-Saharan Africa found that perceived usefulness was the main indicator of user satisfaction, which predicts the sustained use of e-learning systems by students. Furthermore, the researcher impressed the importance of success factors in the design, planning, implementation and utilization in higher learning institutions (Lwoga, 2014).

2.4.3.2 System quality

In the information system field, system quality is described as the extent to which a system has unique measurable features such as system reliability, accessibility, flexibility, and usefulness (Eom & Stapleton, 2011). Furthermore, these features are incorporated into systems to improve their performance. According to Delone and McLean (2003) system quality

is an important success indicator in e-learning, as it encourages system use and promotes user satisfaction. It also relates to technological functionality, performance, and usefulness of the system. System quality can be measured using five dimensions, namely: the reliability shown by how well the system performs tasks, and flexibility in the system's response to the ever-changing requirements of the end-user. Integration denotes the ability of a system to accept more information into the system, accessibility in how easily users can input data and extract information from the system, and last, timeliness is how fast the system responds to data requests (Wu & Zhang, 2014).

At the organizational level, system quality is a significant factor in how the organization performs. However, at the end-user level, quality is dependent on the needs and perspectives of how they view the information system (Ali & Younes, 2013). Dreheeb et al. (2016) in a study to evaluate system quality at a university in Malaysia found that system quality factors (usability, reliability and efficiency) affected the overall system quality, in that it had asignificant influence on user satisfaction and on continued use of the system. Cidral et.al. (2018) in their study on the determinants of e-learning success in Brazil found that system quality had a significant influence in terms of statistics, on individual impact, which points to apositive user experience and satisfaction in using e-learning. Although there has been a majorcontribution to the importance of e-learnings success and effectiveness; the evaluation of quality in e-learning is still dependent on the information system sector.

2.4.3.3 Information quality

Information quality describes the level of superiority of the output produced from an information system. It is the extent to which information is adequate for what it is intended to do (Fadahunsi et al., 2019). Although several studies maintained that information quality is a significant indicator in measuring e-learning effectiveness, this can be challenging since information systems are in themselves complicated and multifaceted (Alsbawy et al., 2016). Information quality is measured by four constructs namely: completeness which is the extent to which the system supplies full information, as required by its handler; currency which is the user's view of how up to date the system is; the format is how the system information is displayed from the user's perspective; and last, accuracy which represents how precise system information is, also from the users' perception (DeLone & McLean, 1992).

Wu and Zhang (2014) in their study on users' intentions to continue using e-learning systems, perceived that usefulness and information quality had a significant effect on whether students continued with e-learning use. Information quality plays a vital role in information system usage and the level of satisfaction reported by users. Eom et al. (2012) validated this in their study

on the role of information technology on an e-learning systems success and found that there is a progressive affiliation between information quality and user satisfaction, as well as system use. Al-Fraihat et al. (2020) also found similar results in their study on the evaluation of e-learning success, showing that when all the constructs of information quality are provided to students it contributed to their overall satisfaction with the e-learning system. Overall, the studies reviewed confirmed that information quality is a central construct when evaluating the effectiveness of e-learning systems; not only in higher learning but in all organizations that utilize information systems.

2.4.3.4 User satisfaction and continued usage

User satisfaction can be referred to as the extent to which a user interacts with an information system, the level to which the user perceives that the system meets their needs. When the information system meets the needs of the user, it can be said that the user will be satisfied (Kurt, 2019). Some studies have observed that user satisfaction is closely linked to information systems that are frequently utilized (Freeze et al. 2019).

User satisfaction has become central in the e-learning environment at most institutions of higher learning around the world and it has become an important goal. Satisfaction and continual use have become recognized as features that affect the success and effectiveness of e-learning systems and that the two features are mutually interdependent. User satisfaction has been extensively used to gauge effectiveness in e-learning environments and it is also linked to academic progress (Ali & Younes, 2013). Hassanzadeh et al. (2012) in their study to develop a model to measure e-learning system success, found that satisfaction had a positive effect on usage. Furthermore, they argued that a user who is satisfied with using the system is more likely to be loyal and thus will increase their use of the system and possibly recommend e-learning to others.

Ma and Yuen (2011) asserted that e-learning use by students was not necessarily a motivating factor for use. However, it is important to find out reasons that motivated students towards the adoption and the continued usage of the system. Continued usage of e-learning denotes that there is an intention from the user to utilize the system for a long time, which, in turn will lead to him or her to derive significant benefits from it (Lin & Wang, 2012). However, accordingto Wang and Chiu (2011) assessing the frequency of system usage or lack thereof was not necessarily an indication of its efficiency. Additionally, it could be said that a decrease in use may point to the decline of expected benefits. Lwoga and Komba (2015) in their study of the precursors of continued usage of online learning in Tanzania found that actual use of the system had a strong relationship with intended continued use of e-learning. They also posited

that if the e-learning platform was user friendly and easy to navigate, users were likely to use the application again.

Goh et al. (2017) examined students learning experiences concerning learning outcomes and satisfaction in Malaysia when they were considering curriculum outlines, interaction and collaboration among instructors and fellow students, as factors contributing to academic results. They found that interaction with fellow students on the e-learning system was crucial when forecasting user approval. In a study regarding effectiveness of e-learning, according to students, it was found that the three indicators, system, service, and information quality had a substantial effect on user satisfaction and net benefits. Furthermore, students stated that they found e-learning satisfactory and intended to continue using the system in the future (Chopra et al., 2019).

2.5 Technical Barriers that Affect E-learning in Higher Learning

Some studies have highlighted several challenges facing the e-learning system and its integration within the face-to-face model. For instance, one of the shortcomings mentioned in research is that e-learning is only effective for students with a higher level of academic locus and self-regulatory skills (Deschacht & Goeman, 2015). Therefore, students who lack these skills may be excluded from learning a reasonable percentage of the course content, which had been apportioned to be learned through e-learning platforms. In addition, several authors posited that poor deployment of e-learning in the higher education sector may contend with its ability to impact favourably on students' learning (Awidi & Cooper, 2015). Tarus et al. (2015) mentioned some of the possible challenges that may hinder the deployment of e-learning could be the lack of proper software, hardware and internet access, as well as the lack of a commitment to policy and a lack of technological skills held by teaching staff, among others. Therefore, it is imperative that institutions of higher learning provide the capacity to counter obstacles by providing the appropriate hardware, software, and high bandwidth to benefit effectively from the implemented e-learning infrastructure (Alkharang, 2014).

A lack of technical expertise creates a barrier in the use and efficiency of e-learning. Therefore, it is imperative that policy makers and those who support e-learning prioritize the prevention and reduction of technical challenges. In addition, Mohamed and Peerbhay (2012) found that students experienced certain challenges when it came to LMS that varied from computer shortages, to limited internet access and stressed that if the challenges were not resolved, that this could negatively affect students' engagement with online resources. Technical staff shortages also cause less efficiency in terms of technical support, maintenance of facilities and day to day operations (Ali & Younes, 2013). Technical staff found the lack of training and

support from institutional management inadequate and said that it compromised the quality of services and support that could be offered to students in terms of who used e-learning systems. They also said that, due to the limited support, they were unable to fully maintain the system or provide sufficient support for students (Hadullo, 2018). In another study, the researcher identified insufficient support at the organizational and service provider level, in terms of a lack of customisability and software compatibility. These issues meant that faculties were unable to identify with and customize the system to be adaptable to their technological needs (Marzilli et al., 2014).

Although internet access is readily available in first world countries, developing countries have been found wanting when it comes to the implementation and running of reliable internet infrastructure, due to the economic situation; thus internet access and ICT access remains a hindrance in promoting e-learning use among students (Farid et al., 2015). The lack of access to the internet is often due to affordability, as well as weak internet connections. In their study on the utilization level of e-learning resources, Olaniran et. al. (2017) found that most of the participants (53 percent) recognized access to the internet as being a major constraint to the participants using and gaining from electronic resources related to their coursework. Despite the continued investment towards e-learning by universities, the costs of bandwidth and reliable internet remain high and therefore reduce the usage of e-learning systems by students (Letseka et al., 2018). The web-based nature of e-learning systems means that it contains a lot of visual objects, images and multimedia material, which requires a lot of data to download and upload as required in course participation. Thus, if internet connectivity is limited this will compromise students' interaction with the system, which will demotivate students from fully utilizing the systems (Alariqi et al., 2019).

The lack of computer facilities creates a barrier for those who have no access to the hardware and software required to use e-learning platforms. Computer access is imperative since it enables students to access e-learning systems. This requires equal access to computers on and off-campus; and the lack thereof presents a challenge since students in developing countries do not always own computers and don't necessarily have access to a computer in their home environment. Therefore, students are not likely to be frequent users of computer technology (Aldowah et al., 2015).

Despite the many advantages of using e-learning systems as a technology, there is also some apprehension when it comes to how secure the technologies are. This is due to the system's ability to track students' data, which allows room for information exploitation where the information could be used for purposes other than academics. This possible breach of security and privacy might just deter students from using e-learning systems (Esterhuyse & Scholtz,

2015). Information sharing, association and interoperability is at the centre of e-learning systems. Therefore information utilised on these platforms needs to be protected to maintain integrity, accessibility, and privacy. Data manipulation and falsifying of user verification pose serious security issues for users and designers of the systems as these systems require high levels of accessibility and interconnectivity (Yang et al., 2014). Web-based technologies such as LMS and other applications used in teaching and learning require efficient ways of security when it comes to identifying and accessing management (May et al., 2012). Furthermore, the privacy and safety of information in e-learning platforms may be compromised if significant challenges such as viruses are not tackled efficiently. Therefore, the latest operating systems and software must be put in place to secure the learning environment as well as to reassure end-users (Qureshi et al., 2012).

Although e-learning has yielded many benefits in the past two decades, the literature suggests that there had been some disadvantages brought on by its use and adoption in education. The effectiveness of e-learning depends on good technical infrastructure, competent staff as well as support and sound maintenance. In the case of developing countries this is challenging due to limited budgets in the education sector, the lack of infrastructure and cultural differences (Algahtani, 2011). Despite the affordability that e-learning offers students in the long run, the initial and running costs of implementing and utilising e-learning are very high and require institutions of higher learning to seek further financial injections, donations and often collaboration with the private sector to mitigate the high financial costs (Kisanga & Ireson, 2015).

E-learning minimizes the level of contact between students and instructors, as it limits direct interaction and lacks interpersonal communication. It might also lead to feelings of isolation, a difficult learning curve, system navigation challenges, computer literacy problems and limited time required to give feedback on assignments (Kattoua et al., 2016). Chong et al. (2016) in their study on access, interest, and attitude towards e-learning among nursing students in Malaysia found that the university needed to promote awareness and access to e-learning infrastructure, as well as provide support.

A high level of self-discipline and direction is necessary when engaging in e-learning, thus learners who lack motivation, possess a fear of technology, have bad study habits and may fall behind or fail to cope. Cultural norms and practices where the student body comprises different demographics may influence the acceptance and use of technology, as new technologies always require time and experience, to take full advantage of its capabilities (Gautam & Tiwari, 2016). Another challenge for developing countries is the language barrier as most content on the world wide web is in the English language which presents a constraint

in e-learning platforms usage for users who have English as a second and possibly a third language, this puts the students at something of a disadvantage (Alkharang & Ghinea, 2013).

Another disadvantage of e-learning is that the instructor must put more effort into the class and assessment preparations as well as keep abreast with the rapidly changing e-learning technology. Additionally, the challenge of e-learning requires a lot of time to develop and maintain curriculum content for an e-learning course require time, experience, and funding to take full advantage of these new developments and capabilities.

2.6 Benefits of E-learning in Higher Education

The term technology in e-learning refers to the set of tools, which are used to complement teaching and learning and deliver educational content to students. Technology is at the centre of e-learning; thus it is essential that it support students' prospects. It is imperative for the technology to be reliable as this determines the effectiveness of e-learning, thus creating a positive response to the learning experience (Ghavifekr & Rosdy, 2015). E-learning use in mainstream academics is extensive and has proven to be beneficial to the academic fraternity. E-Learning has its focus on students' and their needs, which is a crucial feature in the facilitation of education (Arkoful & Aibadoo, 2014). The following are the benefits and advantages of e-learning:

E-learning systems by their very nature require proper technical infrastructure for smooth integration and to enable access to e-learning platforms (Tarus et al., 2015). The proper technical infrastructure is important for ongoing access to e-learning systems, as it permits end users to use up to date hardware and software, which facilitates effective teaching and learning (Naveed et al., 2017). IT infrastructure is a key component to the ongoing effectiveness of an information system such as the e-learning system. It can be a barrier or an enabler as it comprises a set of services which e-learning systems applications depend onfor day to day running. It also allows users and providers to receive, to share information and educational material effectively (Alsawaby et al., 2016). Pelet (2013) asserted that a significant outcome of e-learning usage for students is its compatibility and adaptability which gives students the resilience to engage with emerging technologies, thus realising the main objective of e-learning. The rapid development of e-learning enables teaching and learning to become more interactive and still presents a huge potential for growth (Al-Adwan & Smedley, 2012).

E-learning enables students to interact socially, using different e-learning platforms such as discussion forums whereby students can learn from each other and exchange different views. E-learning further improves and makes communication easier between instructors and

students through its ability to enable interactivity during its course delivery. E-learning has also been hailed for its flexibility which allows students the luxury of engaging in their coursework from any place and at any time. This promotes independence and lifelong learning and enhances the quality of qualifications and transfer of large amounts of information and knowledge (Srivastava, 2019).

E-learning requires a certain level of technical information technology competency and helps the learners develop their skills of using the latest technologies and the Internet. Thus, the continuous use of its various components increases computer literacy, which further increases student motivation and satisfaction (Kattoua et al., 2016). E-learning helps mitigate the scarcities of academic staff, as well as facilitators and ICT staff because the e-learning environment shifts the instructor's role away from being the main source of course content and more towards being the coordinator of the students' knowledge. Furthermore, e-learning reduces the cost of education in the sense that it eliminates the cost of physical infrastructure in the form of classrooms and laboratories that require full-time staff, thus more students can access higher education (Chang, 2016).

E-learning presents a different way of teaching course content and provides online resources for students. It includes the use of websites that host digital texts in the form of a typical textbook that academic staff are knowledgeable about. A crucial benefit is that the web supports the delivery and use of multimedia tools and interactive programs and applications, which students who are digital natives can easily identify with. Therefore, in the development of e-learning, the inclusion of online learning has been enhanced to facilitate education in universities using platforms that employ various LMS such as Moodle, Web Course Tools (WebCT), and Blackboard Learning (BBL) (Tarhini et al., 2016).

E-learning enables students to adapt their learning styles to the content they are being trained on and this further enhances scheduling and allows students to self-pace and track their progress. Additionally, instructors can design the course content and make it dynamic and more adaptable to their teaching style, which provides high-quality training for both students and instructors. An important benefit of e-learning is that it provides instructors with an opportunity to upskill themselves in the realm of information and communication technology which then contributes to technical competency and continuing professional development (Chang, 2016). The other aspect of the flexibility of e-learning is the opportunity for students to view and download course content in the form of video and audio repeatedly. Hence, they are better able to retain information which makes the learning process more enjoyable and beneficial (Srivastava, 2019). E-learning provides administrative support such as registration, classroom management, personal data, monitoring and evaluation of assessments, and

therefore it does not need the physical services of admin and technical staff (Rimale et al., 2016).

The advantages of e-learning have been summed up by acknowledging that e-learning can assess and give feedback to students as they learn, which increases motivation and improves their overall educational experience, by way of connectivity and interactivity, which in turn eradicates barriers of cultural diversity and globalisation. E-learning equips students with knowledge and competence which allows them to develop professionally with skills such as planning and organising, self-regulation, time management and problem solving (Mahlangu, 2018).

Due to its being student centred, e-learning allows objectives to be accomplished in the least time and effort; thus, students and instructors can keep up with its rapid development as they obtain technical experience. Algahtani (2011) affirmed that the benefits of e-learning far outweigh those of face-to-face traditional teaching and learning when applied properly. Almarabeh (2014) stated that e-learning had a positive impact on students' perspectives. Tagoe (2012) stressed the importance of skills in information and communication technology as essential for those who utilise and accept advanced technology in education.

2.7 Factors that Affect the use of E-learning in Higher Education

The factors that affect e-learning usage in institutions of higher learning differ significantly due to context, learning environment and organizational issues. In the instance of underdeveloped countries, the challenges include, scarcity technological resources, lack of computer access and general infrastructural issues (Mohammadi, 2015). The lack of infrastructure in underdeveloped countries is still a challenge and threatens the technical ability of students to gain sufficient knowledge like their counterparts in developed countries (Atanda, 2014). Therefore, it is imperative that these issues be examined to address various challenges. These factors are mainly related to individual as well as organisational factors.

2.7.1 Individual factors

E-learning has become increasingly student centred and it aims to empower students to be technologically self-reliant to develop, become self-directed and motivated. The diversity of the student population in South African higher institutions of learning poses a special challenge, due to educational inequality and diverse backgrounds and thus it may have a different outlook on learning at post-secondary institutions (Xu, 2011). The efficacy of competence in e-learning platforms is one of its objectives. Efficiency of the platforms refers to how the system can assist the end user, as each user has different information needs. E-

learning platforms need to be structured so as to meet the technological and information needs of the end user, since the users have varied educational and cultural backgrounds. The calibre of students requires responsive systems with high speeds since most campuses possess the necessary infrastructure. Students' perceptions should be central to the formation and advancement of e-learning courses because such courses will promote their academic performance and future educational prospects (Adzobu, 2014). The generation of students often referred to as millennials are typified by their constant use of Information Communication Technologies since exploiting these various technologies suits their social and educational needs. Furthermore, it fosters their independence by enabling them to form online communities where they share resources, discuss academic issues and support one another (Ventakesh et al., 2016).

Computers are central to the use of e-learning therefore student's effective performance will depend on their confidence in utilizing the tools effectively. Self-efficacy in the use ofcomputers is the ability of individuals to use computers in various situations. Tams et al. (2018)mentioned that computer self-efficacy depends on what the system offers to the user, and theuser is more likely to use the system successfully if the system offers them what they need toperform work. In addition, students with high CSE (Computer Self Efficacy) are more likely tooutperform those who have lower CSE because they do not first have to learn how to use thecomputer. Wani (2013) stated that computer anxiety is a major cause of underutilisation of computers and e-learning platforms in general. Computer anxiety is often associated with adverse perception towards computers which causes technology avoidance.

Some students find the use of technology challenging due to their lack of experience in using computers, the fear that they might damage computer equipment and that they might not be able to match up with technology intellectually (Chuo et al., 2011). Another barrier that institutions of higher learning face is computer literacy among students. According to Buabeng-Andoh (2012), computer proficiency refers to the level of competence in computer applications use to accomplish various tasks. There are many students in South Africa who enter institutions of higher learning without prior exposure to computers and the internet, which brings further challenges to teaching and learning (Naidoo & Raju, 2012).

Academic ability has been described in the literature as including factors such as the level of intellect, skills, personality, self-efficacy, motivation and the student-teacher relationship among others. Furthermore, as it is a multidimensional variable it could be affected by different learning styles both internal and external to the learning environment, as it relates to different students engaged in academia (Shahabadi & Uplane, 2015). Some studies have found that e-learning encouraged improved academic performance, as well as the learning experience

and self-development of students. These studies also found that students who mostly exploited e-learning for their studies benefited greatly and were able to further develop their technical and innovations skills for their studies as well as for research (Fayomi et al., 2015; Suresh et al., 2018). Higher education curricula now include web-based learning. Therefore, it is essential that these technologies.

2.7.2 Student perceptions

The Cambridge dictionary defines perception as one's interpretation of what they see and hear, based on how things seem. Therefore, students' perception towards e-learning is likely to mirror their opinion, viewpoint, and thinking towards e-learning, which will ultimately affect the adoption, use and continued use of the system (Tamta & Ansari, 2017).

Students' perceptions and attitudes must be considered because students' proficiency in e-learning technologies use contributes to the success and development of academic curricula (Popovici & Minorov, 2015). Furthermore, Popovici and Minorov, (2015) in their study on students' perception of using e-learning technologies found that students' perceptions towards e-learning technologies are likely to improve once they experience various learning advantages. Therefore, it is likely that students will use and engage in e-learning. Students' perceptions concerning e-learning use in higher education is affected by several reasons that are specific to the individual student. These reasons can range from gender, age, background, and levels of computer literacy to attitude towards technology, as well as how some students generally learn.

Tagoe (2012) in a study to assess undergraduate students' perceptions towards integrating e-learning into teaching and learning, founded on the TAM at the University of Ghana, found a correlation with time spent using the internet and with how often they used the internet. Furthermore, the study found that students favoured blended learning and courses enhanced by the internet rather than courses that were purely based online. In another study, to assess students' perceptions towards the use of e-learning based on the TAM at the University of Jordan, students found that the perceived usefulness of the e-learning system was most important in their use of the system (Almarabeh, 2014).

Rhema and Miliszewska (2014) conducted a study in two Libyan universities discussing the perceptions of students towards the use of e-learning by assessing various factors that impact these perceptions. They found that access to technology as well as their competence in different information communication technologies were significant factors for students. Moreover, Ramoroka and Tsheola, (2018) argued that the impact of the widespread

implementation of e-learning in South Africa may become compromised if stakeholders

underestimate the complexities associated with its pedagogy. The pedagogy is related to educators' skill, competence, and confidence in handling e-learning technological devices. Some studies reflected an overall positive perception towards e-learning use in universities in both first and third world countries, which are however, influenced by a range of factors due to different contexts, subjects, socio-economic and social factors (Gasaymeh et al., 2017).

2.7.3 Organisational factors

Meier (2007) stated that culture is an agreed set of values, attitudes, and a way of doing things within a company or institution. Baptista and Oliveira (2015) asserted that culture had a crucial role in the context of e-learning, as it influenced e-learning effectiveness. The key component in technology-based education was students' acceptance of the system that was in place and that this element greatly depends on culture. Therefore, designing and developing e-learning systems may prove complicated as culture varies from one geographical area to another. These cultural differences are further complicated by language differences, as well as access to various technologies. Learning in the e-learning environment presents a new way with new rules and values to adjust to. Although the cultural change may be viewed as an obstacle, it can also be an opportunity for students to improve themselves analytically and to harness innovation (Eiffel Corp, 2018). Ethical as well as cultural communication presents socio-cultural factors that pose a challenge to the implantation of e-learning in tertiary learning as they determine the acceptance or rejection by users of e-learning. Therefore, it is crucial that institutions take these factors into consideration (Al-Adwan & Smedley, 2012).

Hošková-Mayerová and Rosická (2015) averred that an active learning culture motivates students and provides a way for students who are engaged with e-learning platforms with information and skills that make sense to them. Students have several options in order to improve and retain knowledge as well as to develop their skills through tertiary education. The options relate to their learning styles which significantly determines how they acquire and reinforce knowledge, performance and standards (Huda et al., 2019). In addition, it isimportant that in trying to strengthen academic activities that institutions of higher learning payclose attention to the learning culture of students, which is reflective of the knowledge that they acquire through their studies, to take advantage of their learning development (Lairio et al., 2013).

Universities in countries with developing economies also face financial challenges of allotting budgets for e-learning; to adequately provide technical resources such as the software and hardware that is required to run e-learning systems effectively. Furthermore, providing skilled

personnel or at least for the upskilling of existing personnel who can provide training and support for academics, as well as for students is needed or else e-learning will not be financially beneficial (Kasse & Balunywa, 2013). Other organisational challenges to the success of e-learning use are the lack of awareness among its stakeholders, which may limit its value if the systems are not widely communicated and promoted within the organisation. This may be due to a lack of support and commitment from policy makers and from the leadership of organisations (Stoffregen et al., 2015).

A lack of strategic planning and leadership directive is a barrier to the advancement of e-learning because e-learning policy formation will then not be in alignment with the objectives of the organisation; thus, contributing to a powerful organisational barrier arising from cultural problems. It is therefore the responsibility of the university to apply continuous evaluation and improvement of implementation of e-learning systems to fully benefit from e-learning technologies.

2.8 E-learning improvements in universities

The e-learning technology sector is a fast-growing market with great possibilities for universities; and the students who use it are found to have better academic outcomes. To exploit e-learning technologies potential, its deployment should be satisfactory to the needs and concerns of all involved (Wani, 2013). Better access to computers and all the hardware required to enable e-learning activities will be beneficial in improving e-learning usage. Some studies have found that, despite the widespread use of the internet and various mobile technology, access to computers and computer ownership was still found to be wanting and therefore requires improvements, especially in institutions of higher learning (Tagoe, 2012; Atanda, 2014). Despite the provision of proper ICT infrastructure, some e-learning platforms are found wanting by academics as they do not accommodate some multimedia such as videos and some software that is required for teaching and learning (Coleman & Mtshazi, 2017).

The university has made great strides in providing access to computers for students, by providing computer laboratories in each department and in main centres where students can access computers for extended hours. Faster internet connectivity and networking, and improved bandwidth always requires improving as technology is changing fast. Studies have found that e-learning platforms play a positive role in enabling students to gather more information by staying active online, whether it be for doing research, utilising e-learning resources or browsing (Du Toit, 2020; Bagarukayo & Kalema, 2015).

The implementation and the upgrading of various software that can facilitate e-learning systems in faculties that require customisation and compatibility, according to their needs; will further improve e-learning engagement and usage. Digitization of course content in different faculties will go a long way in the customisation of content by students and lecturers. Furthermore, it will give the designers and administrators of e-learning platforms the ability to further make the system more compatible with departmental software and in some cases machinery. It will also be beneficial to involve academics in the initial stages of the design of e-learning platforms, as they primarily dispense and set up the courses and better understand what students need to benefit from them (Louw & Michau, 2018).

Organisational policies that favour e-learning can bring great improvement in the integration of an e-learning culture within a university and is crucial to future educational technology developments. Universities need to align their e-learning activities with organisational finances, resources, and strategic direction (Misut & Pribilova, 2015). They need to raise awareness of the value of e-learning by encouraging usage of e-learning by all stakeholders. Provision of enhanced training for academics, support staff and students in e-learning use is required, to best harness the maximum benefits of e-learning. In addition, this will improve attitudes, increase motivation, and address the resistance to change and fear of technology that is often associated with new e-learning systems. Awareness can include ICT skills development programmes in the short and the long term. This will address the poor perception of e-learning by academics and students (Kisanga & Ireson, 2015).

2.9 Lessons Learnt

E-learning when used effectively, allows students to learn independently, which motivates them to make use of and interact with all available e-learning platforms; thus encouraging them to focus and succeed in their courses. E-learning like any other form of educational technology has its advantages and disadvantages, for students, staff and organisations at large. It is therefore important for universities to constantly engage all stakeholders in order to reach a balance and improve on existing systems.

Computer skills training programmes tailored for each faculty could go a long way towards entrenching and creating awareness of e-learning within academic activities. Both staff and students can benefit from ongoing training programmes, in alignment with each software upgrade or introduction of new e-learning technologies. It is important that universities keep abreast with changing technology (hardware and software). This can be done by initiating and maintaining relationships with the private sector, to harness knowledge from specialists on how to improve e-learning strategic plans and take full advantage of e-learning features.

Cultural differences and different styles of learning have an effect on the use and the effectiveness of e-learning. These are areas that need to be researched to better mitigate the negative effect they might have on e-learning within universities.

2.10 Conclusion

This chapter sought to provide a review of the available literature, in alignment with the research objectives in the study; to address students' perceptions towards the use of e-learning platforms. First, the overview of e-learning, its structural features and different types of e-learning were discussed. Second, the effectiveness and measurements for e-learning were discussed, along with the TAM, the DeLone and McLean Information Systems Model, in order to reflect on how e-learning effectiveness can be evaluated, as well as to find common constructs in these models and discover what studies have found when using different models to evaluate e-learning effectiveness. Third, the technical barriers and benefits of e-learning in higher education were discussed, to highlight how these affect e-learning in higher education institutions. Fourth, the factors that affect e-learning use in relation to individual, student and organisational perspectives were discussed. The chapter concluded with e-learning improvements and lessons learnt.

CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

Chapter 2 outlined the appropriate and associated literature on the use of e-learning in tertiary education generally. It also gave insight into the various developments in e-learning use in teaching and learning; its advantages, challenges as well as common measurements showing the efficacy of e-learning and finally scholars' perceptions towards the use of e-learning. This chapter summarises the research procedures used in the study. It includes the research methodology and design, the population studied in the research, data collection techniques, data analysis and ethical considerations. In addition, the chapter also discusses the limitations of the research.

3.2 Research Approach

Qualitative research has its focus on occurrences in their natural surroundings. It is said to be described using words instead of numbers and the method of data collection often used in qualitative research is by means of observing phenomena (Ormrod & Leedy, 2001). Qualitative research often monitors a flexible and unregulated way of asking questions. Its objective is to discover differences instead of quantifying. It describes experiences and perceptions without measuring, analysing, or generalising (Kumar, 2014). Furthermore, qualitative researchers are interested in explaining the 'why' and the 'how' of the way a process works in a particular environment. This type of research can be conducted using interviews with open-ended questions, journals and physical observations; to obtain data andthe analysis of this data is usually done visually with the use of material results and narrated history (Mohajan, 2018).

A quantitative research approach was used for the study and was defined as a methodical process that is formally undertaken to describe and examine relationships as well as causal relationships among variables, using statistical techniques (Austin & Sutton, 2014). The quantitative research approach uses statistics by using numbers to describe occurrences, and aids in defining relationships among two or more variables (Stockemer, 2018). Quantitative research may be done via the use of emails or third party dissemination of data, using collection instruments. Quantitative research is often deployed in social studies research to study various phenomena, such as attitudes and beliefs. These can be assessed using data collection instruments such as Likert scale questionnaires. Using quantitative methods to measure ensures standardised measurement of data, because participants are all asked the same questions, which makes data representative or comparable throughout the sample (Roni et al, 2020). Quantitative analysis of data depends on the numerical calculation of means,

frequencies, and variance analysis (Mertens, 2009). Eyisi (2016) affirmed that the value of the quantitative approach is in its simplicity. Its outcomes are statistically sound, and the level of bias is lower because the researcher has no interaction with the participants. However, this method is usually applied to a subject that is known; thus, the sample must be large to be representative, to ensure that the results can be generalized. However, the quantitative approach does not always provide comprehensive data on a subject; and therefore might not yield solutions for multifaceted problems (Cohen et al., 2011).

3.3 Research Design

The research design summarises the procedures of how the research activities will be executed, as well as the strategy of how and from whom data will be collected and analysed, to address the research problem (Punch, 2014). Mouton (2001) advised that the research design of a study should be selected based on what would yield the best responses to the research questions, which determines the choice of the research methods. Kumar (2014) added that the execution of the research plan must be done in such a way that the research problem will be addressed in a valid, objective, precise and economic manner. Leedy and Ormrod (2015) also asserted that during the research plan, the procedures of data collection must lead the researcher in the collection, examination, and interpretation of the empirical data. Greener and Martelli (2018) posited that the research process might not always follow the processes as they were planned, but it can still yield the expected results. Figure 3.1 below depicts the research process and its different stages, as adapted in the study.

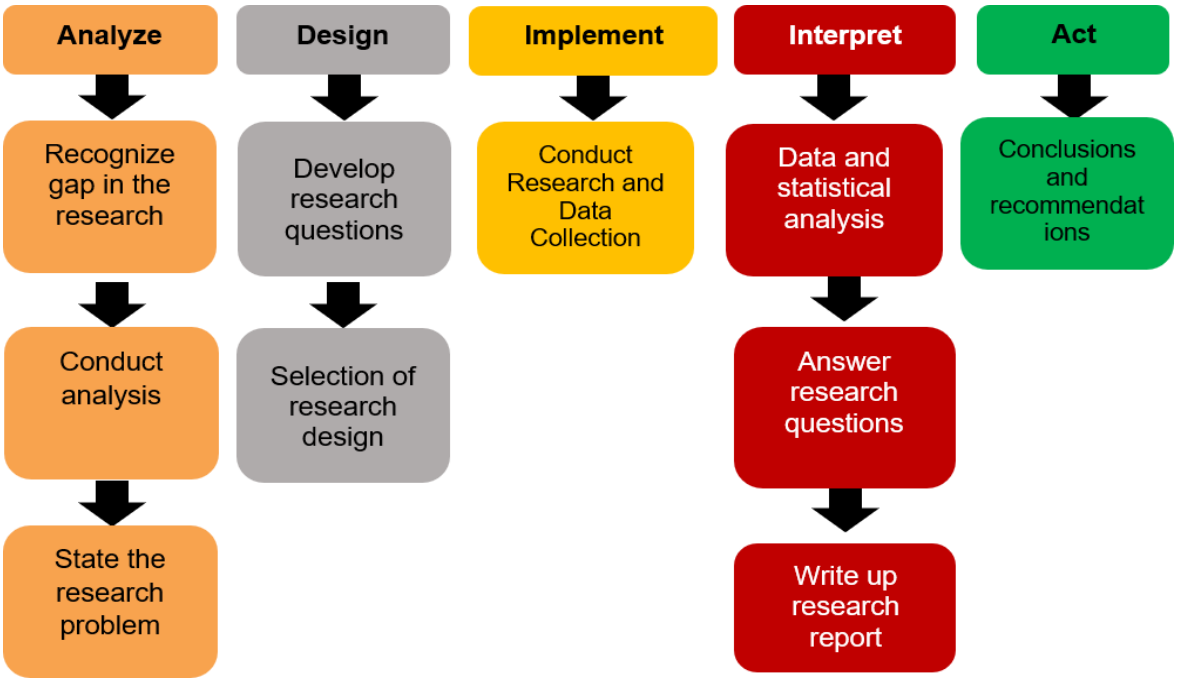

Figure 3.1. The research processes
(Adapted from Greener and Martelli, 2018)

In the social sciences, positivism is described as a prearranged method that combines empirical logic with accurate observations of a person's behaviour, in order to prove the probability of causes that can be used as a predictor of general acquired human behaviour (Neuman, 2003). Positivist researchers prefer quantitative research methods that make use of questionnaires and statistics as they possess consistency and representativeness. In positivist research, researchers are mostly inclined to look for correlations between variables. This is known as the comparative method. This type of sociology is focused on themes and trends rather than on individuals (Yee & Khin, 2010). The positivism paradigm allows the researcher to collect data and analyse it in an objective manner, because in these types of studies the research findings are normally quantifiable; thus, they can lead to statistical analysis. Furthermore, a paradigm requires researchers to employ scientific techniques to generate accurate data quantitatively, by describing factors and how they relate to each other (Henning et al., 2004). The procedure used by the researcher to produce knowledge in positivism is with the use of tools such as validity and reliability (Winter, 2000).

A survey research is described as a procedure of undertaking an investigation with the use of questionnaires that are distributed to the respondents. Data is then collected and analysed with the use of statistics to draw meaningful research deductions (De Vaus, 2016). Surveys are used for a variety of purposes but mainly to collect data for a research study. This study made use of the survey research, using an online questionnaire. Surveys are used to gather information from a portion of the total population that the researcher has identified. This is termed a sample. Sample sizes depends on the purpose of the study and the data that is collected from the sample as this represents the core of interest of the study (Stoop & Harrison, 2012). There are several types of survey design methods such as face-to-face, or telephonic interviews, and questionnaires. Interviews conducted for survey research often comprise standard questions which constitutes a structured interview. Should the researcher include questions that might require more clarity, this is termed as semi-structured interviews. Telephone interviews, on the other hand, are economical and take less time, which is an advantage for the researcher, but does not afford the researcher the same affinity as a face-to-face interviews (Leedy & Ormrod, 2015).

Furthermore, based on how much time is taken, survey research can be categorised in two ways; namely longitudinal cross-sectional survey research and longitudinal survey research. Survey research is undertaken during a varied range of time, and the data collected could be qualitative or quantitative. This method is mostly used in cases where the investigator wants to learn about say; studying the behaviour of school going children in a certain grade. In that case, data will be collected over a period to ensure the reliability of the data. On the other

hand, cross-sectional survey research collects the perceptions of a selected population at a specific interval. This type of survey is usually used in different sectors of society such as education, welfare, and retail; as it can be done quickly, and enables researchers to collect data timeously. Cross-sectional survey research can also be referred to as methodical; thus researchers rely on this method wherever a descriptive analysis of a respondent is needed (Payne & Payne, 2004). Research practice is referred to as the discipline of how research is done with an emphasis on the various activities involved in research design. Once the formulation of research questions, population and sample selection, data collection instruments, data collection and its analysis and reporting are done, the methodology focuses on identifying the study, the research procedures and their design (Kothari, 2004). Mouton (2001) adds that methodology speaks of the tools and processes that are utilized in the processes, which will determine the research approach.

3.4 Sampling

The study population is generally described as a group of people with similar characteristics such as students, workmates, or a particular community (Given, 2008). A sample on the other hand, is a portion of the population of interest that has similar characteristics to be used in a research study, as being representative of the whole population, which is used because it would not be economical to include all the members of the population as participants (Adams et al., 2007). There are two main sampling methods in the social sciences, namely probability and purposive sampling. Probability sampling is generally applied in quantitative research and includes three categories namely, random, cluster, and stratified sampling. This study employed random sampling as it entails randomly choosing a large sample of participants from a population or its subgroups, where the chances of a particular participant in the population being chosen are equal (Teddlie & Yu, 2007). The main objective of random sampling is to ultimately accomplish representativeness which is the extent to which the chosen sample specifically represents the whole population. The target population arestudents from the first year of study up to the BTech level of study within a Department in theFaculty of Engineering and Built Environment from a selected institution. The students selected for the study included all levels of age groups, various races, and genders. The onlinesurvey was electronically mailed to 200 of these students.

3.5 Data Collection

There are different ways of conducting data collection; namely, focus groups, interviews, questionnaires, and observation. This study utilised online questionnaires. The link to the survey was electronically mailed to the respondents. The use of online questionnaires has

become widespread due to recent technological advancements. Online questionnaires are usually conducted using e-mail, websites, and cell phones (Kumar, 2014). In the case of this study Google Forms software was used to design a questionnaire and thereafter a link was generated, which was then sent to the study participants via email. Survey research has several advantages, especially in cases where the study population number is not too great, as this leads to reduced costs. This type of study also has shorter data collection times which reduces the time the researcher needs to revisit the study participants. Although online surveys and questionnaires in general are a relatively easy way to collect data, they have been known to have a low response rate as respondents often leave some questionsunanswered. Due to their inflexible nature, no probing questions or follow up questions can be sought from the participants for clarity; thus, the researcher can't follow up (Rice et al., 2017). Another shortcoming of online questionnaires is that persons who might have been selected to participate might not open the email or click on the questionnaire link, or they mightsimply delete the email, or even submit incomplete questionnaires. The data collection tool utilised for the study was an online questionnaire. The survey included 3 sections, Section A to C.

Section A (multiple choice and rating question). The first section includes a description of the study and information about the participants, such as student demographics, among other things data and characteristics of the participants like their age, gender, study level and computer literacy level. These were mostly multiple-choice questions. The last question in this section included a rating question for participants to choose the platform that they used the most and the least. Due to the nature of the online software, an open-ended question followed where participants could name one more e-learning platform, which might not have been included in the list given.

Section B (multiple choice). The second section included data concerning access as well as the use of e-learning platforms.

Section C (Likert scale). With a rating of 1 to 5 (1 = Strongly Agree, 2 = Agree, 3 = Neutral, 4 = Disagree, 5 = Strongly Disagree), as shown in Table 3.1 below (Sullivan & Artino, 2013). This section included subsections such as usability, reliability, and students' attitude toward e-learning, students' outlook towards e-learning, the benefits of e-learning, challenges in usinge-learning. Table 3.2 below shows the questions that were coded for processing using the SPSS software.

Table 3.1: Coding used for the Likert Scale (Source: Sullivan & Artino, 2013)

Decision Making	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Disagree**
Code	SD	D	N	A	SA

The questionnaire duration was 15 to 20 minutes, and it was designed as far as possible to be clear and unequivocal, to ensure reliable analysis. The responses were recorded by the online system and the data was then collected in electronic format for data analysis.

Table 3.2: Section C questions with codes (Adapted from: Liaw & Huang 2011)

No.	Statements	Code
1	The user interface of e-learning system is well organized and easy to navigate	Us1
2	The instructional interface of the e-learning system functions correctly	Us2
3	The e-learning system makes it easy for me to access course content	Us3
4	The e-learning system allows me to complete and upload assignments efficiently	Us4
5	The e-learning system gives me the opportunity to enhance my technical skills	Us5
6	The layout and user interface design of e-learning platforms is friendly.	R1
7	The overall e-learning system is stable	R2
8	The e-learning system provides the service I need	R3
9	The e-learning platforms available provide complete information	R4
10	The functions and services provided by e-learning are satisfactory	R5
11	I would like to communicate with all subject lecturers via the internet	Sa1
12	E-learning incorporates well with classroom learning	Sa2
13	I benefit from communicating with my lecturer online	Sa3
14	I receive adequate technical support from e-learning	Sa4
15	E-learning is useful for my day-to-day learning programme	Sa5
16	The use of e-learning has improved my academic performance	Sp1
17	I feel confident when using the e-learning system on my own	Sp2
18	Using e-learning fits well with the way I learn	Sp3
19	I enjoy using e-learning platforms as learning tools	Sp4
20	The use of e-learning can simplify the learning process	Sp5
21	I am satisfied with e-learning content	Sp6
22	I enjoy multimedia instructions	Sp7
23	The use of e-learning increases my productivity	Sp8
24	The use of e-learning has improved the quality of my work	Sp9
25	I believe that e-learning enhances my learning experience	Sp10
26	I intend to continue using an e-learning system to assist my learning	Sp11
27	I would like more time to be dedicated to e-learning in my courses	Sp12
28	My interaction with the e-learning system has improved	Sp13
29	I can access it any place at time when it suits me	B1
30	I can access and share educational resources with ease	B2
31	All types of learning styles are accommodated through e-learning	B3
32	I get quick feedback from e-learning	B4
33	I get access to wide and diverse interactions via e-learning.	B5
34	The e-learning platform makes collaboration and interaction easier	B6
35	Learning material e-learning is up to date	B7
36	Lecturers and students communicate better via the e-learning platform	B8
37	There is inadequate training for e-learning in my department	C1
38	I struggle to get technical support when I use e-learning	C2
39	The instructions provided on e-learning are difficult to follow	C3
40	I find it difficult to upload documents on an e-learning platform	C4
41	I find slow internet connectivity in using e-learning	C5
42	I find it difficult to connect to e-learning on my personal device	C6

3.6 Data Analysis

Data collection was concluded, and the data obtained was then deciphered and edited and errors and omissions were identified. The results sheet was downloaded from Google docs, and the questions were then coded on a Microsoft Excel worksheet. The data was then prepared and analysed with SPSS statistical software.

3.7 Trustworthiness and Reliability

According to Wainer and Braun (2013) validity refers to the level at which measures used by the researcher are received and is mostly derived from questionnaires to evaluate the theory or hypothesis they are measuring, which data is collected and how it is collected. They also proposed that the researcher influences the interaction between the construct and the data in the process of authenticating their research; thus, in a way their involvement might diminish the validity of the evaluation. The measure of consistency during research reflects whether a respondent would respond to a question in the same way when asked several times. In the case of survey studies, the likelihood of administering a survey to the same sample more than once is unlikely, for various reasons such as budgets, time and the number of responses obtained.

Cronbach alpha is a measure of internal reliability; it measures how much a collection of elements are related in a survey or how the constructs can belong to a type of scale. This measure is mostly used when a survey contains Likert scale questions, and the researcher needs to establish if the scale is reliable (Trobia, 2011).

The quality of a data collection instrument is usually measured in terms of validity and reliability. Data validity and trustworthiness talks about the level in which the chosen research design is scientifically thorough or suitably carried out (Struwig & Stead, 2007). The precision of the data collection instrument speaks to the level at which it can consistently yield the identical outcomes, when repeated under similar conditions. Furthermore, the instrument should measure all the required constructs with precision and as related to other instruments that measure similar variables (Heale & Twycross, 2015). The data collection instrument even when carefully designed, could possibly contain mistakes. Therefore, it is important to run a pilot test by sending the questionnaire to a small group of people who possess similar traits to those in the main sample. This is to verify whether the instrument might need further revision and if the questions asked were understood (Ormrod & Leedy, 2001). For this purpose, the researcher deployed the survey to several students in the selected department and found that

the questionnaire was usable and asked relevant questions. Furthermore, it enabled the researcher to edit some of the options given in a few multiple-choice questions.

Data validity and reliability for the study followed by ensuring that the questionnaire design enabled the participants to respond to the questions asked without compromising the reliability of the data set. The study was transparent and clear, the questions were unambiguous and avoided confusion with the aid of short simple questions. Heale and Twycross (2015) asserted that matters concerning validity and reliability of a study must be thoroughly addressed as they form an important component analysis of the findings and the decision to implement them. Furthermore, the validity and trustworthiness of the data collected must be verified as to whether it measures the required or proposed constructs.

3.8. Ethical Considerations

The study followed the values of ethical practice to protect the interests of the research participants and the stakeholders. There was minimal risk during the completion of the survey. The confidentiality of data collected in the study was always maintained. The results of the study were stored in a secured location on a password protected computer. Participants were informed that the study was voluntary, and that they could choose to retract their consent at any point, for any reason and therefore their decision would not affect any relationship with the selected university nor the researcher.

Below are the contents of the email sent with the link to the questionnaire.

Please note the following:

- The participation in this study is on a voluntary basis, should you choose not to take part, this will in no way harm your relationship with the selected university.
- All data will be treated with full confidentiality with no identifiable markers. The IP Address and the email addresses will not be revealed.
- You have the option to omit any question you do not want to answer.
- You may discontinue the questionnaire at any point.
- The survey should take about 15 to 20 minutes to complete.

Clicking on the link, means you voluntarily agree to participate in the survey and have noted the abovementioned ethical considerations. The abovementioned principles were observed throughout the data collection process, and all the participants were informed of their rights. As assured to the participants, no information, IP addresses or personal markers were shared or published to any authority, and strict confidentiality was observed.

3.9 Delimitation and Limitations of the Research

Delimitation of Study has been defined as the margins set out by the researcher regarding variables in the study such as the target population, the nature of participants or a setting in which the study is undertaken (Theofanidis & Fountouki, 2018) . The researcher might also choose certain research methodologies for data collection and not others, these delimitations could be imposed for real world reasons such as financial constraints and lack of other resources to undertake a more in-depth study (Leedy & Ormrod, 2016). In the case of the current study research was undertaken within the Mechanical Engineering Department, in the Faculty of Engineering at a selected university in Cape Town. This study is intended to recognize the challenges and prospects of e-learning from engineering students' perspective. The location for the study has been selected due to the abundance of information needed for the study as well as possessing a good number of academic staff and students currently registered for engineering studies who are the target of this study. The main target of the study is the students in engineering disciplines who have utilized e-learning in their studies from their first year of study.

The research has as much as possible remained objective and the researcher took great care in all the research activities. Due to the research process, the study had its limitations. Some of the limitations included:

- The selected population of students from the selected sample were students in the department of Mechanical Engineering and at the time when data collection commenced, students were still engaged in online learning. This meant that there was less access in terms of lecturers reminding them to participate in the survey, should they wish to do so.
- There was a lot of time taken to firstly obtain permission to distribute the questionnaires to students and second to obtain the email addresses of the students from the faculty, due to the need to separate students, according to their years of study.
- Students might not have taken the study seriously as they were inundated with emails with a lot of information regarding their studies in the critical time of assessment.
- The questionnaire's language medium of English might have presented certain misinterpretations since most participants reported English as being their second or possibly third language.

Despite the various challenges and limits, the study was carried out objectively and all research processes were followed as well as possible, and it was expected that the results would be objective.

3.10 Conclusion

This chapter focused on the research approach, design, and the methodology. The following aspects were considered in the study: the background literature was reviewed, and the research gap was identified. The researcher addressed the problem statement, the objectives and research questions, the identification and selection of the target population, the adaptation and testing of the questionnaire, the data collection methods, data analysis, ethical considerations, and the possible limitations of the study. The following chapter will present and discuss the results.

CHAPTER 4: RESEARCH RESULTS AND DISCUSSION

4.1 Introduction

The previous chapter discussed the research procedures used in this study and this chapter presents the results of the study on students' perceptions towards the use of e-learning platforms. The findings are based on the data collected using questionnaires. The quantitative data collected was presented in the form of percentages, graphs, and tables, while qualitative data was in the form of discussions referring to the findings in the literature. The findings are presented according to the following study objectives:

- The impact of e-learning on students' academic performance.
- Exploring the common measurements for e-learning in a higher learning environment.
- Identifying technical barriers that impact e-learning effectiveness among engineering students.
- Assessing the factors that impact the use of e-learning in the university.

The data collection instrument used for the study was a questionnaire which consisted of three sections. The first section comprised questions related to participants' characteristics, their level of computer literacy, prior experience of e-learning as well as identifying which e-learning platforms they used the least and the most; with a ranking from 1 to 7 (1 for the most used and 7 for the least used). The second section consisted of questions associated to the participant's view of the level of access in terms of the devices used to access e-learning platforms and the location and usage of e-learning platforms. This section also included the students' perception of the level of technical support received and access to the e-learning platforms as well as their frequency of e-learning platforms used, the internet and the use of e-learning platforms for study purposes. The third section of the questionnaire consisted of atotal of 42 questions relating to the usability and reliability, students' attitudes towards e- learning as well as challenges and benefits encountered when using e-learning platforms, in this section a Likert scale was employed, and the rankings were coded from 1 to 5 (1 = Disagree Strongly and 5 = Strongly Agree).

4.2 Internal Consistency

The reliability test was carried out on the questionnaire statements using the Cronbach's Alpha Coefficient test (Table 4.1). According to Nunnally & Bernstein (1994). the Cronbach's alpha coefficients that are generally considered are between 0.7 and 0.95. They assert that this is generally acceptable in social science when using a Likert scale. The results of the Cronbach's coefficient alpha for the questionnaire were shown in Table 4.1 below which is within the suggested limits and therefore the reliability of the data set is consistent.

Table 4.1: Reliability Statistics (Source: own source)

Cronbach's Alpha	Based on Standardized Items	No. of Items
.823	.824	5
.868	.868	5
.837	.838	5
.950	.951	13
.879	.884	8
.725	.730	6

4.3 Biographical Information of the Student Respondents

This section provided a biographical presentation of the students. The descriptive statistical data set included age range, gender, year of study.

4.3.1 Age range, gender and level of the Study

Figure 4.1 below illustrated that, of the 160 respondents, most respondents 134 (83.8 percent) were in the 18 to 25 age range, which is the average age of youth who pursue tertiary education. The ministry of higher education has committed greatly to the transformation and access of quality higher education, as well as funding; to make higher education more accessible. Therefore, there has been a rise in the number of students who access tertiary institutions after high school (Matsolo et al. 2018). This is also the age range targeted by employability and skills programmes to bring solutions to unemployment (Graham et al., 2019). Thus, the results of the study were reflective of the current initiatives being pursued in higher learning institutions.

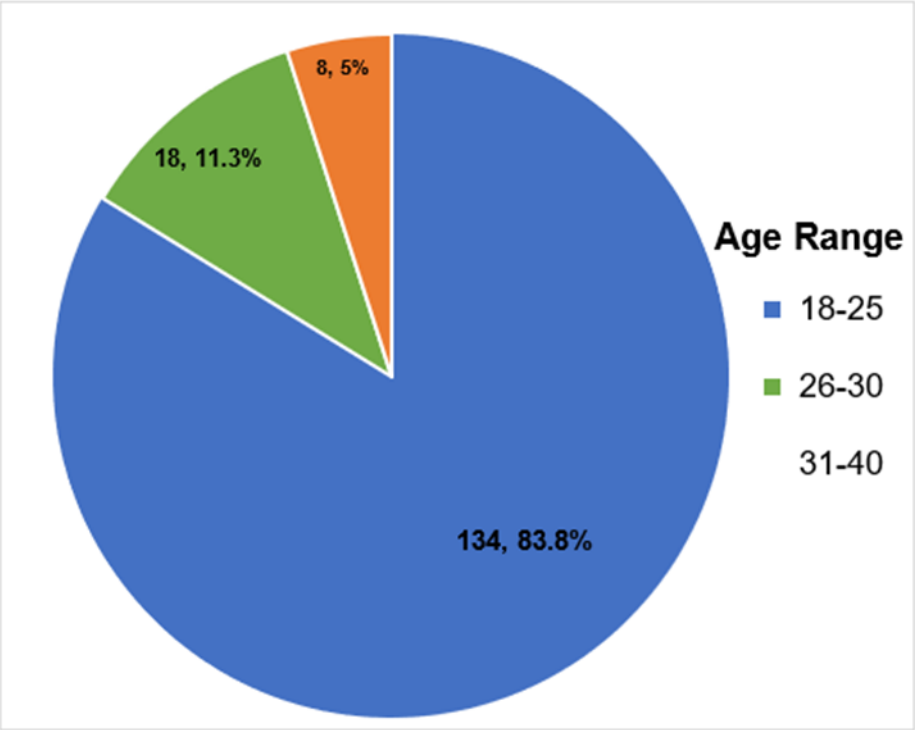

Figure 4.1: Age range of respondents (N=160)

Table 4.2 below shows that out of 160 respondents, 122 (76.3 percent) were male and only 37 (23.1 percent) of the respondents were female. Gender difference is common in manycases in the use of information technology but also similarly, the engineering field was still predominantly male dominated.

Von Solms et al. (2017) asserted that females were still underrepresented in engineering and only made-up 4 percent of registered engineering candidates in South Africa. The Engineering Council of South Africa reported that among the 16,423 registered professional candidates only 713 were females, and of the 504 professional engineers that the body had justregistered, females accounted for only 66 in number (ECSA, 2016). Therefore, the numbers in Table 4.1 could be reflective of the greater engineering industry.

Table 4.2: Gender distribution (N=160)

Gender		
Male	122	76.3%
Female	37	23.1%
Prefer not to say	1	0.6%

Figure 4.2 below shows that students who were in their first-year level of study made up most of the respondents at 73 (45.6 percent), followed by 48 (30 percent), respondents in the second year, 23 (14.4 percent) in the third year and 16 (10 percent) in BTech. There are various reasons why first year students made up most of the respondents. Among others it could be that they had the time to participate in the study.

Fomunyam (2017) highlighted what Greve (2013) had argued that a significant number of students who started their undergraduate studies in engineering tend to abandon their studies within the first two years. The Council of Higher Education (2016) also found that there was a disappointing difference in persistence and graduation rates at higher education institutions.

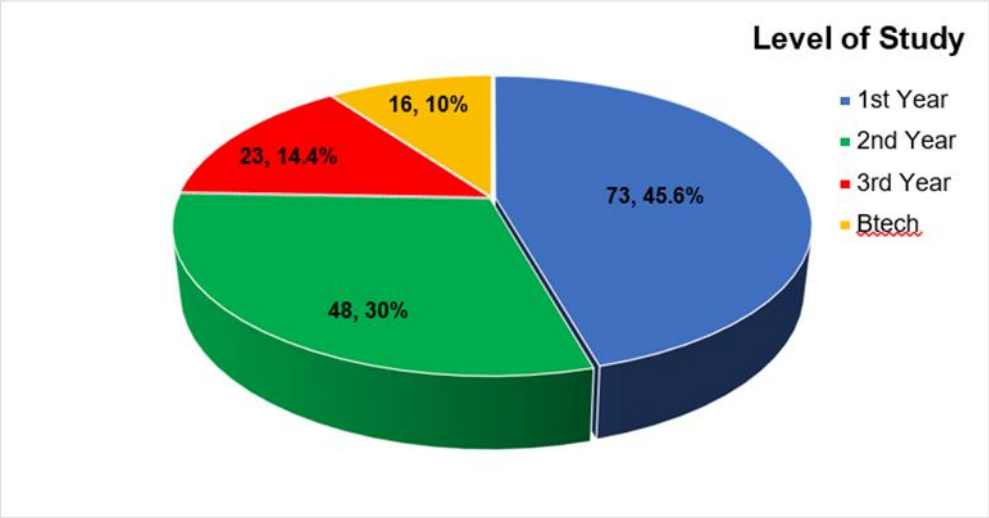

Figure 4.2: Level of study (N=160)

4.3.2 Computer literacy and prior experience with e-learning before studying

Table 4.3 below shows the levels of computer literacy according to the respondents. 113 (70.6 percent) of the participants rated themselves as intermediate. Only 8 (.3 percent) of the participants rated themselves as novice and 29 of the participants (18.1 percent) rated themselves as advanced. The reasons why most students might have rated themselves as intermediate could either be because of their age group or due to the kind of secondary school they had attended. Furthermore, the high numbers of smartphone ownership could contribute to how students rapidly adapt to using technology and the internet in their studies (Pew Research Center, 2018). Msomi and Bansilal (2018) asserted that the use of technology by students in their secondary education played an important role in how they would interact with ICT learning in their studies at tertiary level.

Table 4.3: Computer literacy levels

Computer Literacy		
Literacy level	**No. of respondents**	**Percentage (%)**
Novice	18	11.3%
Intermediate	113	70.6%
Advanced	29	18.1%

Figure 4.3 below shows that 122 (76.30 percent) of the participants had no prior experience with e-learning platforms before undertaking their studies at university and only 38 (23.8 percent) of the respondents had no previous interaction with e-learning platforms. The literature confirmed that a large majority of the students who entered tertiary education in

South Africa had come from under resourced communities where digital technology was limited. It also revealed that most students did not own a personal computer or could not access the internet at home prior to commencing their studies at university.

Schlebusch (2018) in her study on computer anxiety, self-efficacy, and attitudes towards the Internet of first year students at South African universities, found that only 29.8 percent of students owned a computer.

Msomi and Bansilal (2018) indicated that students who completed basic school level often did not have the necessary computer literacy for tackling learning problems which often led to learning challenges when confronted with difficulties regarding e-learning platforms. Although the literature is varied on how experienced students were in computer technology and the use thereof, most students in the study felt that they had intermediate level skills in computing.

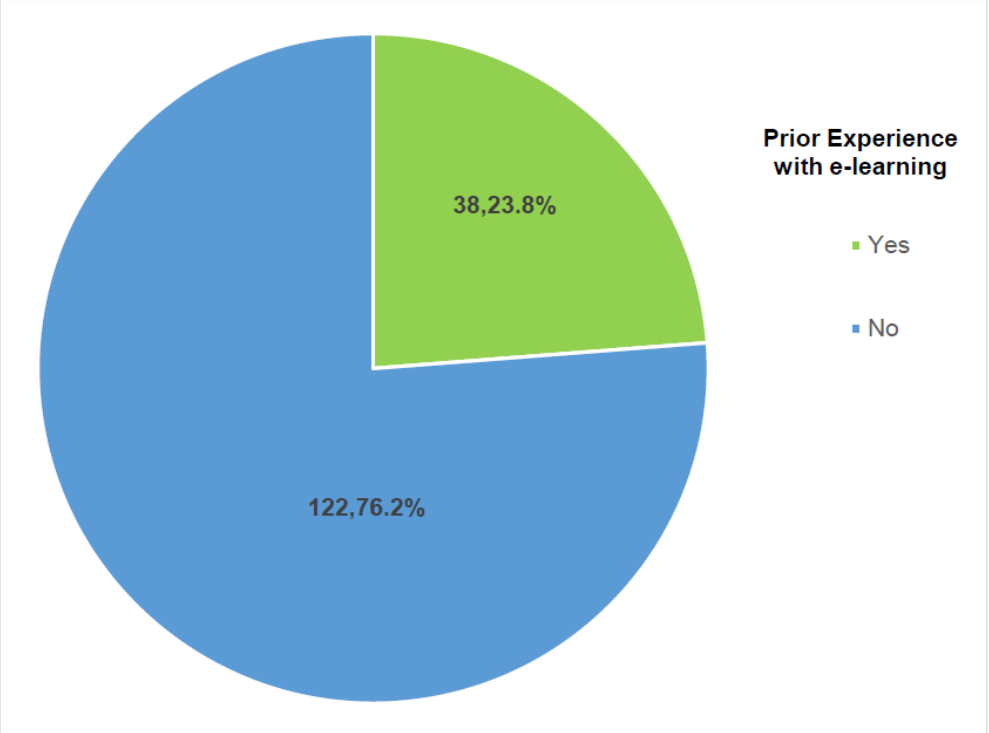

Figure 4.3: Prior Experience with e-learning platforms before studying at university (N=160)

4.3.3 E-learning platform rankings

Figure 4.4 below shows the e-learning platforms that were ranked from 1 to 7 (1 for the most used and 7 for the least used). Blackboard was ranked as the most (1) used e-learning platform with 54 (33.5 percent) respondents. Facebook followed with 25 (15.9 percent) respondents. Microsoft teams was third with 21 (13.2 percent) respondents. Google groups was fourth with 20 (12.5 percent) respondents. Zoom was fifth with 18 (11.2 percent) respondents. YouTube was sixth with 11 (6.9 percent) respondents. Last the least used e-

learning platform was WhatsApp with 11 (6.8 percent) respondents.

Karkoulia (2016) mentioned that there was an increase in the use of Web 2.0 applications and the literature proposed that Web 2.0 platforms that are in use in education include SNS, video sharing and streaming sites such as YouTube. Social network technology, which includes Web 2.0 technology in the form of forums, chat applications, video, and picture sharing, has become widely used by the youth. The outcomes of the study agree with the literature. Kattouaet al. (2016) mentioned that the Blackboard e-learning platform has been considered as the most widely preferred e-learning platforms in institutions of higher learning.

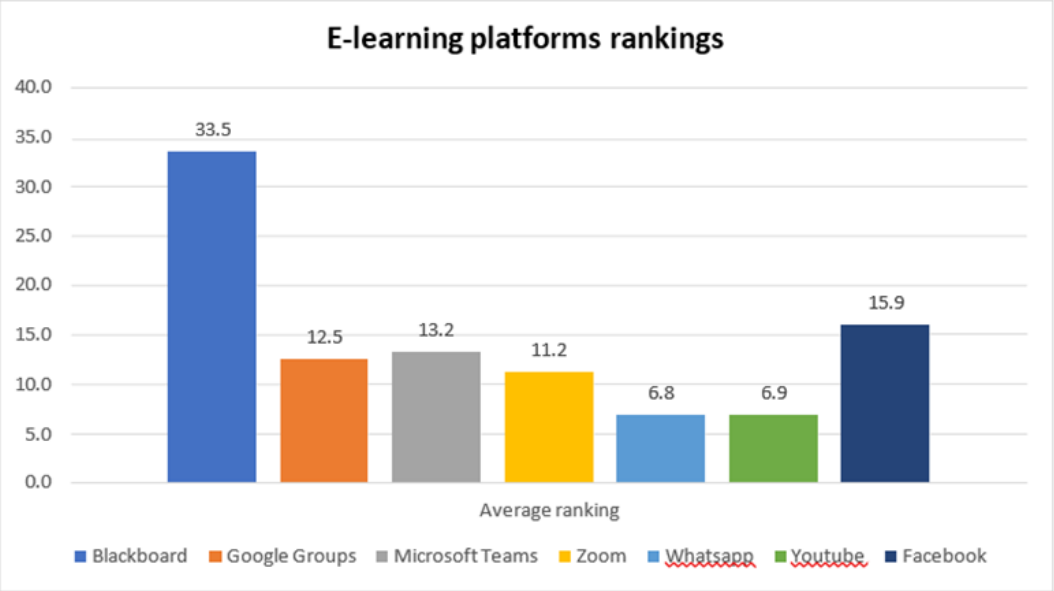

Figure 4.4: Distribution of respondents for e-learning platform rankings (N=160)

An option was given to the respondents to specify which other e-learning platforms they made use of, other than the ones listed for ranking. Table 4.4 below shows the percentages of the most used e-learning platforms. Others in the group included platforms such as Skype, Google Meets, Discord, E-books, and Twitter. There were five invalid responses for this question where respondents just left a blank space or typed symbols and numbers. There has also been a rise in various educational technologies that have been merged with social networking sites, which designers have found to be collaborative for the modern-day student in higher learning (Salloum et al., 2017). The findings in the table below reflect what had been mentioned in the literature; namely that there was a surge in popularity of employing non-conventional e-learning platforms such as blogs, podcasts, live feeds, and social media. These have further encouraged innovation and collaboration among students, which in turn, has increased e-learning use in tertiary education (Alghizzawi et al., 2019).

Table 4.4: E-learning platforms specified

E-learning platform	No. of respondents	Percentage
Telegram	11	7.1%
Email	10	6.5%
Subject Videos	11	7.1%
Others	95	61.3%
None	28	18.1%

4.4 Level of Access and Usage of e-learning Platforms

4.4.1 E-learning platforms device access

Section B of the questionnaire addressed access and usage of e-learning platforms. Figure 4.5 below show which electronic devices respondents used to access e-learning platforms. The electronic devices were coded as (1 = Cellphone, 2 = Tablet, 3 = Desktop, 4 = Laptop). Since the question allowed more than one option to be selected, there were several combinations that the respondents selected; the Cellphone and Laptop combination being the most selected by most students at 52 (33 percent), followed by the laptop at 29 (18,1 percent). The least used combinations of (Laptop, Tablet, Laptop) and (Tablet and Laptop) were both at 1 (0,6 percent). The tablet appears to be the least used device for students.

The literature indicated that possible factors that could affect the use of mainly cellphones and laptops could be that students find it easier to access e-learning platforms on the laptops than on smartphones as some LMS have been found to have challenges displaying navigation and functioning on the small screen of a smart phone (Edumadze, 2019). Although students preferred using both laptops and smartphones, they experienced technical barriers such as the battery lifespan of the cellphone, screen size and limited speeds of memory and therefore, asserted the need for designers of e-learning platforms to consider these factors (Yilmaz, 2016).

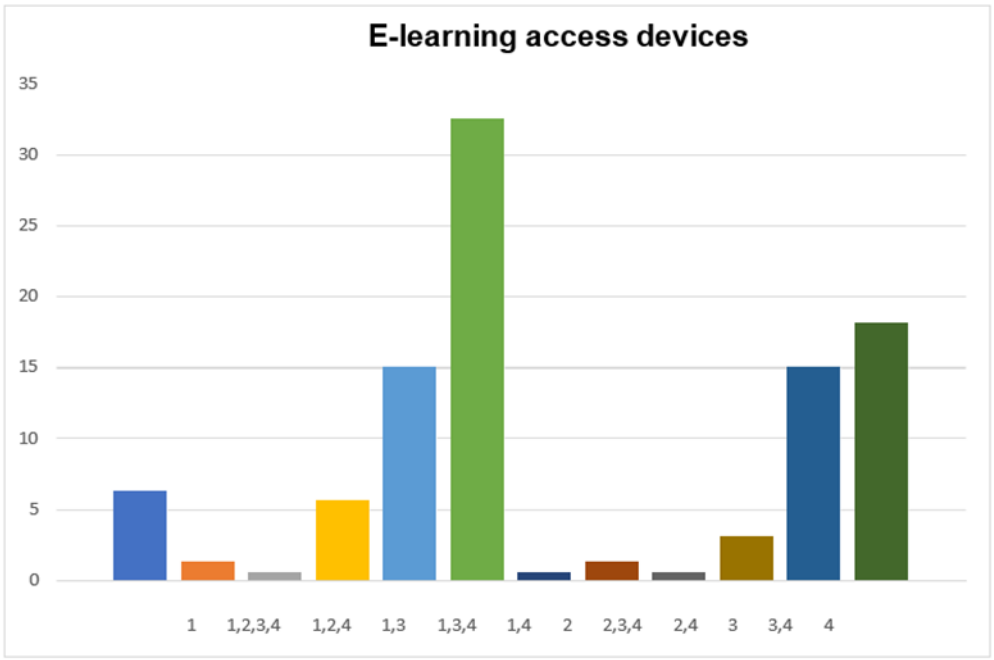

Figure 4.5: Devices used to access e-learning platforms (N=160)

4.4.2 E-learning venue access

The next question in Section B, focused on where the respondents accessed the e-learning platforms. In Figure 4.6 below the venues were coded into 5 venues (1 = Computer Labs, 2 = IT Center, 3 = Home, 4 = Residence, 5 = Other). The option of other included venues such as internet cafés, malls, and the transition from home to residences accounted for 4 (2,5 percent) of the respondents. The most common venue where respondents accessed e-learning platforms was represented by 3 = Home at 71 (44,4 percent). This was followed by the combination of (Computer labs, IT Center, Home) at 25 (15,6 percent).

The venues that were least utilized were the combination of (Computer labs, Residences) and (Home, Other) at 0,6 percent. The ability to access information from home requires the internet, and since more than 44.4 percent of students indicated that they accessed study resources at home, the findings reflected that an increasing number of students have network connectivity. These findings support those reported in the literature that internet access within South African homes was on the rise with 54 percent in 2017 (Internet World Stats, 2017; Digital Statistics in South Africa, 2017). Furthermore, studies found that households in some parts of the country spent about 20 percent of their incomes on internet connectivity services (Western Cape Government, 2017).

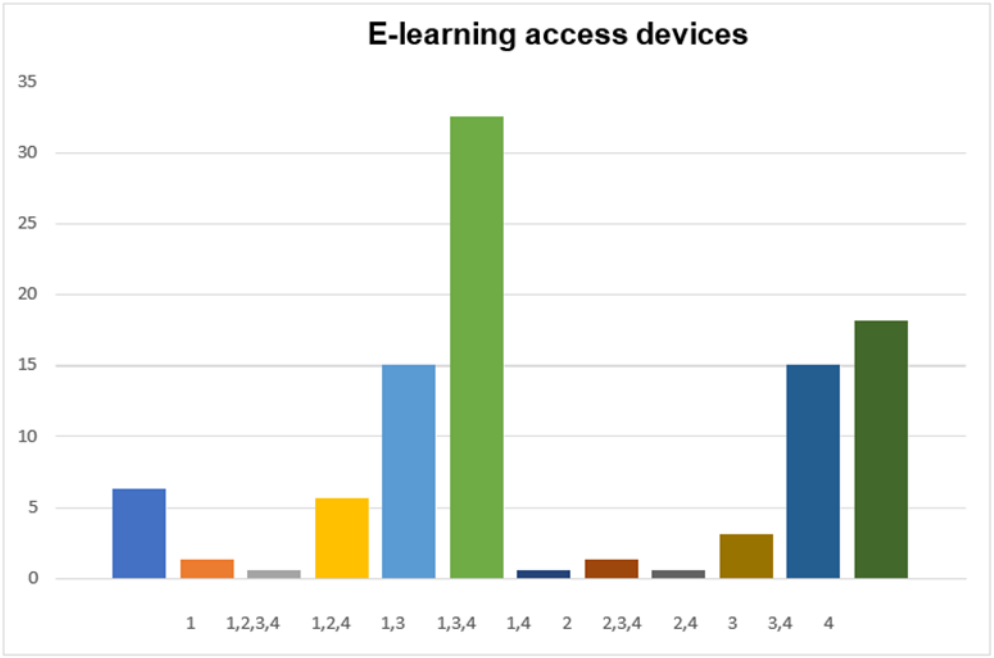

Figure 4.6: Venues where e-learning is accessed (N=160)

4.4.3 E-learning platform technical support

Figure 4.7 below illustrates how the respondents perceived the level of support they had received when accessing and using e-learning platforms. Of the respondents 93 (58.1 percent) answered yes that they had received adequate support on and off campus when accessing the platforms whereas 67 (41.9 percent) of the respondents answered no. According to the research results, students generally felt that they had adequate support when using e-learning platforms, this could possibly indicate that the university provided adequate technical support.

On the contrary some studies have found that inadequate technical support was a hindrance to effective e-learning platforms use (Jamil et al., 2016). Moreno et al. (2017) reflected that the students' intention or motivation to use e-learning platforms effectively led to them fully exploiting the systems functionality and would therefore have found them to be useful for their studies. It was found that when students found the e-learning platforms to be easy to use it encouraged self-efficacy, and greater system interaction. Therefore, the institution would need to provide support to students to maximize e-learning platforms use. Lack of technical support posed a challenge in the use and efficiency of e-learning. It is therefore imperative that policy makers and those who support e-learning prioritized the prevention and reduction of technical challenges (Ali & Younes, 2013).

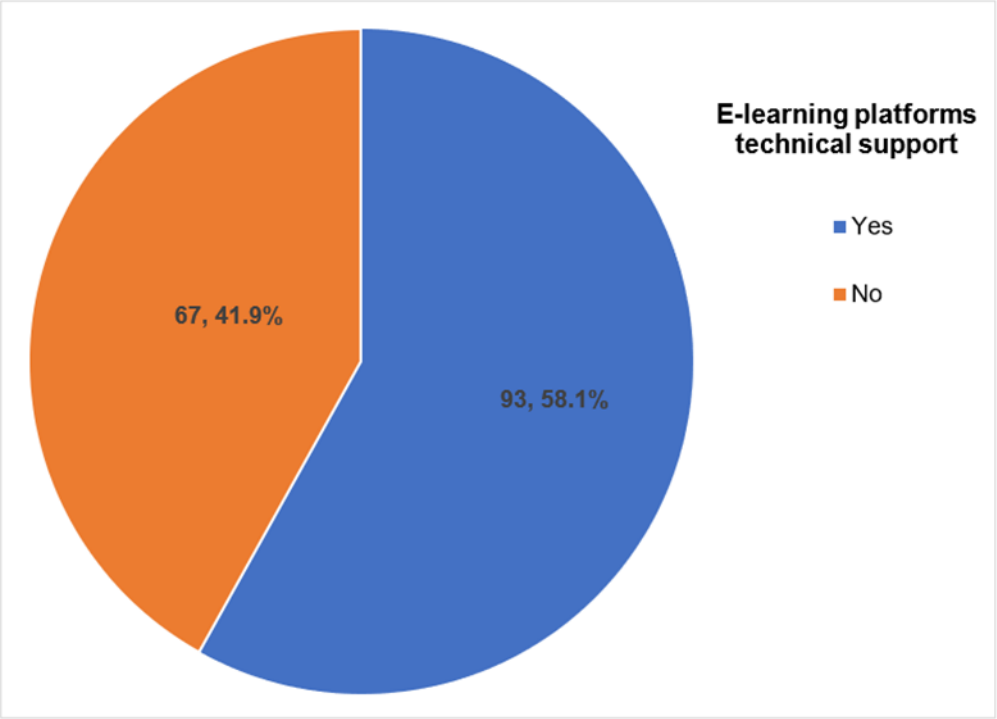

Figure 4.7: Adequate E-learning platform technical support (N=160)

The next question addressed whether the respondents were able to access their study resources effectively using e-learning platforms. Figure 4.8 below shows that 104 (65 percent) of the respondents found the platforms effective and that 56 (35 percent) did not find the platforms effective. The findings reflect that more than half of the population found e-learning platforms were effective in their day-to-day studies. Studies have found that proper information technology infrastructure is vital to the continued effectiveness of e-learning platforms and could be a barrier or enabler, as it allows users to receive and share information (Alsawaby et al., 2016). Thus, many studies had employed the TAM and the DeLone and McLean Model to assess e-learning success and had found that the effectiveness of e-learning is an important factor in its usefulness (Mtebe & Raisamo, 2014; Al-Fraihat et al., 2018).

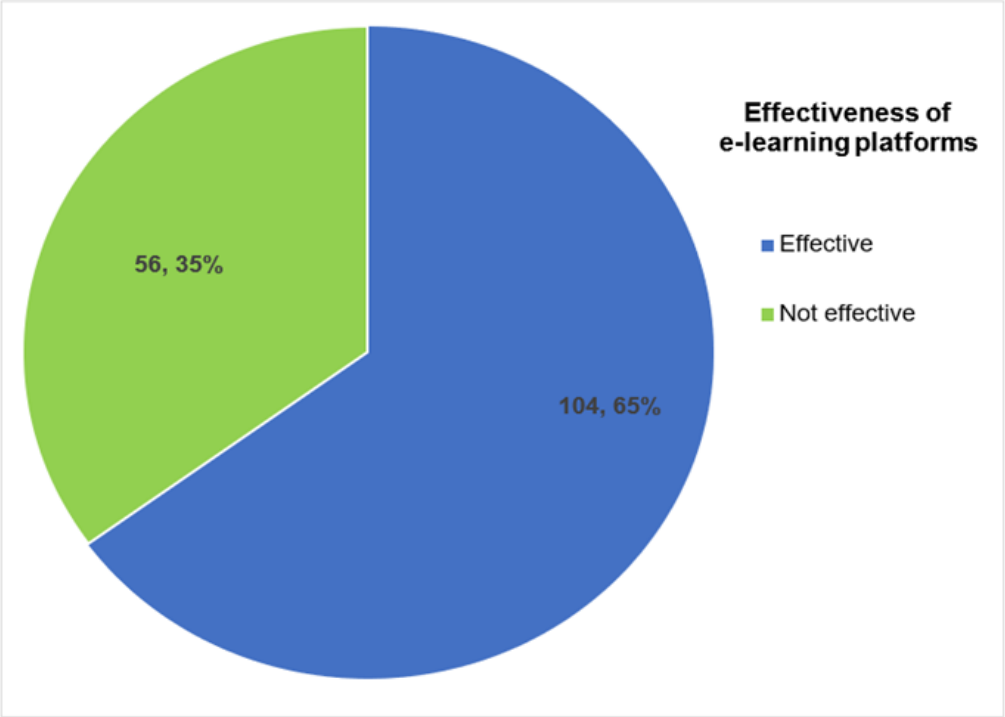

Figure 4.8: The effectiveness of e-learning platforms when accessing study resources (N=160)

4.4.4 Frequency of use and time spent on e-learning platforms

The questions that followed focused on how often and how long the respondents had made use of e-learning platforms for their studies. According to the research results, Table 4.5 below shows the frequency of e-learning platforms used for study purposes, 85 (53 percent) of the respondents indicated that they always used the e-learning platforms. 65 (40.6 percent) used them occasionally, 6 (3.8 percent) never used the platforms and 4 (92.5 percent) seldom made use of the platforms.

The results reflected which students had a positive outlook towards e-learning platforms. Moghavvemi et al. (2017) stated that the habitual use of the platforms significantly impacted the continued use of e-learning platforms and therefore had a positive effect on students' use of e-learning. Ramadiani et al. (2017) asserted that frequent and relevant interaction with e-learning was very important for reaping the benefits of the system, as it would assist students in retaining course material as well as supporting teaching and learning.

Table 4.5: Frequency of e-learning platforms use

Frequency of use	No. of respondents	Percentage (%)
Always	85	53.1%

Occasionally	65	40.6%
Never	6	3.8%
Seldom	4	2.5%

Figure 4.9 below showed the time that the respondents spent time on the internet on a weekly basis. Most respondents 103 (64.4 percent) made use of the internet for more than 9 hours per week. Of the respondents 35 (21.9 percent) spent 6 to 9 hours per week on the internet, 14 (8.8 percent) spent 3 to 6 hours per week and the respondents who spent the least time on the internet comprised 8 (5 percent). The findings reflected that students spent a lot of time on the internet. These results aligned with the literature. The modern-day student's use of the Internet is almost at the point of addiction. Most agreed that students did indeed make use of the internet for personal, recreational and study purposes and that it has therefore become an intergral part of their daily life (Haque et al., 2016). Although students used the internet for their studies and for professional development, most also spent excessive time on social media websites which had a negative effect on their studies (Feng et al., 2019).

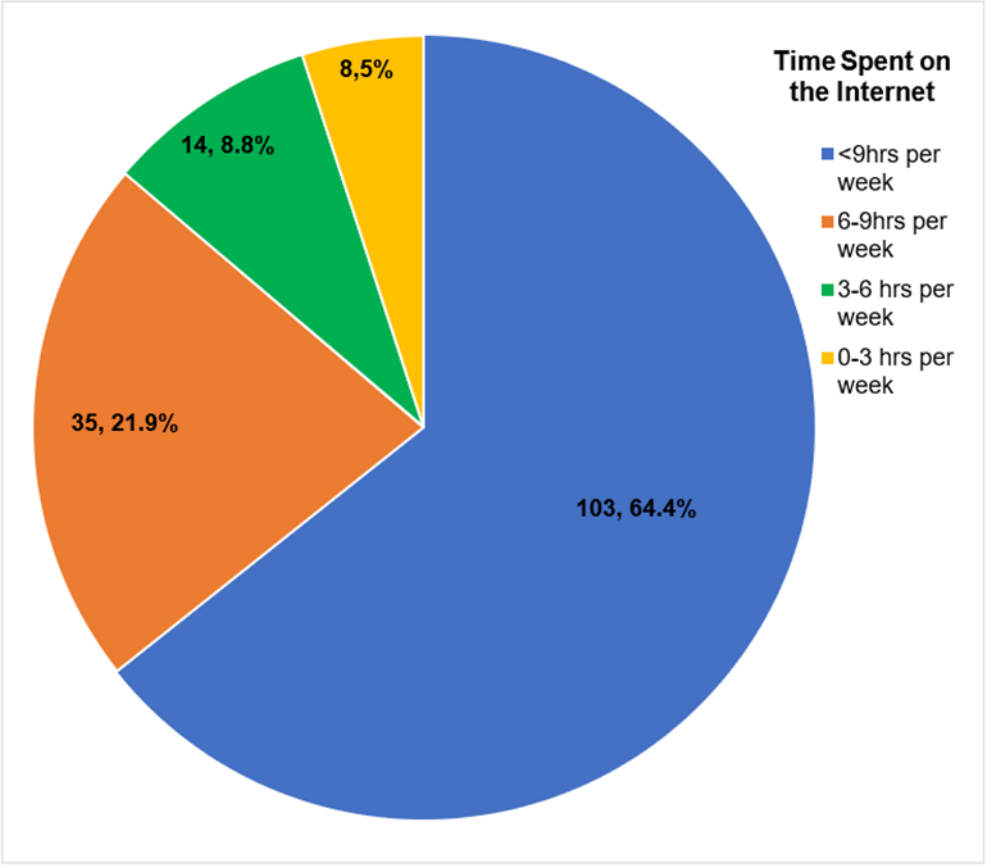

Figure 4.9: The amount of time spent on the internet per week (N=160)

In Figure 4.10 below the amount of time spent using the e-learning platforms was illustrated. In this chart, it was shown that 62 (38.8 percent) of the respondents spent more than 9 hours on Internet platforms, and 38 (23.8 percent) of the respondents spent between 6 to 9 hours using e-learning platforms. Furthermore 45 (28.1 percent) of the respondents spent 3 to 6 hours using e-learning platforms and 15 (9.55 percent) of the respondents spent the least time (0 to 3hours) using e-learning platforms.

The research findings showed that although students spent much of thier time on the internet in comparison to the results in Figure 4.8, this did not necessarily mean that they spent most of that time using e-learning platforms but could have been accessing other online activities. It could be that, some e-learning platforms had been incorporated into social media sites in order to be more relatable to students, as well as to increase use. Although the internet is a great source of information and contributes greatly to the professional development of students, it is also a platform for unethical behaviour found in academia such as plagiarism, fraud and misuse of infrastructure. Therefore, it is imperative that students should be kept informed on proper use of the internet(Soegoto & Tjokroadiponto, 2018). Leyrer-Jackson & Wilson (2017) found that the prolongedinternet use and specifically social media websites had a negative impact on students' academic performance.

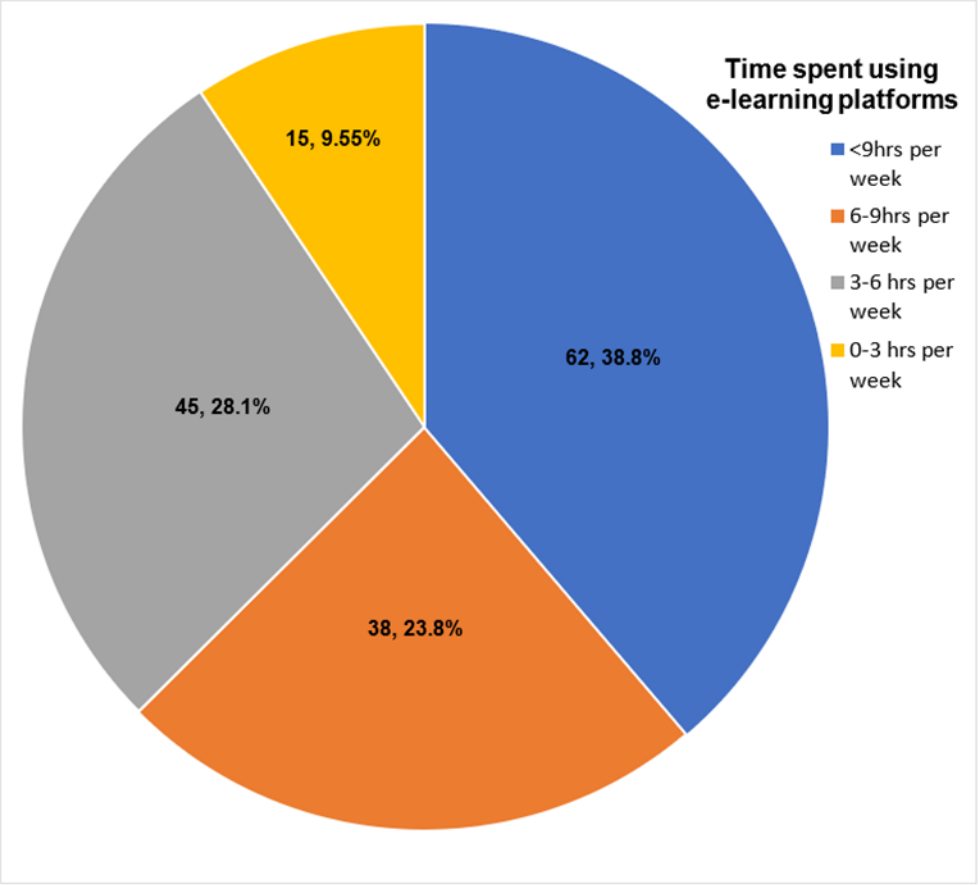

Figure 4.10: The amount of time spent using e-learning platforms (N=160)

4.5 Likert scale results

Section C of the questionnaire was based on Likert scale statements. Fig 4.10 below show the results in percentages.

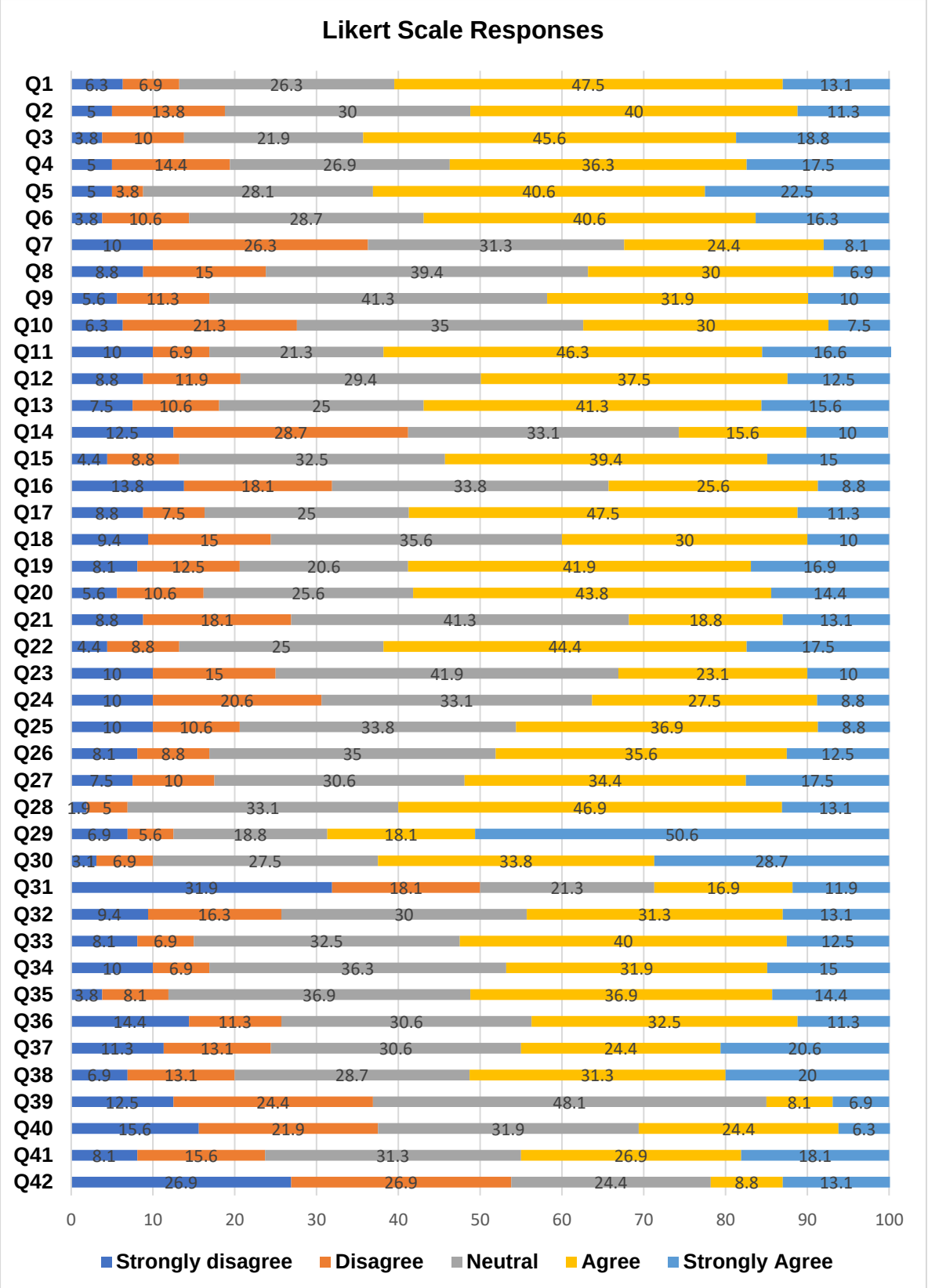

Figure 4.10. Likert scale results (%)

Table 4.6 below displays the various dimensions which reflected the different sub sections on the Likert Scale.

Table 4.6: Dimensions

Dimension	Construct
1	Usability
2	Reliability
3	Students Attitude towards e-learning
4	Student perceptions towards e-learning - Perceived self-efficacy in e-learning - Perceived enjoyment of e-learning - Perceived usefulness of e-learning platforms - Continued use of e-learning platforms
5	Benefits of e-learning use
6	Challenges of e-learning platform use

4.5.1 Usability of e-learning

Figure 4.12 below, shows the results of the first question. Of respondents 61 percent agreed that the user interface of the e-learning system was well organized and easy to navigate, whereas 13.2 percent disagreed, and 26.3 percent were neutral. In the next statement 51.3 percent of the respondents agreed that the instructional interface of the e-learning system functioned correctly, 18.8 percent of the respondents disagreed, and 30 percent of the respondents remained neutral. The literature described how useable the software was regarding its intended purpose. The key feature showed how the interface was used and how much easier it was for the user to access required information. These features allowed users to continue making use of the e-learning system (Nwokedi et al., 2016).

Of the respondents 64.4 percent agreed, 13.8 percent of the respondents disagreed, and 21.9 percent of the respondents remained neutral with the statement that the system made it easy for them to access course content. The next statement showed that 53.8 percent of the respondents agreed, 19.4 percent of the respondents disagreed and 26.9 percent of the respondents were neutral that the system allowed them to complete and upload assignments efficiently. The final statement stated that the e-learning system gave the respondents an opportunity to enhance their technical skills.

The results showed that the respondents found it easy to access course content and upload

assignments efficiently. Thus, this indicated that the system had served its intended purpose. Also, students found that the system contributed towards upskilling them technically, which could indicate they found the system to be of good quality. Usability had been mentioned as one of the significant factors in system quality, which affected the overall system quality and thereby influenced user satisfaction and encouraged users to continue to use the system (Dreheeb et al., 2016).

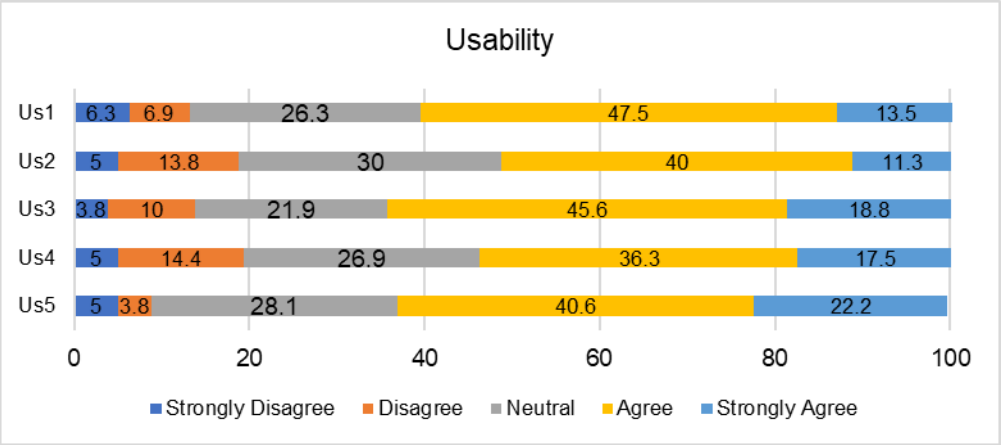

Figure 4.11: Usability of e-learning (%)

4.5.2 Reliability of e-learning

In Figure 4.13 below, the first question in the reliability dimension, 56.3 percent of the respondents agreed that the layout and user interface design of e-learning platforms was friendly, 14.4 percent of the respondents disagreed, and 28.7 percent of the respondents were neutral. Although users agreed that the system was friendly, when asked whether the overall e-learning system was stable most of the respondents 36.3 percent disagreed, 31.3 percent of the respondents remained neutral and 32.5 percent of the respondents agreed. The third was a question that asked whether the e-learning system provided the services needed. 23.8 percent of the respondents disagreed, 39.4 percent of the respondents remained neutral and 36.9 percent of the respondents agreed. The fourth statement asked whether e-learning platforms provided complete information and 16.9 percent of the respondents disagreed, 41.3 percent of the respondents remained neutral and 41.9 percent of the respondents agreed with the statement. The final statement in the reliability dimension stated that the functions and services provided by e-learning were satisfactory, 27.6 percent of the respondents disagreed, 35 percent of the respondents remained neutral and 37.5 percent agreed with the statement. Although the respondents felt that the system was friendly, provided the services needed, functioned correctly, made it easy for them to access course content and upload assignments, and was satisfactory, most of the respondents still found the system to be unstable. This could be due to various negative factors such as internet connectivity, high traffic or software failure,

and technical issues, among other factors. In addition, although some respondents agreed that the system provided the service they needed, more remained neutral.

These results were like those when the respondents were asked if the functions and services provided by the system were satisfactory, more of the respondents remained neutral. Al-Samarraie et al. (2018) asserted that for technology to be sustainable it needs to provide relevant information and must be stable otherwise, it compromises user satisfaction. Furthermore, Uppal et al. (2018) added that it was imperative to students that the e-leaning system should be stable and consistent, and that reliability remained an integral part of the quality of e-learning in higher education.

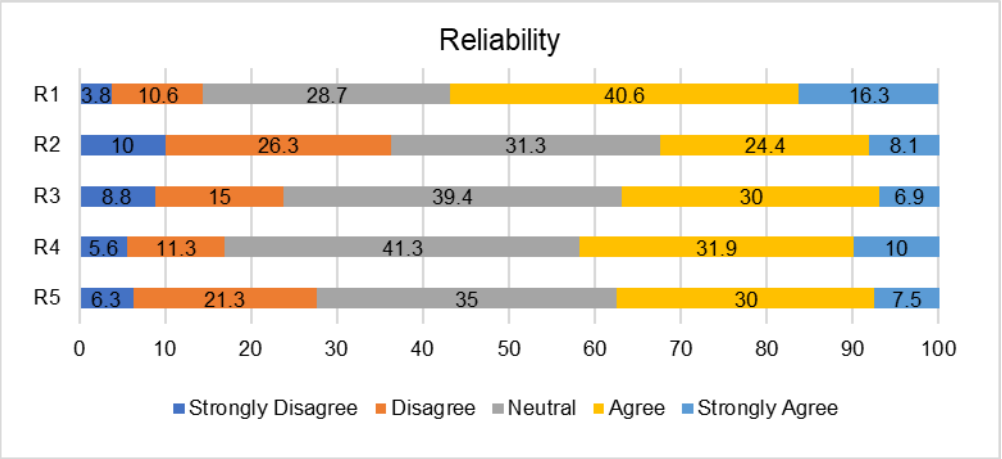

Figure 4.12: Reliability of e-learning (%)

4.5.3 Students attitudes towards e-learning

As depicted in Figure 4.14 below, respondents were asked to specify if they preferred to communicate with their subject lecturers using the internet. The findings indicate that 16.9 percent disagreed, 21.3 percent remained neutral and 61.9 percent agreed with the statement. In addition, the third statement asked if respondents felt that they benefited from communicating with the lecturer online, and the findings indicated that 18.1 percent disagreed,

25 percent remained neutral and 56.9 percent agreed. These findings showed that students preferred to communicate with lecturers through e-learning platforms and found this mode of communication beneficial to their studies. Students' attitudes reflect students' notions of participating in information technology activities using e-learning platforms and the internet. However, the internet required the user to have the necessary devices for communication purposes.

Communication between students and instructors was a great predictor of student satisfaction with e-learning use and had a positive effect on their studies, as students had the liberty of contacting their instructors instantly online, rather than having to wait to be seen in a face-to-

face consultation (Croxton, 2014). Although some respondents (32.5 percent) remained neutral when asked if e-learning was useful in their day-to-day learning programme, most of the respondents (54.4 percent), a little over a third of the population agreed and 13.2 percent disagreed with the statement. A similar finding was found when it was suggested that e-learning incorporates well with classroom learning. Of the respondents 29.4 percent remained neutral whereas fifty percent of the respondents agreed with this sentiment, and 20.7 percent of the respondents disagreed. This is in line with the literature that showed that many students showed a favorable attitude towards technology use in their studies. The finding further confirmed that they preferred to use social media applications, outside of LMS, as these were more beneficial to their studies than hours of online class time. They further indicated that this gave them time to interact and learn with fellow students (Msomi & Bansilal, 2018).

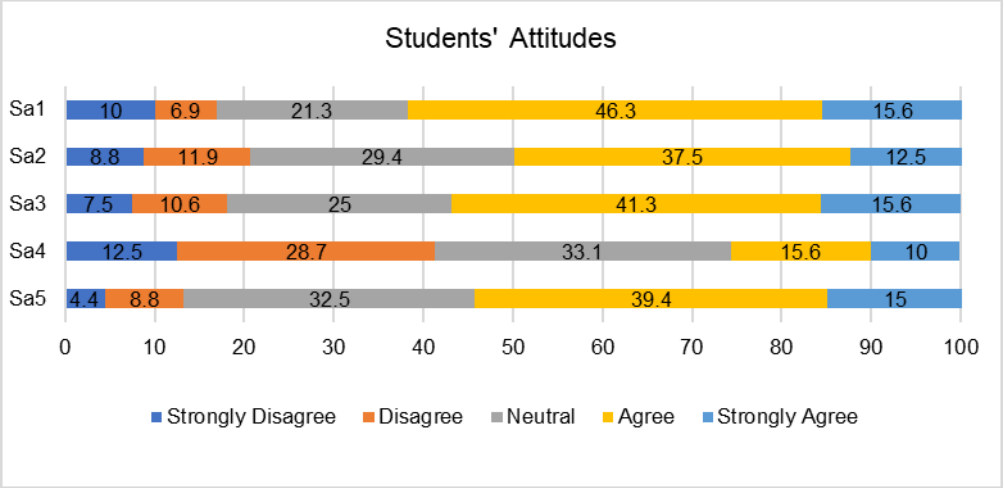

Figure 4.13: Students' attitudes towards e-learning (%)

4.5.4 Student perceptions towards e-learning

4.5.4.1 Perceived self-efficacy in e-learning platform use

In this dimension three constructs as shown in Figure 4.15 below were examined, and respondents were tasked with indicating the level of perceived self-efficacy in e-learning platform use and were asked if it improved their academic performance.

Of the respondents 33.8 percent remained neutral, 34.4 percent of the respondents agreed that the use of e-learning improved their academic performance and 31.9 percent of the respondents disagreed with the statement.

Some studies have found that e-learning use improved academic performance, learning experiences and self-development of students.

These studies also found that students who mostly exploited e-learning for their studies benefited greatly and were able to further develop their technical and innovations skills for their studies, as well as research (Fayomi et al., 2015; Suresh et al., 2018).

The next statement enquired if the respondents felt confident when using e-learning independently.

Of the respondents 16.3 percent disagreed, 25 percent of the respondents remained neutral and 58.8 percent of the respondents agreed with the statement.

The last statement suggested that using e-learning fitted well with the way the respondents learnt. Of the respondents 24.4 percent disagreed, 35.6 percent of the respondents remained neutral and 40 percent of the respondents agreed.

These results are in line with the literature that e-learning necessitates high levels of self-discipline and direction, thus learners who lacked motivation, possessed a fear of technology or if they had bad study habits they would fall behind or fail to cope (Gautam & Tiwari, 2016).

One study determined that self-efficacy had an important positive impact on how users used and interacted with the system, which further increased the continued use of e-learning (Rahmawati, 2019).

In another study, it was found that the level of correlation between the continued use of e-learning systems and self-efficacy was defined by the user's satisfaction with the system (Arunachalam, 2019).

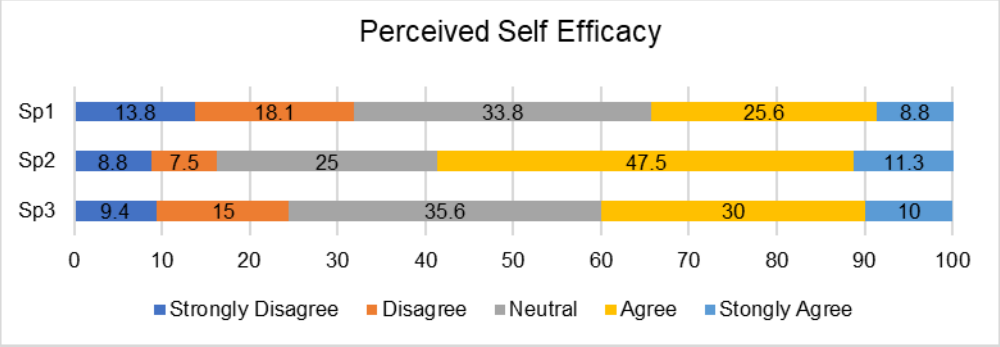

Figure 4.14: Perceived self-efficacy in e-learning use (%)

4.5.4.2 Perceived enjoyment of e-learning platforms use

Figure 4.16 below shows the respondents' outlook on the perceived enjoyment of e-learning platforms which revealed that more that 58.8 percent of the respondents, which accounted for almost 60 percent of the respondents also strongly agreed, 20.6 percent of the respondents

remained neutral and 20.6 percent disagreed. Similarly, when rating respondents outlook on whether the use of e-learning could simplify the learning process, 58.2 percent of the participants agreed, 25.6 percent of the respondents remained neutral and 16.2 percent of the respondents disagreed.

The next statement stated that the respondents were satisfied with the e-learning content. Of the respondents 26.9 percent disagreed, 1.3 percent of the respondents remained neutral and 31.2 percent of the respondents agreed. The final statement stated that respondents enjoyed multimedia instruction. Of the respondents 61.9 percent agreed, 25 percent of the respondents remained neutral and 13.2 percent of the respondents disagreed. These results verified that the students enjoyed the use and interaction with e-learning platforms as most had a positive outlook. Huang (2014) referred to perceived enjoyment in how students viewed various e-learning activities and services, despite any expected outcomes and confirmed that e-learning system use enhanced their learning experience. Some studies found that the apparent enjoyment influenced the outlook of students pertaining to the ease of e-learning systems use, this however did not affect how useful they found the system to be (Elkaseh et al., 2015).

On the contrary, another study found that students rather enjoyed surfing the internet for entertainment purposes, such as social networking sites and did not necessarily enjoy engaging on e-learning platforms for study purposes (Hussein, 2018). Although the findings mostly showed that the respondents enjoyed using e-learning platforms, some studies found varying results, which showed that there are many factors influencing the perceived enjoyment when using a system.

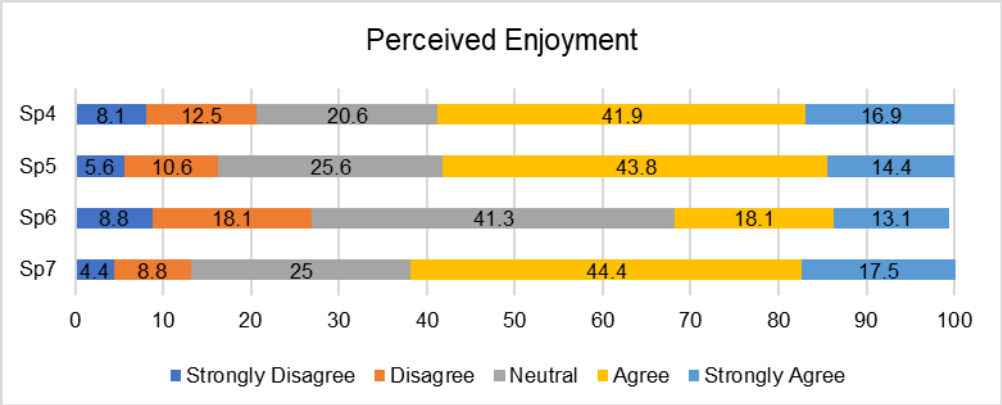

Figure 4.15: Perceived enjoyment of e-learning platform use (%)

4.5.4.3 Perceived usefulness of e-learning platforms

The usefulness of the e-learning platforms is shown in Figure 4.17 below. It was found that 33.1 percent of the respondents agreed, 41.9 percent of the respondents remained neutral and 25 percent of the respondents disagreed that e-learning platforms use increased their productivity. Another 36.3 percent of the respondents agreed that e-learning platforms use

improved the quality of their work, while 33.1 percent of the respondents remained neutral and 30.6 percent of the respondents disagreed with the statement. In the last statement, 45.7 percent of the respondents agreed that they believed that using e-learning platforms enhanced their learning experience, while 33.8 percent of the respondents were undecided and only 20.6 percent of the respondents disagreed.

Nugroho et al. (2018) mentioned that perceived usefulness is the level at which users of a system trusted that it could improve performance and increase productivity. A certain amount of interaction was required for users to deem the system useful, and that consequently, they would make use of the system continuously. The findings confirmed that the respondents found that e-learning platforms not only improved their productivity but also the quality of their academics and enhanced their overall learning experience. Wu and Zhang (2014) in their study on intentions of students to continue using e-learning systems found that perceived usefulness and information quality had a significant effect on the intention of students to continue to utilize e-learning.

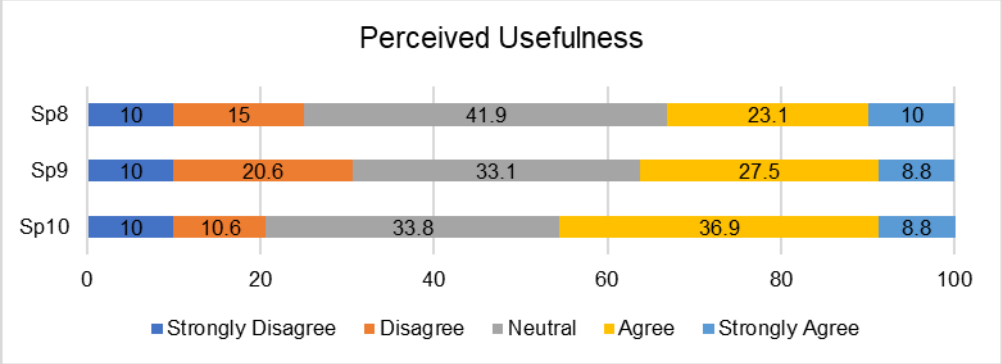

Figure 4.16: Perceived usefulness of e-learning platforms (%)

4.5.4.4 Continued use of e-learning

For the dimension of continued e-learning use as shown in Figure 4.18 below, the first question asked the respondents if their intention was to continue using e-learning to enhance their learning. Of the respondents 48.1 percent agreed, 35 percent of the respondents remained neutral and 16.7 percent of the respondents disagreed. This finding indicated that most of the respondents intended to continue using e-learning platforms probably because they had experienced the benefits thereof.

The next statement asked if the respondents would like more time dedicated to e-learning in their courses. Of the respondents 51.9 percent i.e., over half of the population agreed to this sentiment, 30.6 percent of the respondents remained neutral and 17.5 percent of the respondents disagreed. This was a similar result as the last statement where the respondents confirmed that their interaction with e-learning had improved, only 6.9 percent of the

respondents disagreed, 33.1 percent of the respondents remained neutral and 60 percent of the respondents agreed. This finding showed that the respondents who had spent more time using e-learning platforms were more likely to continue.

These results aligned with other studies such as Lwoga and Komba (2015), who, in their study of precursors of the continued use of online learning management in Tanzania found that the actual use of the system had a sound relationship with the students' intention to continue with e-learning system use. They also posited that if the system was user friendly and easy to use, end users were likely to continue using the system. Furthermore, the success and viability of e-learning depended on continued usage and not only on initial use, but continual use was also an important precursor of overall e-learning success (Al-Samarraie et al., 2018).

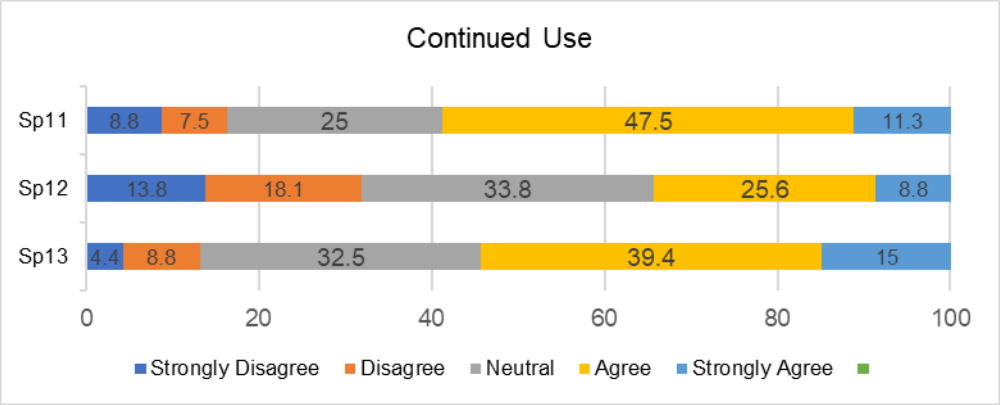

Figure 4.17: Continued use of e-learning (%)

4.5.5 Benefits of e-learning

The researcher aimed to find out if students e-learning platforms use was beneficial to their studies as shown in Figure 4.19 below. The statement "I can access it any place at a time when it suits me" was suggested to the respondents. Of the respondents 68.7 percent agreed,18.8 percent of the respondents remained neutral and only 12.5 percent of the respondents disagreed, that they were able to exploit the flexibility and adaptability of e-learning platforms, as mentioned in the literature. In line with the first statement "I can access and share educational resources with ease" most of the respondent's 62.5 percent agreed, 27.5 of the respondents remained neutral and only 10 percent disagreed. These findings agree with those found in literature studies on the effects of perceived usefulness and ease of use on continuance intention; that the perceived ease of use positively influenced the users' intention to continue using the system (Hamid et al., 2016; Abdullah et al., 2016).

The statement, "all types of learning styles are accommodated through e-learning" exactly half of the respondents 50% disagreed with the statement. Of the respondents 21.3 percent

remained neutral and 28.7 percent of the respondents agreed with the statement. These responses could reflect that the respondents might not have been aware of the initiatives that were in place to include their different types of learning capabilities. It was also noted that there were a total of 44.4 percent positive responses related to swift feedback. Of the respondents 30 percent remained neutral and 25.7 percent of the respondents disagreed. It was noted that swift feedback is important to students. When using technology for learning, timeous feedback created a positive attitude and encouraged students to be more involved inactivities concerning e-learning. Jan et al. (2012) affirmed that timeous response when usinge-learning enforced good relationships between instructors and students and consequently, both parties were more productive when using e-learning systems.

The statement “access to wide and diverse interactions through e-learning” received positive feedback of 52.5 percent. Of the respondents 32.5 percent remained neutral, and 15 percent of the respondents disagreed. These results show that the respondents were benefiting by being able to interact with fellow students and instructors socially and academically.

These findings were supported by Srivastava (2019) who mentioned that e-learning further improved and made communication easier between instructors and students, through its ability to enable interactivity during course delivery. Of the respondents 46.9 percent agreed, 36.3 percent of the respondents remained neutral and 16.9 percent of the respondents disagreed that e-learning platforms made collaboration and interaction easier.

The next statement stated that the learning material on e-learning was up to date. Of the respondents 51.3 percent agreed, 36.9 percent of the respondents remained neutral and 11.9 percent of the respondents disagreed. The last statement suggested that lecturers and students communicated better via the e-learning platform. Of the respondents 43.8 percent agreed, 30.6 percent of the respondents remained neutral and 25.8 percent of the respondents disagreed. El Mhouti et al. (2017) affirmed that e-learning platforms could improve the interaction, communication and collaboration amongst students who utilized them, and encouraged the creation of new ways of teaching and learning.

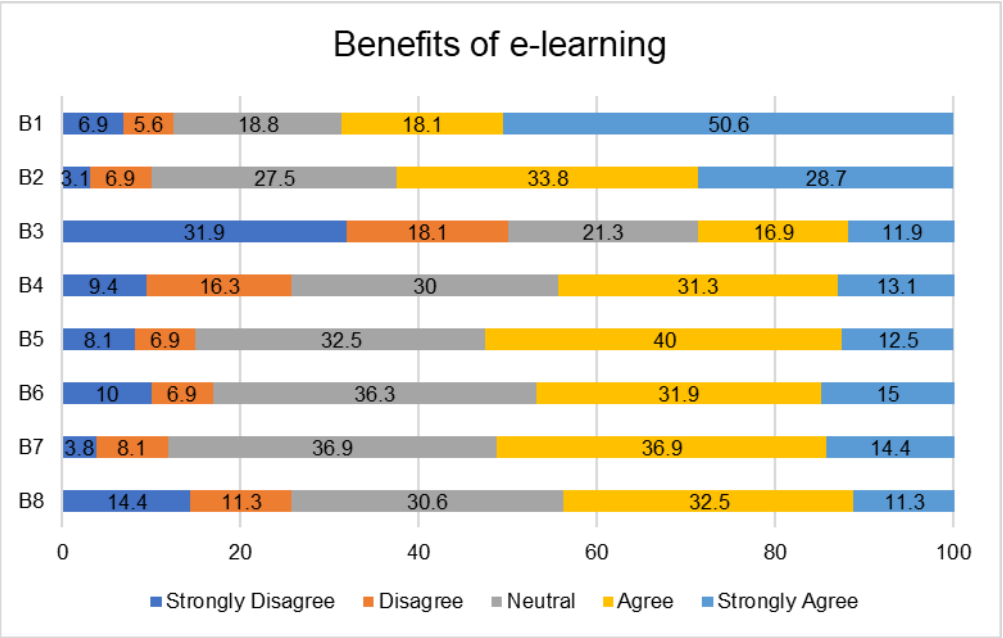

Figure 4.18: Benefits of e-learning (%)

4.5.6 Challenges of using e-learning platforms

Figure 4.20 below shows the results based on questions about the challenges experienced by students regarding e-learning platforms use. The respondents were provided with statements regarding potential challenges and 45 percent of the respondents agreed that there wasn't enough training in e-learning use in their department, 30.6 percent of the respondents remained neutral, while 24.1 percent of the respondents disagreed with the notion. The second statement was "I struggle to get technical support when I use e-learning". Of the respondents 51.3 percent agreed, 28.7 percent of the respondents remained neutral and 20 percent of the respondents disagreed.

The results revealed that one of the main challenges that the participants had to contend with was the lack of technical support. The literature asserts that the lack of technical support poses a challenge to the use and efficiency of e-learning, it is therefore imperative that policy makers and those who support e-learning prioritize the prevention and reduction of technical challenges (Almaiah & Alyoussef, 2019). Most of the respondent's 36.9 percent when given the suggestion; "The instructions provided on e-learning are difficult to follow" disagreed with the statement, 48.1 percent of the respondents remained neutral and only 15 percent of the respondents agreed. This is in line with the earlier finding on the question of usability which reflected similar results. When given the statement "I find it difficult to upload documents on e-learning platform" 37.5 percent of the respondents did not agree with the given statement, 31.9 percent of the respondents remained neutral and 30.6 percent of the respondents agreed. These finding are almost balanced but a little over a third of the respondents still disagreed.

The statement suggesting slow internet connectivity when using e-learning elicited 45 percent in agreement. Of the respondents 31.3 percent remained neutral and 23.7 percent of the respondents disagreed with the statement. The challenge of internet connectivity is in line with the literature, since e-learning platforms due to their design, contain a lot of visual objects, images and multimedia material, which requires a lot of data for downloading and uploading as required for course participation. Thus, when internet connectivity is limited this would compromise students' interaction with the system, which, in turn, would demotivate students from fully utilizing the systems (Alariqi et al., 2019).

The last statement "I find it difficult to connect to e-learning on my personal device" received disagreement from more than half of the respondents where 53.8 percent disagreed. Of the respondents 24.4 percent remained neutral and 21.9 percent of the respondents agreed with the statement. Despite the many challenges facing adequate infrastructure and device ownership when students had to access student platforms the findings were positive. The most common devices for accessing e-learning platforms were smartphones and laptops. This reflects that ownership and access were improving. Alsawaby et al., (2016) asserted that IT infrastructure was a key component to the ongoing effectiveness of an information system such as the e-learning system. It could be a barrier or an enabler as it comprises a set of services on which e-learning system applications depend on for day to day running. It also allowed users and providers to receive and to share information and educational material effectively.

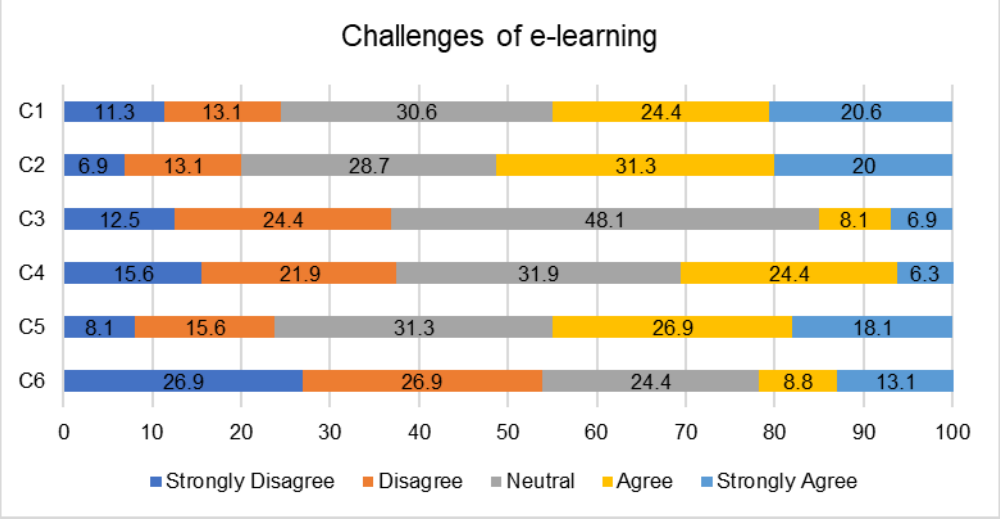

Figure 4.19: Challenges of e-learning (%)

4.6 Descriptive Statistical Results

Skewness is the measure of how much a set of data is deviating from bell curve and kurtosis is a measure of the maximum the curve of a distribution reaches. Kurtosis measures how large the two tails are together, and it reflects the degree of probability in the tails, the value is often compared to the kurtosis of the normal distribution, which is equal to 3 (Hair et al., 2017). Kurtosis also describes the measure of the presence of outlying values in the distribution. If the kurtosis is greater than 3, then the dataset has more tails than a normal distribution. If the kurtosis value from a dataset is less than 3, then the dataset has much less tails than a normal distribution. Higher kurtosis means more of the variability is due to a few extreme differences from the mean, rather than a lot of modest differences from the mean. High kurtosis in a data set is an indicator that data has heavy tails or has outliers. If there is a high kurtosis, then, there needs to be a closer examination (Analytics Vidhya, 2021).

The researcher received 160 responses which were coded, the results depicted in Figure 4.5 below. In the case of the first questions of Age range, the kurtosis value is 4,962, this indicates that there are outliers or values that are above the average which in this case are students in the normal age range of 18-24, this is the most common age range that students enter higher education. The data is reflective of the low number of older students (11.3% in the 26-30years old and 5% in the 31-40 years old). The skewness of this data set is positive which lies more right of normal distribution. The general recommendation for skewness is if the value is more than +1 or lower than -1, this is an indication of a significantly skewed distribution. In the case of the second question regarding the gender of the students, the skewness value is 1.420 which indicates that the distribution will be skewed significantly to the right, this is a true indication that there are more males(76.3%) than females(23.1%) in the sample.

The results for question sixteen regarding the frequency of use of e-learning platforms by students also indicated skewness of a value more than +1 which is 1.314. This value also indicates the distribution will be slightly skewed positively, as it shows that more than half of the respondents (n=85 and 53.1%) indicated that they use e-learning platforms frequently. Overall, the results did not reveal any negative skewness, all the values skewed to the right side where the mean, median, and mode of the distribution are positive.

Table 4.7: Descriptive Statistics (n = 160)

Item	R	Min	Max	Mean	S.D	Ske.	Kur.
Age range	2	1	3	1.21	0.519	2.428	4.962
Gender	1	1	2	0.24	0.445	1.420	0.613

Item	R	Min	Max	Mean	S.D	Ske.	Kur.
Level of study	3	1	4	1.89	0.997	0.846	-
Level of computer literacy	2	1	3	2.07	0.539	0.057	0.440
Experience with e-learning	1	1	2	1.76	0.427	-	-
e-learning platforms use the most	6	1	7	3.93	2.396	0.017	-
Elearning_ platforms_Rank_Google groups	6	1	7	3.31	2.125	0.567	-
Elearning_ platforms_Rank_Microsoft teams	6	1	7	3.39	1.860	0.429	-
Elearning_ platforms_Rank_Zoom	6	1	7	3.21	2.246	0.572	-
Elearning_ platforms_Rank_Whatsapp	6	1	7	3.29	2.327	0.475	-
Elearning_ platforms_Rank_Youtube	6	1	7	2.94	2.227	0.781	-
Elearning_ platforms_Rank_Other	6	1	7	3.01	2.221	0.759	-
Elearning_ platforms_Rank_Specify	4	1	5	3.78	1.037	-	1.432
Elearning platforms_Adequate_support	1	1	2	1.42	0.495	0.333	-
Elearning_platforms_access_study_resouces	1	1	2	1.35	0.478	0.635	-
Elearning platforms_Frequency_Use	3	1	4	1.56	0.689	1.314	2.139
Time spent_Internet weekly	3	1	4	3.46	0.853	-	1.441
Time spent Elearning_platforms _weekly	3	1	4	2.92	1.022	-	-
Us1	4	1	5	3.54	1.015	-	0.532
Us2	4	1	5	3.39	1.022	-	-
Us3	4	1	5	3.66	1.016	-	0.158
Us4	4	1	5	3.47	1.093	-	-
Us5	4	1	5	3.72	1.017	-	0.604
R1	4	1	5	3.55	1.008	-	-
R2	4	1	5	2.94	1.112	0.029	-
R3	4	1	5	3.11	1.034	-	-
R4	4	1	5	3.29	0.988	-	0.016
R5	4	1	5	3.11	1.028	-	-
Sa1	4	1	5	3.51	1.144	-	0.068
Sa2	4	1	5	3.33	1.114	-	-
Sa3	4	1	5	3.47	1.110	-	-
Sa4	4	1	5	2.82	1.149	0.261	-
Sa5	4	1	5	3.52	0.997	-	0.112
Sp1	4	1	5	2.98	1.160	-	-
Sp2	4	1	5	3.45	1.075	-	0.224
Sp3	4	1	5	3.16	1.098	-	-
Sp4	4	1	5	3.47	1.154	-	-
Sp5	4	1	5	3.51	1.046	-	0.018
Sp6	4	1	5	3.09	1.115	0.006	-
Sp7	4	1	5	3.62	1.015	-	0.235
Sp8	4	1	5	3.08	1.087	-	-
Sp9	4	1	5	3.04	1.112	-	-
Sp10	4	1	5	3.24	1.084	-	-
Sp11	4	1	5	3.36	1.072	-	-
Sp12	4	1	5	3.44	1.120	-	-
Sp13	4	1	5	3.64	0.842	-	0.665
B1	4	1	5	4.00	1.244	-	0.069
B2	4	1	5	3.78	1.038	-	-
B3	4	1	5	2.59	1.394	0.319	-
B4	4	1	5	3.23	1.154	-	-
B5	4	1	5	3.42	1.061	-	0.157

Item	R	Min	Max	Mean	S.D	Ske.	Kur.
B6	4	1	5	3.35	1.128	-	-
B7	4	1	5	3.50	0.965	-	0.139
B8	4	1	5	3.15	1.204	-	-
C1	4	1	5	3.30	1.253	-	-
C2	4	1	5	3.44	1.153	-	-
C3	4	1	5	2.73	1.015	0.247	0.122
C4	4	1	5	2.84	1.149	-	-
C5	4	1	5	3.31	1.177	-	-
C6	4	1	5	2.54	1.326	0.527	-

Note: R: Range; Min: Minimum; Max: Maximum; S.D.: Standard. Deviation; Ske: Skewness Kur: Kurtosis

4.7 Correlation Test Results

According to the correlation results only the statistically noteworthy correlations were discussed. Pearson's correlation coefficients have been popular, according to the tables below and only the coefficients below the 0.05 level (two-tailed) were considered significant. There was a positive correlation between the level of study and the level of computer literacy among respondents with the with r=.284, and the relationship was significant (p=0.001 < 0.05). The finding could be due to various factors such as growing awareness of digital literacy and e-learning use. The results were in line with the literature, that averred that as students progressed with their education, so does their use of electronic devices and this significantly contributes to their level of computer literacy (Tennant et al., 2015).

Table 4.8: Level of study versus Level of computer literacy

		Level of Study	Level of computer literacy
Level of Study	Pearson Correlation	1	.284**
	Sig. (2-tailed)		.000
	N	160	160
Level of computer literacy	Pearson Correlation	.284	1
	Sig. (2-tailed)	.000	
	N	160	160

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

Table 4.9 below shows that there was a negative correlation between the students' level of study and accessing their course work effectively via e-learning platforms with r = -.181; and the association was significant (p=0.022 < 0.05). The finding could reflect that as students progressed in their studies, they had found that e-learning platforms were effective in their studies, as shown in the results in Figure 4.8. These findings possibly show alignment with the literature that showed that there are several factors that affect e-learning effectiveness; namely, students' level of access, acquaintance and contact with e-learning platforms (Ali et al., 2018).

Table 4.9: Level of Study versus E-learning platforms access

		Level of Study	E-learning platforms_access study_resouces_1ness
Level of Study	Pearson Correlation	1	-.181*
	Sig. (2-tailed)		.022
	N	160	160
E-learning platform access	Pearson Correlation	-.181	1
	Sig. (2-tailed)	.022	
	N	160	160

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

Table 4.10 below showed that there was a negative correlation between the students' level of computer literacy and the variable accessing their course work effectively, via e-learning platforms with r = -.240 and the association was significant (p=0.022 < 0.05). There are varied findings in the literature that suggest that as students gain higher levels of computer literacy, they might find it easy and effective to exploit the benefits of e-learning. However, on the other hand, some studies reflected that even undergraduate students possessed higher levels of computer literacy and thus found e-learning platforms to be effective in their studies (Rasouli et al., 2016; Salim et al., 2018).

Table 4.10: Level of computer literacy and e-learning platform access

		Level of Computer Literacy	E-learning platforms_access study_resouces_1ness
Level of Study	Pearson Correlation	1	-.240**
	Sig. (2-tailed)		.022
	N	160	160
	Pearson Correlation	-.240**	
	Sig. (2-tailed)	.022	
	N	160	160

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

Table 4.11 below shows that there was a negative correlation between the students' level of computer literacy and the variable e-learning platforms frequency of use with r = -.239 and the association was significant (p=0.002 < 0.05). Although some studies found that frequent interaction with e-learning platforms was beneficial to students in terms of improved information technology skills, some studies found that computer literacy levels did not have a significant influence on the use of e-learning, but also stated that if students had access and perceived the platforms to be beneficial to their studies, they would utilize them for their course needs (Ramadiani et al., 2017; Hanif et al., 2018).

Table 4.11: Level of computer literacy versus the frequency of e-learning platform use

		Level of Computer Literacy	E-learning Platforms Frequency of use
Level of Study	Pearson Correlation	1	-.239**
	Sig. (2-tailed)		.002
	N	160	160
	Pearson Correlation	-.239**	1
	Sig. (- tailed)	.002	
	N	160	160

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

4.8 Conclusion

This chapter presented data collected from students within an engineering department. The questionnaire was the main method of data collection. The main themes within the data set were aligned with the aims and the objectives of the research and all the dimensions associated with the research questions.

The findings from the results reflected that the students generally have a positive outlook towards e-learning use in their engineering studies. Most students also reflected that they found e-learning platforms to be effective and useful in their studies, which is in line with the objective outlined earlier in the chapter. The results also show students perceived that they received adequate support when utilizing e-learning platforms. Although some results varied to a certain extent, some students still found e-learning platforms to be complementary to their day-to-day traditional learning. Some technical barriers were also confirmed by students and some included connectivity issues, infrastructural issues and software and interface challenges. Despite the challenges, students also found many benefits in using e-learning platforms such as improvement in their outcomes, in their productivity and improved quality in their submissions.

The results of the research have correlated significantly and have been consistent with scholarly articles; and theories from the literature have helped to support the results of the study. The research objectives have been addressed through the findings and discussions presented and interpretations have been drawn from the literature. The fourth objective will be discussed in the next chapter under contributions (suggestions).

CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The preceding chapter presented the research results and discussion. This chapter provides the overall summary and final conclusions of the study. This will be followed by a summary of the findings from the results in the previous chapter; followed by the recommendations and implications, contributions and suggestions, suggestions for further studies, limitations of the study and the conclusion. Included are the recommendations and suggestions for e-learning improvements within the university, in view of the findings. The findings are based on the results of the study, relevant research studies and the literature. This study was conducted within a university at the mechanical engineering department.

5.2 Summary of the Findings

This study deliberated on students' outlook towards e-learning platforms use in their studies. The primary objective of the research sought to identify if the use of e-learning influenced students' academic performance. Also, the study sought to identify various constructs that were used in the evaluation of the efficacy of e-learning platforms use. The recommendations from this study endeavoured to contribute to improvements in students' e-learning platform use by highlighting the challenges and technical barriers that limit the use of e-learning platforms and suggesting possible solutions. The study undertook the survey research design method and gathered data using questionnaires. Several dimensions were examined such as usability, reliability, and students' attitude towards e-learning. There is no complete framework to address the evaluation of e-learning effectiveness. Most of the literature has revealed that there are various models that can be employed separately or concurrently, to properly evaluate e-learning. The results of the first section of the questionnaire revealed that the internal consistency of the questionnaire was indeed reliable. The Cronbach's coefficient alpha values of the dataset remained consistent and within the recommended limits.

The biographical description findings in the results of the study, in terms of age range and gender were in line with the higher education space, where most of the participants were within the 18 to 25 age group. The gender results were also consistent with the industry norm, where there were more male than female participants. This could also be due to other factors not evaluated in the study. The results also indicated that most of the respondents were in their first year of study and that the least number of the participants were enrolled for their BTech studies. The findings reflected that the respondents had differing levels of competencies in ICT use. The challenge posed to university leadership is to widen the offering of information

technology skills and courses within the university community, to maximise e-learning platform benefits and ultimately to improve students' outcomes and experiences.

The next few questions focused on the respondents' computer literacy levels, their prior experience with e-learning platforms and the identification of which platforms the respondents most utilised, and which other platforms that were not on the list they had used for their studies. In the case of computer literacy levels most of the respondents rated themselves at intermediate level. This might be an indication that the respondents were familiar and comfortable with using computers and e-learning, tools which confirms the findings of many studies concerning the use of Information and communication technologies in higher education.

Although the respondents indicated that they possessed the necessary skills in IT, they also indicated that they had no prior experience with e-learning before studying at the university. These findings could be due to several factors, such as the disparities in the demographics of students who enter institutions of higher learning in a diverse country such as South Africa. Also, this could reveal that students were able to learn how to navigate themselves through the information communication space, because most of their courses required these skills. The challenge is for the university to provide resources and training for those students who still need to improve their computer literacy skills in order to fully exploit e-learning platforms, and to bridge the gap for those who might have no prior experience with e-learning and computers. The respondents identified various e-learning platforms that were available at the university. Most of the respondents indicated that they used the Blackboard platform the most. These findings confirm that Blackboard is the most used e-learning platform within the university. The next highest ranked platform was Facebook. This could also be due to the rise in popularity of social media use in education. Other e-learning platforms that respondents mentioned included video calling applications, email and subject videos.

Regarding access, effectiveness, support and usage of e-learning platforms, the respondents confirmed that they made use of their smartphones and laptops to access e-learning platforms. These findings were indicative of modern-day students who are engaged in ICT. Furthermore, the respondents indicated that they had access to e-learning platforms at home, which confirmed the rise in internet access within homes in South Africa. The respondents also indicated that they had adequate technical support. They also found e-learning platforms to be effective. Although most of the respondents indicated that they frequently used e-learning platforms for their studies, the findings revealed that they spent more time on the internet than engaging only on e-learning platforms. These finding are contradictory but could reflect that the time the respondents spent on the internet also accounted for time spent on e-learning

platforms. A correlation test was conducted, and the test found several relationships among certain variables to be significant. The results varied, but mostly confirmed the findings of the study. The test found that the level of study was associated with the level of computer literacy. This could have reflected that as students went through the system, they progressed in their use of information technology; thereby improving their computer literacy skills.

The test also found that there was a relationship between students' level of study, level of computer literacy levels and how they were able to access the e-learning platforms effectively. This relationship is reflective of the finding that 65 percent of the respondents confirmed that they were indeed able to access their course resources effectively, using e-learning platforms. The test also highlighted a significant relationship between the level of computer literacy and frequency of use of e-learning platforms. These results reflected a negative correlation which could mean a weak relationship between the two variables; and therefore, as discussed in the previous chapter, students with varying computer literacy skills still engage fully in using e-learning platforms to get through their coursework.

5.2.1 Effect of e-learning on students' academic performance

The findings reflect what has been described and researched in literature regarding different factors that embody academic performance. The results were divided into three, where the respondents agreed that e-learning use had a favourable impact on students' academic performance. Although the respondents reflected that e-learning increased their productivity, the quality of their work, enhanced the students' overall learning experience and fitted with the way they learnt. The respondents also indicated that using e-learning for their studies did not accommodate all learning styles. The respondents also felt that e-learning improved self-efficacy. This was reflected in the results; in that they felt confident using e-learning platforms independently. Another finding was that e-learning use gave them a chance to enhance their technical skills.

The respondents also indicated that their use of e-learning improved communication with their lecturers as they received quick feedback, which was beneficial for keeping abreast with their studies. Furthermore, this could improve student-teacher relationship as students who are usually not able to engage with instructors in a face-to-face mode of teaching and learning found it easier to engage with lecturers on online platforms. It is therefore imperative that the university constantly engage students in how best to initiate measures to improve e-learning systems such that they could be designed with learning styles in mind. It would be prudent to further implement communication applications that further improved communication between

instructors and students. All the factors reflected in the findings are described in the literature as determinants of academic performance.

5.2.2 Measurements for e-learning in higher learning environment

Various constructs have been used in the evaluation of e-learning effectiveness. The findings of the study reflected that most students had a positive outlook on the usability of e-learning platforms. Most of the respondents indicated that usability of e-learning platform tools had created a more accessible, well organised learning environment. Most of the respondents indicated that the layout and the way the interface was designed made it easy to navigate. The results concluded that students found it easy to access course content and upload assignments. The frequent users of e-learning platforms indicated that e-learning served its intended purpose.

On the issue of information and system quality, the study findings revealed that the respondents found the information provided by e-learning to be of quality and that the use of the system improved their quality of work. Al-Fraihat et al. (2020) also found similar results in their study in the evaluation of e-learning success, as they showed that when all the constructs of information quality were provided to students, it contributed to their overall satisfaction with the e-learning platform. Also, the constructs of perceived ease of access and usefulness were indicators of the effectiveness of e-learning use. The respondents indicated that they found the system to be user friendly, easy to use and useful.

5.2.3 Impact of technical barriers on e-learning among engineering students

For institutions of higher learning to fully exploit and deploy the services offered by e-learning they need to guarantee that their facilities are fully capacitated with infrastructure and ICT tools that can fully run e-learning platforms. Technical barriers such as inadequate technical support, slow internet connectivity, inadequate software compatibility, outdated hardware, and computer security, often discourage students from fully utilising e-learning. Also, another technical barrier (Ali et al., 2018), was that students struggled to get technical support when using e-learning platforms. This has been a common barrier in the continued use of e-learning platforms. Furthermore, the respondents indicated that they found that there was limited internet access when using e-learning. This finding was common to many studies that were conducted in developing countries, due to economic and infrastructural issues. These countries remain behind in terms of technology and infrastructural advancements. Regarding the reliability factor, the respondents revealed that although the platforms were user friendly, they did not find them to be stable. These findings could possibly indicate that e-learning

platforms are directly affected by network connectivity or possibly poor interface and software design. Therefore, it is imperative that IT departments involve all stakeholders in the design and requirements phase of selecting platforms that are to be formally used within universities.

5.2.4 Students' perceptions towards the use of e-learning

E-learning success is significantly dependant on its effective use. The literature has proved that when students had a positive perception about e-learning, they were more likely to accept and continue to utilise it. The findings also reflected that the respondents generally had a positive outlook towards e-learning. This was reflected in their responses when looking at their attitudes towards the use of e-learning. Most of the respondents indicated that they enjoyed using the platforms and found them to be useful in their studies. They also found that e-learning use improved communication and interaction both among each other and with their lecturers. They also indicated that e-learning platforms contributed positively to their day-to-day experiences in their studies. It is important that universities and their stakeholders to take students' perceptions into considerations as their proficiency in e-learning use is a great contributor to the success of e-learning and the development of curriculum as well (Popovici & Minorov, 2015). Overall students' perceptions contribute to the overall success of e-learning, in terms of user satisfaction and continued use of e-learning.

5.2.5 Valuable suggestions for improving e-learning usage

The university should endeavour to adopt policies for ICT, that enable the investment of financial resources into infrastructure upgrades and network improvement; to expand the use of e-learning within institutions. Technical and academic support of e-learning for both staff and students is very important as it influences academic performance. Therefore, more technical staff and resources should be availed for students to bridge the gap of inadequate support. Regular preventive maintenance should also be undertaken to increase the efficiency of e-learning use.

The university needs to relook at the compatibility issues that arise when students' use specialised engineering software, in order to fully exploit the system as a whole and not have to use different platforms to upload assignments or view content. It has been found that e-learning use is better in the social sciences and arts faculties, than in the pure sciences and engineering (Algahtani, 2011). E-learning should be piloted per faculty before applying it to all departments, to establish proper guidelines to the service providers and designers to accommodate differences in user requirements. Training and awareness of e-learning should be high on the agenda and this should be offered to all stakeholders such as students,

instructors, lecturers and support staff, in order to maximise and fully exploit the investment that has been made in making e-learning platforms operational. The findings indicated that most of the respondents indicated that there was not enough training for e-learning in their departments. Therefore, it is important that this should be addressed.

5.3 Contributions

5.3.1 Contribution to the body knowledge

The study provides a contribution to knowledge in the area of e-learning platforms. Many studies have focused on e-learning in respect of LMS. This study focused on additional applications such as SNS, video streaming platforms and other applications, as tools for lecturing in a mixed mode environment. The intention of the study was to contribute a better understanding of e-learning platforms use from the students' perspective, on how it impacted their learning experiences; and also, to evaluate the effectiveness of e-learning by addressing factors such as technical barriers, benefits and how the use of e-learning platforms can be further exploited, for teaching and learning.

The study further highlighted the common constructs used to evaluate e-learning, by describing various constructs from the most highly used evaluation models, such as the Delone and McClean model and the TAM; in order to describe how the constructs can be used to gain information, in order to improve and sustain usage of e-learning platforms.

5.3.2 Contribution to the literature

While the Information Communications Technology and e-learning sector remains fast paced in terms of advancement, previous studies have addressed the adoption of e-learning in universities but are yet to fully evaluate e-learning effectiveness post its adoption. This study focused not only on the students' outlook on e-learning platform use, but also on its impact on their day-to-day experiences of blended learning. The study was undertaken with respondents engaged in engineering studies; which gave the study a technical perspective. Therefore, based on that, the study does add to existing literature in a distinctive way and can be used as a reference for Information technology departments and for academic purposes.

5.4 Recommendations and Suggestions

The aim of the study was to examine students' outlook towards the use of e-learning platforms in an engineering department at a university. Below are the recommendations based on the reviewed literature and findings of the study that will contribute to bringing solutions to the challenges faced by students:

- The university management could consider employing initiatives to compensate for the low level of human interaction that comes with the extended use of e-learning, to accommodate students' different learning styles. Sustainable programs that provide support for students beyond learning spaces is important just as technology needs to be up to date and students stability is important for sustainable e-learning initiatives (Al-Samarraie, Alzahrani, and Alalwan, 2018).
- It will be beneficial for the university to increase information communication technology security against viruses and fraudulent activity that leads to plagiarism and invasion of privacy. The university can invest in cyber security software to monitor their communication networks by partnering with companies that specialise in information technology security which will foster trust among university stakeholders (Kholiavko et al., 2021). In their study on ethical awareness issues advised that institutions of higher learning would benefit greatly from implementing policies around ethics for the e-learning environment, this will assist in reducing plagiarism and invasion of privacy (Talib and Mahasneh, 2020).
- Introduction of training for both student and instructors to keep abreast with rapidly changing technology; as well as to enhance technical skills to match industrial standards. Also, computer literacy courses for students who come from disadvantaged secondary schools should be initiated, for them to fully exploit e-learning platforms to improve their academic performance. In their study on online education status, challenges, trends and implications Palvia et al. (2018) confirmed that equipping educators and students would contribute greatly to their technological competence as well as engagement and improvement on how education is disseminated
- The involvement of educators and instructors in the design of e-learning materials and platforms will go a long way towards making the platforms more effective for teaching and learning. The university can set up an advisory team, where academic staff, instructors, designers and involved stakeholders can collate their needs and ideas on how best to contribute to the design and improvement of e-learning platforms. The establishment of stakeholder relationships with the private and industrial sector will further enhance the use of blended or online learning, as this will equip students with skills, by deploying e-tools that are currently being utilised in industry. Furthermore, these partnerships will create a sustainable development plan to keep up with the fast pace information technology environment (Donath, Mircea and Rozman, 2020).
- The improvement in technical support and internet access will go a long way towards encouraging continuing e-learning platforms use. From the findings of the study, it was shown that students find the internet to be slow. Furthermore, the strenghthening of technical expertise and support technical is crucial as it creates a channel of feedback that informs the technical teams with information on technical needs, errors and

difficulties faced by academics, support staff and most importantly students((Jamil, Sethi and Ali, 2016). Therefore, it is recommended that thedepartment of information technology increase the bandwidth for increased internet speeds, as well as to improve the stability of e-learning platforms. These steps when taken systematically will strengthen the use of e-learning which has proven to have a significant potential in improving teaching and learning in higher education (Aljaber, 2018).

5.5 Recommendations for Further Studies

Considering the limitations of this study, and other matters arising from this study, and in the literature, some possibilities for further study are mentioned below. Other similar studies may widen the scope to verify and generalise the results. This study focused on an engineering department to investigate engineering students' perceptions towards the use of e-learning platforms. Another study could be done on the faculty of engineering. This study also excluded instructors' perceptions. A study that includes instructors could shed light on their outlook on e-learning effectiveness, and its impact on their students' studies.

Another focus could be the usability of e-learning platforms in conjunction with specialised software deployed in the engineering faculty, to best advise how universities could enhance the quality of LMS, to be more inclusive.

5.6 Limitations of the Study

Although the study had some strengths (high response rate to the questionnaire distributed), there were some limitations. While the questionnaire was an online questionnaire, many students were not available on campus during the period of data collection, and many did not have access to their student e-mails off - campus.

Although the study attempted to limit partiality, as it relied on the students' perceptions, some limitations were unavoidable, due to the tools and data collection methodology. Also, the study reported that students' perceptions showed that, while there was an understanding of how they responded, there were limits on the interpretations of the findings; thus, this could present a weakness in the analysis and arrangement of the data.

5.7 Conclusion

The final chapter discussed and summarised the finding of the study, as well as how it lined up with the literature. The objectives of the study were summarised according to the finding of the study and reflected varied findings on students' perceptions toward e-learning platform use. Students generally had a positive outlook, but some also indicated that there were

challenges and barriers that prevented them from fully exploiting the systems. Consequently, some of the findings were contradictory, as factors that affect students are varied. As alluded to in the findings and discussions the use of e-learning platforms had a positive impact on students' academic performance. Some studies also reflected this notion and challenges, and some barriers were also highlighted.

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APPENDIX A: ETHICS PERMISSION REQUEST

Cape Peninsula
University of Technology

POSBUS/PO BOX 1906 BELLVILLE 7535 – TEL. +27 21 959-6496 FAX 086 600 8758
SYMPHONY WAY BELLVILLE 7530

FACULTY OF ENGINEERING
DEPARTMENT OF MECHANICAL ENGINEERING

TO WHOM IT MAY CONCERN:

23 July 2020

Sir/Madam

I, Simphiwe Nqabisa, in my designation as HOD: Mechanical Engineering hereby give consent in principle to allow Confidence Komani who is a student at the Cape Peninsula University of Technology (CPUT), to collect data as part of her study for her MTech: Business Administration (Project Management). Confidence Komani who is the student has explained the nature of her research and the type of data she envisages to collect.

This consent does not in any way commit any member of staff or students to be a participant in the research, also it is expected that the student Confidence Komani will get consent from any participants.

I reserve the right to withdraw permission at any time in the future.
In addition, the University's name will not be mentioned anywhere in the said research, including the thesis, journal article, conference paper and research poster.

If you have any further inquiries, feel free to contact me via the email or on my land line.

Mr Simphiwe Nqabisa
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Department of Mechanical Engineering
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PO Box 1906
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Tel: (021) 959 8642
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APPENDIX B: ETHICS CLEARANCE CERTIFICATE

P.O. Box 1906 □ Bellville 7535 South Africa □ Symphony Road Bellville 7535 □ Tel: +27 21 460 3291 □ Email: fbmsethics@cput.ac.za

Office of the Chairperson Research Ethics Committee	**FACULTY: BUSINESS AND MANAGEMENT SCIENCES**

The Faculty's Research Ethics Committee (FREC) on **25 August 2020**, ethics **Approval** was granted to **Confidence K. Komani (204130654)** for a research activity for **M Tech: Business Administration in Project Management** at the Cape Peninsula University of Technology.

Title of dissertation/thesis/ project:	**Student perceptions towards the use of e-Learning at a selected university in Cape town** Lead Supervisor(s): Dr Bingwen Yan

Comments:

Decision: APPROVED

 **Signed: Chairperson: Research Ethics Committee**	**Date: 8 September 2020**

Clearance Certificate No. | 2020FOBREC794

APPENDIX C: QUESTIONNAIRE

Student Perceptions towards the use of e-learning systems at a selected university in Cape Town

The target population are students from the first level of study to BTech level in mechanical engineering studies. Your identity is protected; please do not make any markings that may be used to identify you. This survey is completely voluntary; you may refuse to partake and omit any question you do not want to answer at any stage during the research.

SECTION A. BIOGRAPHY

Please cross the applicable boxes

1. How old are you this year, please use the table to indicate your age range?

18 – 25 years	**26 – 30 years**	**31 – 40 years**	**41 – above**

2. Please indicate your gender?

Male	**Female**

3. What is your level of study?

First year	**Second year**	**Third year**	**BTech**	**Other**

4. What is your level of computer literacy?

Novice	**Intermediate**	**Advanced**

5. Do you have prior experience with e-Learning before studying at this university?

Yes	**No**

6. Which of the following e-Learning platforms do you use the most? Please rank the platforms from 1-7 (1 for most and 7 for the least)

No.	e-Learning Platforms	Option
1	Blackboard	
2	Google Groups	
3	Microsoft Teams	
4	Zoom	
5	WhatsApp	
6	YouTube	
7	Facebook	
	Other (Please indicate)	

SECTION B

WHAT IS THE LEVEL OF ACCESS AND USAGE OF e-LEARNING PLATFORMS?

1. Which device(s) do you use to access e-learning platforms?

Cellphone	**Tablet**	**Desktop**	**Laptop**

2. Where do you access e-Learning platforms?

Campus Labs	**IT Centre**	**Home**	**Office**

3. Do you get adequate support on/off campus in terms of accessing e-learning platforms?

Yes	**No**

4. Do e-learning platforms enable you to access your study resources effectively?

Effective	**Not effective**

5. What is your frequency of use of e-Learning platforms?

Always	**Occasionally**	**Seldom**	**Never**

6. How much time do you spend using the internet per week?

0 – 3 hours	**3 – 6 hours**	**6 – 9 hours**	**9 hours – above**

7. How much time do you spend using e-Learning platforms for your studies per week?

0 – 3 hours	**3 – 6 hours**	**6 – 9 hours**	**9 – above**

SECTION C

USABILITY AND RELIABILITY OF e-LEARNING PLATFORMS

Please rank the following by crossing the most applicable. By using the scales 1 to 5.

Decision	**Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly**
Code	**1**	**2**	**3**	**4**	**5**
	Usability				

Us1	The user interface of e-Learning system is well organised and easy to navigate	1	2	3	4	5
Us2	The instructional interface of the e-Learning system functions correctly	1	2	3	4	5
Us3	The e-Learning system makes it easy for me to access course content	1	2	3	4	5
Us4	The e-Learning system allows me to complete and upload assignments efficiently	1	2	3	4	5
Us5	The e-Learning system gives me the opportunity to enhance my technical skills	1	2	3	4	5
	Reliability					
R1	The layout and user interface design of e-Learning platforms is friendly	1	2	3	4	5
R2	The overall e-Learning system is stable	1	2	3	4	5
R3	The e-Learning system provides the service I need	1	2	3	4	5
R4	The e-Learning platforms available provide complete information	1	2	3	4	5
R5	The functions and services provided by e-learning are satisfactory	1	2	3	4	5
	Students attitude towards e-Learning					
Sa1	I would like to communicate with all subject lecturers via the internet	1	2	3	4	5
Sa2	E-learning incorporates well with classroom learning	1	2	3	4	5
Sa3	I benefit from communicating with my lecturer online	1	2	3	4	5
Sa4	I receive adequate technical support for e-Learning	1	2	3	4	5
Sa5	E-learning is useful to my day-to-day learning programme	1	2	3	4	5
	Students' perceptions towards e-Learning					
	Perceived self-efficacy in e-Learning platforms use					
Sp1	The use of e-Learning has improved my academic performance	1	2	3	4	5
Sp2	I feel confident when using the e-Learning system on my own	1	2	3	4	5
Sp3	Using e-Learning fits well with the way I learn	1	2	3	4	5
	Perceived enjoyment of e-learning platforms use					
Sp4	I enjoy using e-Learning platforms as learning tools	1	2	3	4	5
Sp5	The use of e-Learning can simplify the learning process	1	2	3	4	5
Sp6	I am satisfied with e-Learning content	1	2	3	4	5
Sp7	I enjoy multimedia instructions	1	2	3	4	5
	Perceived usefulness of e-Learning platforms					
Sp8	The use of e-Learning increases my productivity	**1**	**2**	**3**	**4**	**5**
Sp9	The use of e-Learning has improved the quality of my work	**1**	**2**	**3**	**4**	**5**
Sp10	I believe that e-Learning enhances my learning experience	**1**	**2**	**3**	**4**	**5**

	Continued use of e-Learning					
Sp11	I intend to continue using e-Learning system to assist my learning	**1**	**2**	**3**	**4**	**5**
Sp12	I would like more time to be dedicated to e-Learning in my courses	**1**	**2**	**3**	**4**	**5**
Sp13	My interaction with the e-Learning system has improved	**1**	**2**	**3**	**4**	**5**
	Benefits of e-Learning					
B1	I can access it any place at time when it suits me	**1**	**2**	**3**	**4**	**5**
B2	I can access and share educational resources with ease.	**1**	**2**	**3**	**4**	**5**
B3	All types of learning styles are accommodated through e-Learning	**1**	**2**	**3**	**4**	**5**
B4	I get quick feedback through e-Learning	**1**	**2**	**3**	**4**	**5**
B5	I get access to wide and diverse interactions through e-Learning	**1**	**2**	**3**	**4**	**5**
B6	The e-Learning platform makes collaboration and interaction easier	**1**	**2**	**3**	**4**	**5**
B7	Learning material e-Learning is up to date	**1**	**2**	**3**	**4**	**5**
B8	Lecturers and students communicate better via the e-Learning platform	**1**	**2**	**3**	**4**	**5**
	Challenges of using e-learning platforms					
C1	There is inadequate training for e-Learning in my department	**1**	**2**	**3**	**4**	**5**
C2	I struggle to get technical support when I use e-Learning	**1**	**2**	**3**	**4**	**5**
C3	The instructions provided on e-Learning are difficult to follow	**1**	**2**	**3**	**4**	**5**
C4	I find it difficult to upload documents on e-Learning platform	**1**	**2**	**3**	**4**	**5**
C5	I find slow internet connectivity in using e-Learning	**1**	**2**	**3**	**4**	**5**
C6	I find it difficult to connect to e-Learning on my personal device	**1**	**2**	**3**	**4**	**5**

THANK YOU FOR TAKING PART IN THIS EXERCISE

APPENDIX D: DEMOGRAPHIC RESULTS

Table: Age Range

Age Group (years)	Frequency	Valid %	Cumulative %
18 - 25	134	83.8	83.8
26 - 30	18	11.3	95
31 - 40	8	5	100
Total	**160**	**100.0**	

Table: Gender

Gender	Frequency	Valid %	Cumulative %
Male	122	76.3	76.3
Female	37	23.1	99.4
Prefer not to say	1	0.6	100
Total	**160**	**100.0**	

Table: Level of Study

Level of Study	Frequency	Valid %	Cumulative %
1st year	73	45.6	45.6
2nd year	48	30	75.6
3rd year	23	14.4	90
BTech	16	10	100
Total	**111**	**100.0**	

Table: Computer Literacy

Computer Literacy	Frequency	Valid %	Cumulative %
Novice	18	11.3	11.3
Intermediate	113	70.6	81.9
Advanced	29	18.1	100
Total	**160**	**100.0**	

Table: Prior Experience with e-Learning

Response	Frequency	Valid %	Cumulative %
Yes	38	23.8	23.8
No	122	76.3	100
Total	**160**	**100.0**	

Table: E-learning platform ranking: Other (Specify)

E-learning platform Ranking: Other (Specify)	Frequency	Valid %	Cumulative %
Telegram	11	7.1	6.9
Email	10	6.5	6.3
Subject Videos	11	7.1	6.9
Others	95	61.3	59
None	28	18.1	11.3
Total	**160**	**100.0**	

Section B:

Table: Devices used to access e-Learning

Frequency of use	Frequency	Valid %	Cumulative %
1	10	6.3	6.3
1, 2, 3, 4	2	1.3	7.5
1, 2, 4	1	0.6	8.1
1, 3	9	5.6	13.8
1, 3, 4	24	15	28.7
1, 4	52	32.5	61.3
2	1	0.6	61.9
2, 3, 4	2	1.3	63.1
2, 4	1	0.6	63.7
3	5	3.1	66.9
3, 4	24	15	81.9
4	29	18.1	100
Total	**160**	**100.0**	

Table: Venues where e-Learning is accessed

Venues	Frequency	Valid %	Cumulative %
1, 2	14	8.8	8.8
1, 2, 3	25	15.6	24.4
1, 2, 3, 4	3	1.9	26.3
1, 2, 4	5	3.1	29.4
1, 3	3	1.9	31.3
1, 3, 4	3	1.9	33.1
1, 4	1	0.6	33.8
2	3	1.9	35.6
2, 3	9	5.6	41.3
2, 4	2	1.3	42.5
3	71	44.4	86.9
3, 4	8	5	91.9
3, 5	1	0.6	92.5
4	8	5	97.5
5	4	2.5	100
Total	**160**	**100.0**	

Table: E-learning platform adequate support

Response	Frequency	Valid %	Cumulative %
Yes	93	58.1	58.1
No	67	41.2	100
Total	**160**	**100.0**	

Table: Effectiveness of e-Learning platforms

Response	Frequency	Valid %	Cumulative %
Effective	104	65	65
Not effective	56	35	100
Total	**160**	**100.0**	

Table: Frequency of use of e-Learning platforms

Frequency of use	Frequency	Valid %	Cumulative %
Always	85	53.1	53.1
Occasionally	65	40.6	93.8
Never	6	3.8	97.5
Seldom	4	2.5	100
Total	**160**	**100.0**	

Table: Time spent on the internet

Amount of time spent on the internet	Frequency	Valid %	Cumulative %
<9hours per week	103	64.4	100
6-9 hours per week	35	21.9	35.6
3-6 hours per week	14	8.8	13.8
0-3 hours per week	8	5	5
Total	160	100.0	

Table: Time spent using e-Learning platforms

Amount of time spent using e-Learning platforms	Frequency	Valid %	Cumulative %
<9 hours per week	62	38.8	100
6 - 9 hours per week	38	23.8	61.3
3 - 6 hours per week	45	28.1	37.5
0 - 3 hours per week	15	9.4	9.4
Total	**160**	**100.0**	

APPENDIX E: DESCRIPTIVE STATISTICS

Table: Descriptive statistics of respondents on all statements

Variables	Categories	*F	**%
The user interface of e-Learning system is well organised and easy to navigate	Strongly disagree	10	6.3%
	Disagree	11	6.9%
	Neutral	42	26.3%
	Agree	76	47.5%
	Strongly agree	21	13.1%
The instructional interface of the e-Learning system functions correctly	Strongly disagree	8	5%
	Disagree	22	13.8%
	Neutral	48	30%
	Agree	64	40%
	Strongly agree	18	11.3%
The e-Learning system makes it easy for me to access course content	Strongly disagree	6	3.8%
	Disagree	16	10%
	Neutral	35	21.9%
	Agree	73	45.6%
	Strongly agree	30	18.8%
The e-Learning system allows me to complete and upload assignments efficiently	Strongly disagree	8	5%
	Disagree	23	14.4%
	Neutral	43	26.9%
	Agree	58	36.3%
	Strongly agree	28	17.5%
The e-Learning system give me the opportunity to enhance my technical skills	Strongly disagree	8	5%
	Disagree	6	3.8%
	Neutral	45	28.1%
	Agree	65	40.6%
	Strongly agree	36	22.5%
The layout and user interface design of e-Learning platforms is friendly	Strongly disagree	6	3.8%
	Disagree	17	10.6%
	Neutral	46	28.7%
	Agree	65	40.6%
	Strongly agree	26	16.3%
The overall e-Learning system is stable	Strongly disagree	16	10%
	Disagree	42	26.3%
	Neutral	50	31.3%
	Agree	39	24.4%
	Strongly agree	13	8.1%
	Strongly disagree	14	8.8%

Variables	Categories	*F	**%
The e-Learning system provides the service that I need	Disagree	24	15%
	Neutral	63	39.4%
	Agree	48	30%
	Strongly agree	11	6.9%
The e-Learning system provides complete information	Strongly disagree	9	5.6%
	Disagree	18	11.3%
	Neutral	66	41.3%
	Agree	51	31.9%
	Strongly agree	16	10%
The functions and services provided by the e-Learning system are satisfactory	Strongly disagree	10	6.3%
	Disagree	34	21.3%
	Neutral	56	35%
	Agree	48	30%
	Strong agree	12	7.5%
I would like to communicate with all subject lecturers via the internet	Strongly disagree	16	10%
	Disagree	11	6.9%
	Neutral	34	21.3%
	Agree	74	46.3%
	Strongly agree	25	15.6%
E-learning incorporates well with classroom learning	Strongly disagree	14	8.8%
	Disagree	19	11.9%
	Neutral	47	29.4%
	Agree	60	37.5%
	Strongly agree	20	12.5%
I benefit from communicating with my lecturer online	Strongly disagree	12	7.5%
	Disagree	17	10.6%
	Neutral	40	25%
	Agree	66	41.3%
	Strongly agree	25	16.6%
I receive adequate technical support for e-Learning	Strongly disagree	20	12.5%
	Disagree	46	28.7%
	Neutral	53	33.1%
	Agree	25	15.6%
	Strongly agree	16	10%
E-learning is useful for my day-to-day learning programme	Strongly disagree	7	4.4%
	Disagree	14	8.8%
	Neutral	52	32.5%
	Agree	63	39.4%
	Strongly agree	24	15%
	Strongly disagree	22	13.8%

Variables	Categories	*F	**%
The use of e-Learning has improved my academic performance	Disagree	29	18.1%
	Neutral	54	33.8%
	Agree	41	25.6%
	Strongly agree	14	8.8%
I feel confident when using the e-Learning system on my own	Strongly disagree	14	8.8%
	Disagree	12	7.5%
	Neutral	40	25%
	Agree	76	47.5%
	Strongly agree	18	11.3%
Using e-Learning fits well with the way I learn	Strongly disagree	15	9.4%
	Disagree	24	15%
	Neutral	57	35.6%
	Agree	48	30%
	Strongly agree	16	10%
I enjoy using e-Learning platforms as learning tools	Strongly disagree	13	8.1%
	Disagree	20	12.5%
	Neutral	33	20.6%
	Agree	67	41.9%
	Strongly agree	27	16.9%
The use of e-Learning can simplify the learning process	Strongly disagree	9	5.6%
	Disagree	17	10.6%
	Neutral	41	25.6%
	Agree	70	43.8%
	Strongly agree	23	14.4%
I am satisfied with e-Learning content	Strongly disagree	14	8.8%
	Disagree	29	18.1%
	Neutral	66	41.3%
	Agree	30	18.8%
	Strongly agree	21	13.1%
I enjoy multimedia instructions	Strongly disagree	7	4.4%
	Disagree	14	8.8%
	Neutral	40	25%
	Agree	71	44.4%
	Strongly agree	28	17.5%
The use of e-Learning increases my productivity	Strongly disagree	16	10%
	Disagree	24	15%
	Neutral	67	41.9%
	Agree	37	23.1%
	Strongly agree	16	10%
	Strongly disagree	16	10%

Variables	Categories	*F	**%
The use of e-Learning has improved the quality of my work	Disagree	33	20.6%
	Neutral	53	33.1%
	Agree	44	27.5%
	Strongly agree	14	8.8%
I believe that e-Learning enhances my learning experience	Strongly disagree	16	10%
	Disagree	17	10.6%
	Neutral	54	33.8%
	Agree	59	36.9%
	Strong agree	14	8.8%
I intend to continue using the e-Learning system to assist my learning	Strongly disagree	13	8.1%
	Disagree	14	8.8%
	Neutral	56	35%
	Agree	57	35.6%
	Strongly agree	20	12.5%
I would like more time to be dedicated to e-Learning in my courses	Strongly disagree	12	7.5%
	Disagree	16	10%
	Neutral	49	30.6%
	Agree	55	34.4%
	Strongly agree	28	17.5%
My interaction with the e-Learning system has improved	Strongly disagree	3	1.9%
	Disagree	8	5%
	Neutral	53	33.1%
	Agree	75	46.9%
	Strongly agree	21	13.1%
I can access it at any place and time it suits me	Strongly disagree	11	6.9 %
	Disagree	9	5.6%
	Neutral	30	18.8%
	Agree	29	18.1%
	Strongly agree	81	50.6%
I can access and share educational resources with ease	Strongly disagree	5	3.1%
	Disagree	11	6.9%
	Neutral	44	27.5%
	Agree	54	33.8%
	Strongly agree	46	28.7%
All types of learning styles are accommodated through e-Learning	Strongly disagree	51	31.9%
	Disagree	29	18.1%
	Neutral	34	21.3%
	Agree	27	16.9%
	Strongly agree	19	11.9%
I get quick feedback through e-Learning	Strongly disagree	15	9.4%

Variables	Categories	*F	**%
	Disagree	26	16.3%
	Neutral	48	30%
	Agree	50	31.3%
	Strongly agree	21	13.1%
I get access to wide and diverse interactions through e-Learning	Strongly disagree	13	8.1%
	Disagree	11	6.9%
	Neutral	52	32.5%
	Agree	64	40%
	Strongly agree	20	12.5%
The e-Learning platform makes collaboration and interaction easier	Strongly disagree	16	10%
	Disagree	11	6.9%
	Neutral	58	36.3%
	Agree	51	31.9%
	Strongly agree	24	15%
Learning material e-Learning is up to date	Strongly disagree	6	3.8%
	Disagree	13	8.1%
	Neutral	59	36.9%
	Agree	59	36.9%
	Strongly agree	23	14.4%
Lecturers and students communicate better via the e-Learning platforms	Strongly disagree	23	14.4%
	Disagree	18	11.3%
	Neutral	49	30.6%
	Agree	52	32.5%
	Strongly agree	18	11.3%
There is inadequate training for e-Learning in my department	Strongly disagree	18	11.3%
	Disagree	21	13.1%
	Neutral	49	30.6%
	Agree	39	24.4%
	Strongly agree	33	20.6%
I struggle to get technical support when I use e-Learning	Strongly disagree	11	6.9%
	Disagree	21	13.1%
	Neutral	46	28.7%
	Agree	50	31.3%
	Strong agree	32	20%
The instructions provided on e-Learning are difficult to follow	Strongly disagree	20	12.5%
	Disagree	39	24.4%
	Neutral	77	48.1%
	Agree	13	8.1%
	Strongly agree	11	6.9%
	Strongly disagree	25	15.6%

Variables	Categories	*F	**%
I find it difficult to upload documents on the e-Learning platform	Disagree	35	21.9%
	Neutral	51	31.9%
	Agree	39	24.4%
	Strongly agree	10	6.3%
I find slow internet connectivity in using e-Learning	Strongly disagree	13	8.1%
	Disagree	25	15.6%
	Neutral	50	31.3%
	Agree	43	26.9%
	Strongly agree	29	18.1%
I find it difficult to connect to e-Learning on my personal device	Strongly disagree	43	26.9%
	Disagree	43	26.9%
	Neutral	39	24.4%
	Agree	14	8.8%
	Strongly agree	21	13.1%

*F: Frequencies

**%: Percentage out of total

APPENDIX F: CORRELATION TEST RESULTS

Age range * Prior experience with e-Learning before studying					
			Prior experience with e-Learning before studying		Total
			Yes	No	
Age range	18 - 25 yrs	Count	28	106	134
		% within Age range	20.9%	79.1%	100.0%
		% within Prior experience with e-Learning before studying	73.7%	86.9%	83.8%
		% of Total	17.5%	66.3%	83.8%
	26 - 30 yrs	Count	9	9	18
		% within Age range	50.0%	50.0%	100.0%
		% within Prior experience with e-Learning before studying	23.7%	7.4%	11.3%
		% of Total	5.6%	5.6%	11.3%
	31 - 40 yrs	Count	1	7	8
		% within Age range	12.5%	87.5%	100.0%
		% within Prior experience with e-Learning before studying	2.6%	5.7%	5.0%
		% of Total	0.6%	4.4%	5.0%
Total		Count	38	122	160
		% within Age range	23.8%	76.3%	100.0%
		% within Prior experience with e-Learning before studying	100.0%	100.0%	100.0%
		% of Total	23.8%	76.3%	100.0%

Chi-Square Tests			
	Value	**df**	**Asymptotic Significance (2-sided)**
Pearson Chi-Square	8.011[a]	2	.018
Likelihood Ratio	7.068	2	.029
Linear-by-Linear Association	1.098	1	.295
N of Valid Cases	160		

a. 2 cells (33.3%) have expected count of less than 5. The minimum count is 1.90.

Table 4.8: Level of Study versus Level of Computer Literacy

		Level of Study	**Level of Computer Literacy**
Level of Study	Pearson Correlation	1	.284**
	Sig. (2-tailed)		.000
	N	160	160
Level of Computer Literacy	Pearson Correlation	.284	1
	Sig. (2-tailed)	.000	
	N	160	160