E-ASSESSMENT IN THE TEACHING AND LEARNING OF INFORMATION TECHNOLOGY AT A HIGHER EDUCATION INSTITUTION

By

Martin Koranteng Appiah

Thesis submitted in fulfilment of the requirements in respect of the Doctoral degree

Doctor of Philosophy

in

Higher Education Studies

in the

Faculty of Education

at the

University of the Free State

Bloemfontein

January 2018

PROMOTER: Dr SP van Tonder

DECLARATION

I, Martin Koranteng Appiah, declare that the thesis that I herewith submit for the Doctoral Degree, Doctor of Philosophy in Higher Education Studies at the University of the Free State, is my independent work, and that I have not previously submitted it for a qualification at another institution of higher education.

I hereby cede copyright of this thesis in favour of the University of the Free State.

Martin Appiah

Date: January 2018

REMARK

For the convenience of the examiners, I divided the thesis into two books since that will enable them to, while reading from the first book, easily compare the text and references in the text in all the chapters with the list of references and the appendices that appear in the second book.

EDITOR'S CERTIFICATE

Doctor of Philosophy
in
Higher Education Studies

E-ASSESSMENT IN THE TEACHING AND LEARNING OF INFORMATION TECHNOLOGY AT A HIGHER EDUCATION INSTITUTION

Martin Koranteng Appiah

I, the undersigned, hereby certify that the editing process comprised the following:

Language editing

- Syntax.
- Sentence construction.
- Grammar, punctuation, and spelling.
- Appropriate word selection.
- Final proofreading.

Format/layout editing

- Uniformity in page layout.
- Comparing in-text citations/sources in reference list.

Freelance editor	:	S M Bell
Completed	:	January 2018
Signature	:	Sue Bell

TRANS-EDIT - EDITING & AUDIO TRANSCRIPTIONS
Cell: 072 685 8040 / 072 953 7415
Website: www.manu-type.co.za
Email: mt@trans-edit.co.za

ACKNOWLEDGEMENTS

I want to express my heartfelt gratitude and appreciation to everybody who contributed to the completion of this study. Particularly, special thanks and acknowledgement go to the following contributors:

- My Heavenly Father, who gave me the strength and ability to complete this study.
- My dear wife Rita and my lovely son, Martin, thank you for your love, support and encouragement throughout this academic journey.
- My parents (Apostle and Mrs. Appiah) and siblings, thank you for your advice, patience and prayer support – It's finally over!
- My late father-in-law (Apostle J.W.D. Cudjoe), my mother-in-law, brothers-in-law, and sisters-in-law, thank you for your support.
- My promoter, Dr Fanus van Tonder, your wisdom and excellent supervision is worth mentioning. I feel honoured to have received supervision from you and could not have asked for a more suitable person to supervise me through this process, and for that I am sincerely grateful.
- All the participants who participated in the study, thank you for your time and contributions – I hope this product will be beneficial to you as well.
- My colleagues and friends, for your encouragement and advice.
- Mrs. Sue Bell, for the language editing, formatting and help with the list of references.

ABSTRACT

Recent developments in teaching and learning in higher education require of institutions to create learning environments which would enable their students to move away from the traditional, established norms of a surface learning approach to student engagement, and strategic and deep learning approaches. The latter are believed to ensure the delivery of graduates who can cope with the demands of the twenty-first century. In order for students to appropriately change their way of learning, there should also be a shift from the current focus on their abilities and lecturers' teaching, to how they could learn best, and how they confront the learning process.

Current views suggest that appropriate teaching and learning can occur if students are motivated to actively and deeply engage in the learning task by using teaching-learning activities that have been shown to have a high impact on student success. Furthermore, students can be empowered by using information and communication technologies (ICTs) to identify and reflect on what they learn, and improve their learning in this way. This can be effectively done in the context of blended learning, which includes face-to-face teaching and learning, e-learning, and also e-assessment. This usually takes place by involving special ICT-supported learning management systems (LMSs) that should ease the lecturer's task of managing the teaching and learning environment, and also enhancing students' learning experience.

In light of the significance of ICT-enhanced teaching, learning, and assessment of student success in higher education, this study endeavoured to identify how student assessment should feature in an e-learning environment and how such e-assessment could best be implemented through the Moodle LMS. This does not only apply in my own teaching of Information Technology (IT) as a discipline, but also in the teaching of IT by other IT lecturers at the Computer Training Institute (CTI) in South Africa.

A literature review exposed how the literature in general portrays the implementation of e-assessment in the teaching and learning of IT as an academic discipline in higher education. The empirical research that followed was informed by the literature and involved a qualitative, intrinsic, single case study research design with limited quantitative enhancement. The first round of empirical data collection involved questionnaire surveys and focus group interviews with purposefully selected IT lecturers and IT students of the institution. The self-constructed survey questionnaires were administered online and mainly contained open-ended questions. Two follow-up focus group interviews (one with IT lecturers and another with IT students) served as participant review opportunities of the findings of the initial questionnaire surveys, and thus strengthened the trustworthiness of the questionnaire data and findings. The IT lecturer survey focused on their experiences and perceptions of the implementation of e-assessment in their own teaching of IT. The IT student survey, on the other hand, focused on their experiences and perceptions regarding the role of e-assessment in their own learning of IT as a discipline.

The findings from the literature review, the questionnaire surveys, and the focus group interviews were subsequently compared, converged, and integrated in order to compile a preliminary framework for the implementation of e-assessment in the teaching and learning of IT at the institution. The preliminary framework was subsequently reviewed and validated by a purposefully selected panel of experts in the fields of teaching, learning, assessment, e-learning, e-assessment, ICT, and the teaching of IT as a discipline. The experts were requested to complete a self-structured, online questionnaire in which they could rate the importance of each feature in the preliminary framework as well as provide comments and suggestions in this regard. The findings obtained from this expert survey led to the amendment, removal, or addition of some features in the final framework which is presented in the last chapter of the thesis.

The significance of this study lies in the compilation of the framework for the implementation of e-assessment in the teaching and learning of IT in higher education. The proposed framework is based on sound theoretical principles reported in literature across the nation and the world, including guidelines provided by national and international assessment bodies, and was also informed by the expertise of participants that had relevant experience and knowledge pertaining to the topic. Fundamentally, this framework is based on an asset-based approach where the investigation of current effective practices is encouraged, and where individuals can learn from one another by frequently exploring the strengths and challenges pertaining to practices, and find practical solutions to problems. Although the aim of the study was not to generalise the findings; other stakeholders in higher education might opt to use these findings as a starting point whenever they intend to explore the implementation of e-assessment in their own teaching and learning. This is due to the generic nature of the features in the framework and since the framework is clearly not static.

Key words: higher education; student learning/engagement; learning approach; teaching and learning; assessment (*of/for/as* learning); e-learning; e-assessment; information technology; learning management system.

TABLE OF CONTENTS

ACRONYMS AND ABBREVIATIONS

AAC & U	Association of American Colleges and Universities
ARCS	Attention, Relevance, Confidence, Satisfaction
ASI	Approaches to Studying Inventory
ASQA	Australian Skills Quality Authority
CAA	Computer Assisted Assessment
CCSSE	Community College Survey of Student Engagement
CETIS	Centre for Educational Technology Interoperability Standards
CHE	Council on Higher Education
CMU	Carnegie Mellon University
CSFs	Critical Success Factors
CTI	Computer Training Institute
DET	Department of Education and Training
DFES	Department for Education and Skills
HE	Higher Education
HEIs	Higher Education Institutions
HEQC	Higher Education Quality Committee
HEQSF	Higher Education Qualifications Sub-Framework
HIPs	High Impact Practices
ICT	Information and Communication Technology
ILO	International Labour Organization
ILOs	Intended Learning Outcomes
IT	Information Technology
JISC	Joint Information Systems Committee
LCMS	Learning Content Management System

LDAP	Lightweight Directory Access Protocol
LMS	Learning Management System
MCQs	Multiple Choice Questions
MOODLE	Modular Object Oriented Dynamic Learning Environment
NIU	Northern Illinois University
NSSE	National Survey of Student Engagement
NSW	New South Wales
OELE	Ontology E-learning
OFQUAL	Office of Qualification and Examinations Regulation
PLE	Personal Learning Environment
PoPI	Protection of Personal Information
QAA	Quality Assurance Agency
RLE	Reality Learning Environment
SAQA	South African Qualifications Authority
SASSE	South African Surveys of Student Engagement
SCORM	Sharable Content Object Reference Model
SOLO	Structure and Observed Learning Outcome
SPQ	Study Process Questionnaire
SQA	Scottish Qualifications Authority
TLA	Teaching Learning Activity
UFS	University of the Free State
URI	Uniform Resource Identifier
VLE	Virtual Learning Environment

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION AND ORIENTATION

1.1 INTRODUCTION

The aim of this chapter is to familiarise the reader with the study. The chapter begins by providing a background to the research problem, followed by the research problem, research questions, aim, and objectives of the study. Subsequently, the theoretical and paradigmatic framework, the demarcation of the study, as well as the terms and concepts used in the study are clarified. A brief overview of the research design and methodology used for the study is discussed. In conclusion, the significance of the study and the layout of the chapters are provided. Figure 1.1 indicates the structure of this chapter:

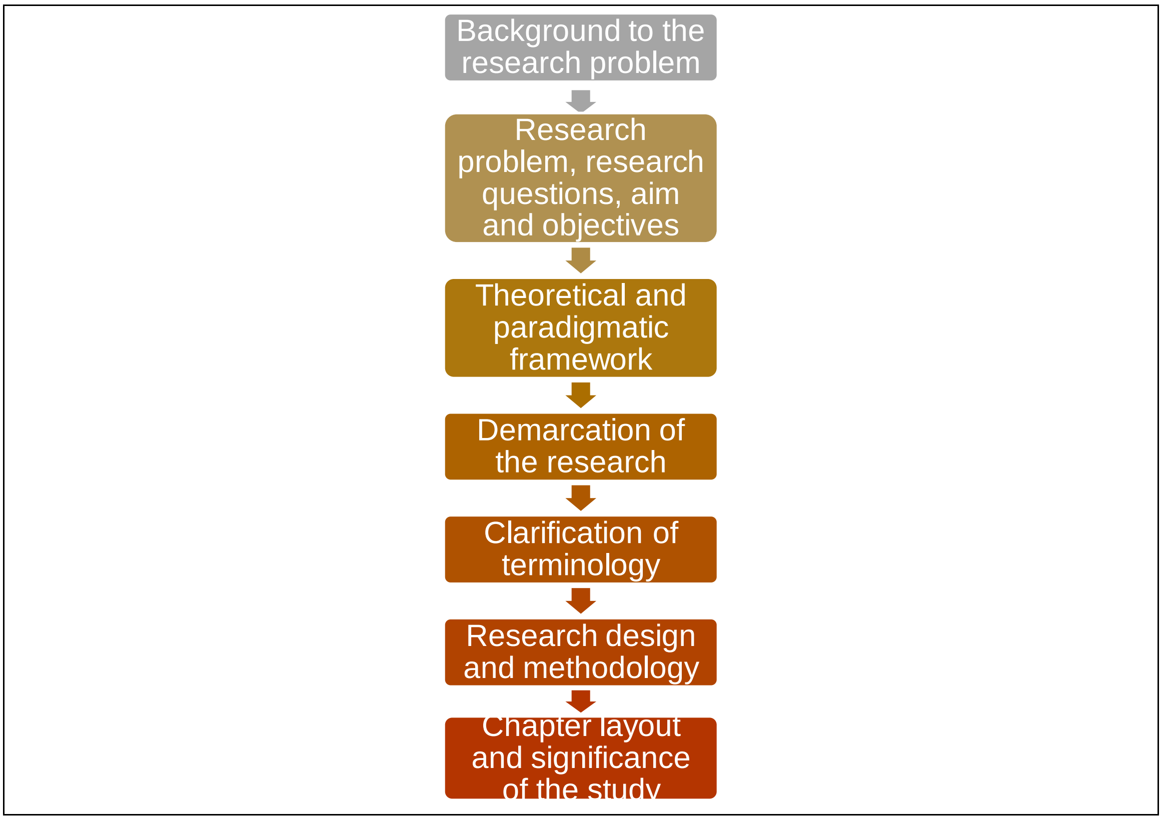

Figure 1.1: Structure of Chapter 1

Source: The researcher

1.2 BACKGROUND TO RESEARCH PROBLEM

Current perspectives on teaching and learning in higher education (HE) focus on creating student learning environments that will ensure that students shift from the conventional surface approach to learning that has long characterised the HE environment, towards engagement and strategic and deep learning approaches (see 2.2.4; 2.2.5; 2.4), since the latter are required in order to deliver graduates who are capable of coping with the demands of the twenty-first century (Van Tonder, Wilkinson & Van Schoor, 2005:1287). In this context, Biggs and Tang (2011:16-29) highlight a number of important issues that should be taken into account. They indicate that in order to ensure the required shift in student learning, the focus in teaching and learning should also move away from a conventional emphases on what the student is (e.g., his/her abilities) and what the lecturer does (e.g., teaching or lecturing) to *how students learn* and *what they do* in the learning process. Recent developments pertaining to teaching and learning, such as evidence-based student engagement (see 2.4) and high-impact teaching-learning activities (see 2.5) as well as the "flipping the classroom" movement may, in my view, be related to the above-mentioned perspectives.

However, Biggs and Tang (2011:70-78) also refer to the range of teaching-learning activities that are supported by contemporary information and communication technology (ICT), and the positive impact that they might have on student learning. Daly, Pachler, Mor, and Mellar (2010:619-620) concur that ICT provides an excellent medium for supporting student learning. Among the possibilities of using ICTs for the enhancement of teaching and learning, are the phenomena of e-learning and special ICT-supported learning management systems (LMSs) that could ease the lecturer's task of managing the teaching and learning environment (see 3.2.2; 3.2.4). Examples of such LMSs are Blackboard and Moodle (see 3.2.4).

Literature indeed emphasises the benefits of both e-learning (e.g., online learning facilitation without any face-to-face contact) and blended learning (a combination of contact tuition and e-learning) in the context of higher education. According to López-Pérez, Pérez-López, and Rodríguez-Ariza (2010:819), e-learning/blended learning has the capacity to improve, expand, and transform the way students learn as well as the way lecturers teach. Porter, Graham, Spring, and Welch (2014:186) purport that before any institution implements e-learning/blended learning, it should have clear goals that it intends to achieve. Some of these goals could include improved pedagogy, accessibility, flexibility, cost-savings, and the use of resources. Dias and Diniz (2014:307) contend that institutions need to rethink and reorganise their online teaching and learning dynamics by using different activities, such as online group interaction, teamwork, and forum discussions. These activities usually require the implementation of sophisticated roles in a higher-order combined learning process and knowledge structure. Dias and Diniz (2014:308) further argue that the quality of the blended learning process can be enhanced if institutions consider the flexibility of e-learning/blended learning in education and the relationships between students and lecturers.

Research has also shown that students learn what they think will be assessed (and how). This phenomenon was first coined by Elton (1987, in Biggs & Tang, 2011:197-198) as the *backwash effect of assessment on student learning* (see 2.2.6.2). One might therefore conclude that assessment in effect drives student learning. Instead of allowing this backwash effect of assessment to negatively affect students' approaches to learning (e.g., through merely memorising information) it is, according to Biggs and Tang (2011:197-198), possible to apply this backwash effect in a positive way through the deliberate constructive alignment of all teaching-learning activities and assessment tasks with the intended learning outcomes of the programme (see 2.7). Thus teaching, learning, and assessment are clearly interdependent and should be managed collectively.

In view of the above-mentioned value of ICT-enhanced teaching-learning activities in the context of an e-learning/blended learning environment as well as the integrated nature of teaching, learning and assessment, the question arises as to how assessment would feature in an e-learning/blended learning environment and how it could or should be applied in such a learning environment.

According to the Joint Information Systems Committee (JISC, 2007:43), e-assessment can be defined as "the end-to-end electronic assessment processes where ICT is used for the presentation of assessment activity and the recording of responses." E-assessment may therefore be part and parcel of an e-learning/blended learning environment.

Literature indeed indicates that e-assessment plays an important role in teaching and learning. Through e-assessment, students can be enabled to identify and reflect on what they have been taught and have learned in the context of blended learning (which includes e-assessment), thus improving the quality of their learning experience (Dermo, 2009:203). According to Brink and Lautenbach (2011:503-504), students and lecturers can benefit significantly from e-assessment if there is an effective connection between learning outcome, instruction, and assessment. Jordan (2014:1) points out that e-assessment can also improve students' learning experiences through the provision of information to lecturers about student errors and involvement, at their various levels of study. Assessment analytics can indicate students' involvement and their misunderstandings in e-assessment (Ellis, 2013:663). Furthermore, the process of assessing learners should improve with the implementation of e-assessment since it comes with benefits such as instant feedback, cost-saving (due to a paperless system), time-saving, and convenience to both the student and lecturer (Sorensen, 2013:173). Holmes (2015:1) emphasises that for e-assessment to be successfully implemented in any institution, one should encourage students' engagement through appropriate curriculum design which includes opportunities for e-assessment.

The JISC (2006:12) purports that “to create questions and assessments across disciplines, a staff education programme is normally required to ensure the staff have an accurate knowledge of the capabilities and limitations of e-assessment.” The JISC (2007:18) also reflects its own stance that “institutions that have adopted e-assessment have to develop the skills of the staff that support the e-assessment process.”

1.3 RESEARCH PROBLEM, RESEARCH QUESTIONS, AIM, AND OBJECTIVES

The sections below provide a description of the research problem, research questions, and the aim and objectives.

1.3.1 Research problem

Based on the background provided above, the research problem in this study is discussed briefly as follows:

E-learning and e-assessment became a possibility at the Computer Training Institute (CTI), which is a private higher education institution (HEI), in 2013 through the provision of access to the open-source Moodle learning management system (LMS) for lecturers and students of the institution. Having been an IT lecturer at CTI from 2013 to 2015, however, I observed that most lecturers at CTI with whom I came into contact did not use the Moodle LMS for the purpose of providing computer-enhanced teaching-learning and assessment opportunities for their students. As a lecturer who taught Information Technology (IT) on the Bloemfontein Campus of CTI, I also observed that even lecturers who teach the same subject were somewhat hesitant and unsure about how to use the LMS in their teaching of the subject and their assessment of student learning.

The JISC (2004:12) advocates staff development opportunities by stating, “To create questions and assessments across disciplines, a staff education programme is normally required to ensure the staff have an accurate knowledge of the capabilities and limitations of e-assessment.” In the absence of such development opportunities, I therefore believed that, at the very least, lecturers at CTI needed a kind of action plan or framework that provides guidelines for the implementation of an e-learning/blended learning mode of delivery through the Moodle LMS. Enquiries in this regard revealed that the institution was indeed researching how lecturers could be trained or advised to use the LMS in general, but that the institution’s investigation did not focus on the way in which the LMS could be utilised for e-assessment in particular. I therefore opted to take responsibility for investigating how e-assessment could be implemented through the Moodle LMS in my own teaching of the subject Information Technology, as well as in the teaching of IT lecturers at CTI.

1.3.2 Research questions

The above-mentioned research problem led to the formulation of the following primary and secondary research questions for this study:

1.3.2.1 Primary research question

How could CTI lecturers implement e-assessment in the teaching and learning of IT?

1.3.2.2 Secondary research questions

1. How does the literature portray, in general, the implementation of e-assessment in the teaching and learning of IT as a subject/discipline in the context of higher education (HE)?
2. How do IT lecturers at CTI experience and/or perceive the role of e-assessment in their teaching?
3. How do IT students at CTI experience and/or perceive the role of e-assessment in their own learning?
4. What would be the best way to implement e-assessment in the teaching and learning of IT as a subject/discipline at CTI?

1.3.3 Research aim and objectives

The ultimate aim of this research was to investigate how CTI lecturers could implement e-assessment in the teaching and learning of IT.

The abovementioned aim was collectively achieved through the seven objectives listed below.

1. To investigate how the literature portrays, in general, the implementation of e-assessment in the teaching and learning of IT in the context of HE (through a literature review).
2. To investigate how CTI IT lecturers experience and/or perceive the role of e-assessment in their own teaching by making use of a lecturer survey.
3. To investigate how CTI IT students experience and/or perceive the role of e-assessment in their own learning by making use of a student survey.
4. To compile a preliminary framework for the implementation of e-assessment in the teaching and learning of IT at CTI by comparing, converging, and integrating the data obtained from the literature review and the lecturer and student surveys.

5. To have the preliminary framework evaluated by means of a survey among experts in the fields of teaching and learning, IT as a discipline, information and communication technologies (ICTs) in education, assessment, e-assessment, and e-learning in higher education.
6. To adapt the preliminary framework, based on the findings of the expert survey.
7. To propose the adapted framework as a means to implement e-assessment in the teaching and learning of IT at CTI.

1.4 THEORETICAL AND PARADIGMATIC FRAMEWORK

The theoretical framework for the study was informed by existing/contemporary theories and conceptions pertaining to student learning (see 2.2), assessment *of*, *for,* and *as* learning (see 2.9.1; 2.9.2; 2.9.3), e-learning/blended learning (see 3.2), and e-assessment (see 3.3) in the teaching and learning of IT in a higher education (HE) context. The constructivist research paradigm underlies all my work in this study because I deliberately tried to obtain an understanding of the participants' experiences of e-assessment from their own point of view by means of applying a qualitative research approach (Hesse-Biber & Leavy, 2011:37; Jackson & Sorensen, 2003:257). Despite my preference for qualitative, constructivist research methods, however, I eventually used very basic quantitative data (frequencies) in the last questionnaire survey in order to support and validate my qualitative data and findings.

1.5 DISCIPLINARY DEMARCATION OF THE RESEARCH

The findings of the study are expected to be used by the lecturers in the Faculty of Information Technology at the CTI Education Group. Due to this, this study falls within the field of higher education studies, and overlaps the following of Tight's (2012:9) key themes in higher education research: course design (which includes assessment), teaching and learning, and the student experience in higher education.

1.6 CLARIFICATION OF CONCEPTS

The key concepts that are deemed profound in the research title, research problem, research questions, and the aim and objectives of this study will be briefly described in order to provide the reader with an understanding of the study.

1.6.1 Higher education

In this study, higher education refers to the tertiary/post-secondary education provided at education institutions that offer learning programmes that lead to qualifications that meet the requirements for accreditation by the Higher Education Quality Committee (HEQC) of the

Council on Higher Education (CHE), and registration on the South African Higher Education Qualifications Sub-Framework (HEQSF) (Council on Higher Education, 2008). In the context of this study, CTI is a higher education institution that offers relevant IT programmes which lead to a qualification that meets the requirements of the HEQSF).

1.6.2 Teaching and learning

In the context of this study, teaching and learning refer to a combined process where lecturers select/design and apply intended learning outcomes (ILOs), teaching/learning activities (TLAs), and assessment tasks (ATs) in order to facilitate successful learning among students (QAA, 2012:7; see 2.7.3.1; 2.7.3.2; 2.7.3.3)

1.6.3 Student assessment

Student assessment refers to the continuous process of evaluating students' understanding, capabilities, progress, and/or status, which should improve learning. In assessment, both lecturers and students perform some tasks in order to provide information that can be used critically in order to enhance the students' learning and the lecturers' teaching (Angelo, 1995:7; Black & Wiliam, 2010:82; the QAA, 2012:4).

1.6.4 E-learning/blended learning

For the purpose of this study, I define e-learning as the process of delivering teaching and learning information and communication through a networked or standalone computer and/or other storage devices such as CD-ROMs, DVDs, satellites, etc. E-learning can take the form of online learning facilitation without any face-to-face contact, whereas blended learning is a combination of contact tuition and e-learning in the context of higher education (Anderson, 2008:1; Nehme, 2010:223; Nichols, 2003:2; Welsh, Wanberg, Brown & Simmering, 2003:246; see 3.2.2).

1.6.5 E-assessment

E-assessment involves the use of any information and communication technological (ICT) devices to create, deliver, store and/or report students' assessment products and marks; and to provide feedback on the students' responses. Examples of devices that can be used to create and implement e-assessment tasks include laptops, desktop computers, smartphones, iPads, Android tablets, etc. (Crisp, 2011:5; Howarth, 2015:4; Office of Qualifications and Examinations Regulation (Ofqual, cited in Winkley, 2010:4)). In the context of this study, e-assessment involves the posting of assessment tasks on CTI's online learning management system (*myLMS*), the students' online completion of these tasks, marking of these tasks, storage of their responses, and the reporting of their performance via the myLMS system.

1.6.6 Information Technology (IT) as a subject/discipline

IT refers to the subject or discipline that is taught at CTI, which involves the study and application of computer technology (the entire programme that IT students at CTI study) (Lunt, Ekstrom, Gorka, Hislop, Kamali, Lawson, LeBlanc Miller & Reichgelt, 2008:9; see 4.2).

1.6.7 Learning Management System (LMS)

LMS refers to a software tool that is used by lecturers for creating, implementing, managing, and monitoring teaching, learning, and assessment activities for their students (McIntosh, 2015:5; Naidu, 2006:43).

1.7 RESEARCH DESIGN AND METHODOLOGY

This study involved a literature review ad an empirical investigation into the context of the research problem at the Faculty of Information Technology at the CTI Education Group in South Africa. The literature review served as the foundation for the empirical investigation that followed. In the empirical component, a qualitative, intrinsic single case study research design with only limited quantitative enhancement was used. This design enabled me to use different methods of data collection, including questionnaire surveys, focus group discussions, and document analysis.

1.7.1 Selection of participants

I made use of convenience and purposeful sampling and that enabled me to target individuals who were knowledgeable and had an understanding of my research problem. Thus, I was able to gather rich information from the lecturers and students of the CTI education group. In the case of the expert review and validation of the proposed e-assessment framework, some of the purposefully selected participants directed me to other participants who could provide rich information relating to my study (snowball sampling). Since the aim of the study was not to generalise the findings, I ensured that the sample size would allow for reaching a point where no new information was found (see 5.3.1.1[c]; 6.4.1).

In the first round of data collection (the initial lecturer and student questionnaire surveys and the focus group discussions), IT lecturers and IT students from the Faculty of Information Technology were invited to participate in the research (see 5.3.1.1 [d]). After the questionnaire surveys, semi-structured focus group interviews were conducted with a small group of IT lecturers and a small group of IT students to seek confirmation that the findings of the questionnaire survey were valid (see 5.3.1.1 [d]). The focus group interviews were thus also used as a participant review opportunity, which in turn strengthened the confirmability and credibility (trustworthiness) of the questionnaire data and findings.

For the focus group interviews with IT lecturers and IT students, I conveniently and purposively selected five IT lecturer participants and seven IT student participants from the Vanderbijlpark Campus of the CTI Education Group to take part, bearing in mind maximum variation of race, gender, and age (see 5.3.1.1 [c]; Merriam, 2009:78; McMillan & Schumacher, 2006:320).

During the second round of data collection (the survey among experts), I firstly selected a few expert participants based on their respective areas of expertise pertaining to teaching and learning, IT as a discipline, information and communication technologies (ICTs), assessment, e-assessment and e-learning in higher education, and other relevant factors pertaining to e-assessment in higher education. I requested some of these expert participants to nominate other relevant participants, which means that the selection developed from purposeful to snowball selection (see 5.3.1.1 [c]). The expert panel evaluated the preliminary framework that I designed from the literature review and the first round of data collection.

1.7.2 Data collection techniques

In the study, self-structured online questionnaires were used for both rounds of data collection (the first survey questionnaires for the students and lecturers, and the second survey questionnaires for the expert participants) (see 5.3.1.1 [d]).

The survey questionnaires for IT lecturers and IT students were informed by the literature review that was undertaken in Chapters 2, 3, and 4 respectively. The research question that the literature review focused on was the following:

- How does the literature portray, in general, the implementation of e-assessment in the teaching and learning of IT as a subject/discipline in the context of higher education?

The online survey questionnaires for the IT lecturers and IT students contained mainly open-ended questions. These two surveys were followed by equivalent focus group interviews with a small group of IT lecturers and a small group of IT students, the aim of which was to confirm the first survey findings.

The purpose of the second round of data collection was to enable the expert participants to review the viability of the proposed framework. A self-structured, online questionnaire was used and it included all the features and sub-features of a preliminary framework that I compiled by means of comparing, converging, and integrating the literature and empirical findings of the first round of data collection. All the features and sub-features listed in the questionnaire had to be rated by the expert participants as "*essential" (E), "useful" (U) or "not necessary" (N)*. In addition, the expert participants were afforded frequent opportunities to provide their comments and suggestions pertaining to groups of features (see 5.3.1.1 [d] [iii]).

1.7.3 Data analysis, interpretation, and reporting

The qualitative data obtained from all the questionnaire surveys and the focus group interviews were analysed by means of coding, reading, memoing, masking participants' identities, searching for patterns, and categorising data into appropriate themes and subthemes (see 5.3.2; Chapter 6). With regards to the analysis of the quantitative data obtained from the closed items requiring the rating of the importance of the features and sub-features in the expert questionnaire, I only applied very basic frequency analysis and reporting that assisted me in deciding whether a feature should be retained, amended, or discarded. Thus, this questionnaire consisted of both quantitative and qualitative components of data collection.

The QSRNvivo software assisted me with the qualitative data analysis processes. The data and findings are reported by means of thick/rich descriptions containing verbatim expressions made by some of the participants (see 5.3.2).

1.7.4 Ethical considerations

During the study, I paid attention to different ethical considerations. Informed consent and voluntary participation were explained to all the participants in the invitation e-mail in the online questionnaires as well as at the beginning of the focus group interviews. Where questionnaire participants failed to provide informed consent, they were taken to the end of the questionnaire, and could therefore not proceed in answering the questionnaire (see Appendix B). Instructions on how to complete the questionnaires (how to answer the questions) were clearly formulated in the online questionnaires. Participants were informed that they were free to withdraw from the study at any point in time without incurring any penalties (see 5.6.1). During the focus group interviews the participants were required to complete and sign a typed informed consent form before the interview started. I directly transcribed the sound recordings I made of the focus group interviews in such a way that the identities of the participants could not be traced. For this purpose, the participants' names were coded in the transcriptions and during analysis and reporting; all the data were password protected and locked away, and were therefore continually protected from being accessed by unauthorised people. During the data reporting, I also tried to ensure that the participants could not be identified based on the personal detail of the verbatim comments (see 5.6.2).

The Ethics Committee (Ethical clearance number: UFS-EDU-2015-001), Title Registration Committee, and the Faculty Board of the Faculty of Education at the University of the Free State respectively granted ethical clearance for the study and approved the registration of the study title. The Computer Training Institute's (CTI's) Ethics Committee (Ethical clearance number: 2/2016 MA) also granted ethical clearance and permission to conduct this research on its different campuses (see 5.6.4; Appendix A).

1.7.5 Role of the researcher in the investigation

I am currently employed as an IT lecturer at Vaal University of Technology. However, I started my lecturing career as an IT lecturer at the Bloemfontein Campus of the CTI Education Group in the Faculty of Information Technology in 2013 where I remained until 2015. The experience gave me an in-depth understanding of the background and expressions exposed in the study, but might also have influenced my interpretation and reporting of the data and findings.

During the reporting of results, I therefore deliberately strived to remain as honest and objective as possible, and reported both positive and negative results. Human bias was therefore not refuted, and I was devoted to disciplined subjectivity and reflexivity throughout the process (see 5.4; 5.6.5). I was also aware of the limitations pertaining to this study, which are reported in section 8.6 of the thesis.

1.7.6 Quality assurance of the study

In this study, I performed a literature review and investigated different perceptions and experiences of lecturers, students, and expert participants. The credibility of the findings was enhanced by means of follow-up focus groups with the lecturer and student participants, and by collecting data from the participants who were experts in the fields of teaching and learning, IT as a discipline, ICTs in education, assessment, e-assessment, and/or e-learning in higher education (see 5.5.1).

My promoter peer-reviewed and tested me in order to assist me in remaining honest throughout the study. He continually questioned me about my methods, meanings, and analysis but also allowed me to ask questions and voice my concerns (see 5.5.1).

To improve the trustworthiness and authenticity of the findings during the data reporting, verbatim accounts of participants' comments were used. I ensured that all participants remained unidentifiable (see 5.6.2). The transferability of the findings to related contexts was improved through detailed/thick descriptions of the literature, contexts, and the findings in order to ensure that the reader would be able to relate the findings to similar contexts and conditions that they might encounter (see 5.5.2).

For the purpose of dependability and confirmability, I ensured that the research study was based on rich, extensive, and appropriate data. I also provided an audit trail by providing in-depth explanations of how the findings were obtained. Dependability and confirmability of the findings were also improved through participant and peer reviews, as well as the triangulation of sources and types of data (see 5.5.3; 5.5.4).

Finally, during the interpretive data analysis stage, I applied *disciplined* subjectivity and reflexivity in order to understand the variety of perceptions and to detect possible bias. This means that in order to support the confirmability of the findings, I asked questions about my own preference, motivation, and concern.

1.8 SIGNIFICANCE OF THE STUDY

If e-assessment is ineffectively implemented by lecturers, it can negatively affect students' learning (Terzis & Economides, 2011:1032). Both IT lecturers and IT students at CTI would therefore benefit from this study because the proposed framework for e-assessment is expected to ease the implementation of e-assessment, which will be aimed at improving, expanding, and transforming the way IT students learn and the way IT lecturers teach (López-Pérez *et al.,* 2010:819).

I did not only compile the proposed assessment framework from the literature review on how students learn (see Chapter 2), e-learning, and e-assessment in higher education (see Chapter 3) and teaching, learning, and assessment in IT (see Chapter 4), but was also informed by the rich information provided by the participants who held relative to expert knowledge and experience of the related fields in the higher education environment (see Chapter 6). The preliminary framework was evaluated and validated by the expert participants in the fields of teaching and learning, IT as a discipline, ICTs in education, assessment, e-assessment, and e-learning in higher education (see Chapter 7).

The suggestions I make in this thesis are therefore not only based on good theoretical foundations, but can also assist lecturers and students to effectively collaborate in implementing e-assessment in their teaching and learning, respectively. Due to the many generic features/components included in the framework, it would not only provide significant guidelines for IT lecturers at CTI, but could also serve as a vantage point for other lecturers at CTI and at other higher education institutions who wish to explore the benefits and possible implementation of e-assessment in the teaching and learning of their respective disciplines.

The motivation of the proposed framework lies in an asset-based method where the investigation of current effective practices of e-assessment is encouraged; and lecturers, students, and institutions can learn from each other by identifying the strengths and areas of improvement in the e-assessment system.

1.9 CHAPTER LAYOUT

In order to address the primary research question, the individual chapters in this thesis address the particular secondary research questions that collectively enabled me to answer the primary research question. The thesis consists of two main sections, namely the literature review (Chapters 2 to 4) and the empirical study (Chapters 5 to 8). Chapters 2, 3, and 4 respond to secondary research question 1, whereas Chapters 5, 6, and 7 relate to secondary research questions 2 and 3, and Chapter 8 to secondary research question 4.

- Chapter 2 (How students learn: implications for student assessment in higher education) is organised in two parts, namely how students learn, and assessment in higher education respectively. This chapter commences by clarifying and discussing topics which are of broad and current interest such as student learning approaches, active learning, authentic learning, student engagement, and high-impact educational practices. With regards to assessment in higher education, the following topics are investigated: the relation between student learning and assessment; the importance of assessment for students, lecturers, and institutions; principles of good assessment; the constructive alignment in course design, of learning outcomes with teaching-learning activities (TLAs), and assessment tasks; assessment and evidence; the forms of assessment; assessment *of* learning (summative assessment), assessment *for* learning (formative assessment), and assessment *as* learning (self- and peer assessment); and assessment standards.

- Chapter 3 (E-learning and E-assessment) focuses on two main concepts in higher education, namely e-learning and e-assessment. The discussion on e-learning concepts focuses on the origin of e-learning; an overview of e-learning; modes or types of e-learning; the e-learning platform and environment; the relationship between e-learning and student performance; the advantages and disadvantages of e-learning; enabling factors and barriers to e-learning; critical success factors for e-learning implementation; e-learning and student motivation; and evaluating the effects of e-learning. In terms of e-assessment in higher education, constructs such as e-assessment feedback, compatibility and flexibility of e-assessment; the benefits and challenges of e-assessment; and the components of and requirements for e-assessment are discussed.

- Chapter 4 (Teaching, learning and assessment of Information Technology: Towards e-assessment in IT) reports different studies pertaining to the teaching, learning, and assessment in Information Technology as a subject/discipline. Constructs investigated in this chapter include the following: the definition of IT; curriculum design in IT; principles for IT curriculum design; teaching methods in IT; challenges in the teaching of IT; students' reasons for succeeding and/or failing in the learning of IT; ways of enhancing students' creative thinking skills in the learning of IT; the role of lecturers and students in the teaching and learning of IT; assessment design in IT; and forms of assessment in IT. The literature review reported in Chapters 2, 3, and 4 therefore provides the background that ultimately informed the empirical research in this study. The empirical research is expounded in this thesis in Chapters 5 to 7.

- Chapter 5 (Research design and methodology) outlines in more detail the research design and the methodology used in the empirical research study, which aimed at answering secondary research questions 2 and 3.

- Chapter 6 (Data analysis and interpretation) focuses on answering secondary research questions 2 and 3 by explaining the analysis and interpretation of the data collected during the first round of data collection (the first online questionnaire surveys and the focus group interviews). The data that were collected and are interpreted in this chapter are the perceptions and experiences of IT lecturers and IT students regarding the role of e-assessment in their teaching and learning respectively. Through comparing, converging, and integrating the literature review and empirical findings obtained from the first round of data collection, a preliminary framework was eventually compiled.

- Chapter 7 (Proposed framework for the implementation of e-assessment in the teaching and learning of Information Technology) focuses on answering the fourth secondary research question. This chapter therefore reports on how the preceding research findings were used to compile a preliminary e-assessment framework. It also reports on the second round of data collection and interpretation, namely the expert questionnaire survey through which the preliminary framework for the implementation of e-assessment in the teaching and learning of IT at CTI was eventually reviewed and validated by the expert panel.

- Chapter 8 (Towards a framework for the implementation of e-assessment in the teaching and learning of Information Technology: conclusions, implications, and limitations) concludes the study by re-examining the secondary research questions, determining how each secondary research question was addressed in this study, and how they collectively contributed to answering the primary research question. As a major recommendation, the final proposed and validated framework is presented as a means to implement e-assessment in the teaching and learning of IT at CTI. The chapter finally also focuses on the significance and limitations of the study as well as the implications these have for future research related to the implementation of e-assessment in different contexts.

1.10 CONCLUSION

In this chapter, the layout of the study which guided the research was provided. The remaining chapters will clarify and expand upon the various concepts and constructs that were referred to in this chapter.

This study began with a literature review, which was followed by an empirical study. The next chapter, Chapter 2, provides background information regarding how students learn and how student assessment is performed in higher education. Figure 1.2 provides an illustration of the sequence of activities and interrelated themes of the study.

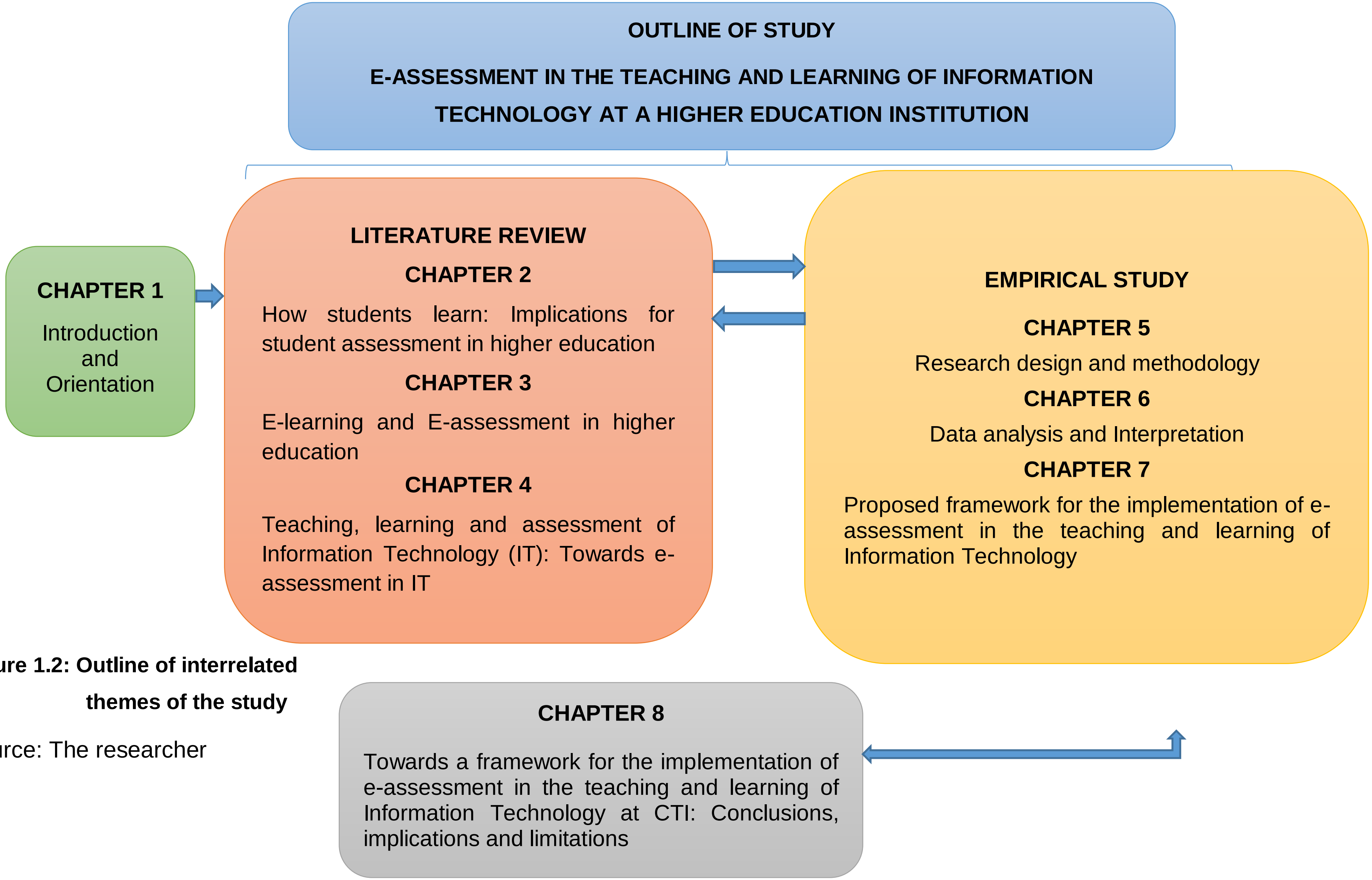

Figure 1.2: Outline of interrelated themes of the study

Source: The researcher

CHAPTER 2

HOW STUDENTS LEARN: IMPLICATIONS FOR STUDENT ASSESSMENT IN HIGHER EDUCATION

2.1 INTRODUCTION

In this review, various studies on student learning approaches; student engagement; active learning, and high-impact educational practices are reviewed. In addition, studies on assessment will be reviewed. Topics such as an overview of assessment; the importance of assessment for students, lecturers, and institutions; principles of good assessment; the constructive alignment of learning outcomes, teaching-learning activities (TLAs) and assessment tasks (ATs); assessment and evidence; lecturers' role in assessment; the forms of assessment; assessment *of* learning (summative assessment); assessment *for* learning (formative assessment), and assessment *as* learning (self and peer assessment); and assessment standards are investigated in this literature study chapter.

This chapter is divided into two sections, namely: how students learn (student learning approaches, active learning, authentic learning, student engagement, and high impact educational practices), and assessment *of/for/as* learning in higher education.

How students learn is discussed in the first section.

2.2 STUDENT LEARNING APPROACHES

The origin and discussion of student learning approaches (surface, deep, and strategic/ achieving learning approaches) are elaborated in this section.

2.2.1 Origin of student learning approaches

The surface and deep learning approach model came into place when experts in the field of higher education were trying to expand the educational debate away from only intrinsic student abilities (Beattie, Collins & McInnes, 1997:1-2; Cuthbert, 2005:236; Howie & Bagnall, 2012:390). It could be said that the field of higher education was looking for an integrated model or an answer to questions about students' learning, which also involved the student learning environment, curriculum design, and assessment (Biggs, 1976:46; Haggis, 2003:92-93). Ideally, it could be said that the surface and deep learning approach model gave an answer to this question. After the development of this model, however, research into surface and deep learning approaches became vague, and there was little competition for its control of the field (Malcolm & Zukas, 2001:35; Webb, 1997a:198). Ramsden (2003:43) confirms that the two different ways students relate to learning are indeed surface and deep learning approaches. There are two related ways one can view students' learning approaches: the first aspect focuses on what the students understand, and the other aspect deals with how the students structure a task. Some literature on student learning use the terms 'deep-holistic' and 'surface-atomistic' to define the mixture of these two aspects, although the terms deep and surface are often used (Ramsden, 2003:43).

Although John Biggs was not the initiator of the concepts "deep" and "surface" learning approaches he made these terms popular, and has made a significant contribution to the success of the model among students, lecturers, and institutions (Walker, 2005:535-536). Originally these terms were introduced by Marton and Säljö (1976a:4-6, 1976b:116-117) who found that the students they were researching exhibited a surface learning approach and/or a deep learning approach. During Marton and Säljö's research with the students, they gave them a text to read and told the students that some questions would be asked after they had read the text. These authors then identified the students who mainly reported series of unconnected facts as having used a surface learning approach. Those students who provided meaningful explanations about the text were referred to as having used a deep learning approach.

Since the original work of Marton and Säljö, the model of deep and surface learning approaches has been implemented by four main groups of academics and researchers under the heading "approaches to learning": a Lancaster group, led by Entwistle; an Australian Group led by Biggs; a Swedish group led by Marton; and a Richmond group led by Pask (Beattie *et al.,* 1997:3). All these groups have contributed hugely to the studies of surface and deep learning approaches. According to Beattie *et al.* (1997:4-5), the major issue with this model of approaches to learning is the fact that the core structure and meaning of the model were not clear. This is attributed to the fact that the model was quickly and efficiently used immediately as it came into place. The model was accepted and used in the field of higher education before the key areas of the model had been clarified in depth, i.e., researchers and theorists failed to look into the core structure and meaning of the learning approaches model.

Research, done by Biggs and others, continued to duplicate the model of surface and deep learning approaches. These researchers reconfirmed that surface and deep learning approaches are used by students and could be tested for, but without rigorous evaluation of the fundamental structure and meaning of the model itself (Beattie *et al.,* 1997:1-12; Biggs & Tang, 2007:24-26; Malcolm & Zukas, 2001:33-42). As a result, there was a need for research on the fundamental structure and meaning of the surface and deep learning approaches. Different applications were developed for the learning approaches model for institutions. Some of these applications were Biggs's 'Structure and Observed Learning Outcome' (SOLO) taxonomy, Entwistle and Ramsden's 'Approaches to Studying Inventory' (ASI), and Biggs's "Study Process Questionnaire" (SPQ) (Biggs, Kember & Leung, 2001:135-137).

Research using questionnaires to study student learning approaches have been ongoing for years. The Study Process Questionnaire (SPQ) of Biggs was mostly used in higher education in determining students' learning approaches (Biggs *et al.,* 2001:135-137). Studies that used the original SPQ had the tendency to find accurate relationships between good assessment outcomes and deep learning approaches (Snelgrove & Slater, 2003:498; Zeegers, 2001:131-132). However, since the original version of the SPQ was too protracted and unpredictable, it led to a revised version, the Revised Two-Factor Study Process Questionnaire (R-SPQ-2F), which was developed by Biggs *et al.* (2001:135-137) to simplify the administration and interpretation of student responses. This updated questionnaire has been proven to be reliable and valid for identifying deep and surface learning approaches (Biggs *et al.,* 2001:135-137).

2.2.2 Overview of student learning approaches

Zhang and Sternberg (2000:470) define "learning approach" as the inspiration and the implementation of applicable strategies by students to learn. They further say that the term "approach" defines what and how students learn rather than how much they remember. Students relate various activities in various ways when they learn. Ramsden (2003:45) also states that learning approaches are not traits or intrinsic characters of a student; instead they signify the set of activities of a learner.

From the above definitions, I view the term "learning approach" as the relationship between students and the learning process they are undertaking.

2.2.3 Surface learning approach

Biggs defines a surface learning approach as an approach where a student only learns to acquire the minimum pass rate and the minimum requirement of the course he/she is learning (Biggs & Tang, 2011:24). They state that a surface approach occurs when one intends to finish a particular activity without going through a lot of problems but aims at easily meeting the course requirements. When this happens, students use lower levels of thinking instead of higher levels of thinking to perform the activities well. Biggs and Tang (2011:24) prefer to use the terms 'cutting corners' and 'sweeping under the carpet'. Ramsden (2003:46) states that surface learning approaches should not be tolerated in higher education institutions if they intend to maintain their educational values. Although a surface learning approach may allow some students to emulate authentic learning and deceive their lecturers to think that they have learned, this approach is a poor learning approach (Ramsden, 2003:46).

According to Biggs (in Biggs & Tang, 2011:24) students who use a surface learning approach often merely memorise facts instead of concentrating on an in-depth understanding, expand their essays to make them appear more important than they are, and list points instead of addressing an argument. Finally, they hardly look at original work done by others; instead they depend on other people's interpretations. A surface approach may help a student to pass an examination but because he/she only memorises the basic concepts, the possibility of the student forgetting everything almost immediately is very high. Marton and Säljö (1984:46) state: "we are not arguing that the deep/holistic approach is always 'best': only that it is the best, indeed the only, way to understand learning materials."

Webb (1997a:195-212), however, mentions that memorisation of concepts is not always a surface learning approach, as alleged by Biggs and Tang (2011). It is sometimes acceptable depending circumstances, for example a drama student who will memorise his/her lines for a play. Sometimes students are also required to memorise certain formulae. He further states that memorisation sometimes plays a vital role in being able to apply a deep approach; for example, during an examination. This is termed "deep memorizing" by Tang (1991:10). In deep memorising, the student intends to understand in detail but is also required to remember detail quickly. Those details are, however, connected so that correct recollection of the part can give access to the entire concept.

2.2.3.1 Why/when do students take a surface approach to learning?

Various authors identify reasons why students implement a surface learning approach viewed from both the student's and lecturer's side. They state that students take a surface learning approach when they:

- only want to attain the minimum pass rate (Biggs & Tang, 2011:25);
- are interested in other things besides academic work (Biggs & Tang, 2011:25);
- feel the workload is too much and that he/she does not have enough time (Biggs & Tang, 2011:25);
- do not understand the task requirements (Biggs & Tang, 2011:25);
- genuinely do not understand a specific concept in depth (Biggs & Tang, 2011:25);
- make use of rote learning (Lublin, 2003:4);
- do not go beyond the course requirements (Lublin, 2003:4); and
- their motivation is fear of failure (Lublin, 2003:4).

2.2.3.2 How do lecturers influence students to take a surface approach to learning?

According to Biggs and Tang (2011:25), lecturers influence students to take a surface learning approach when they:

- use bullet points in their teaching instead of detailed description;
- mainly use multiple choice and true/false questions to assess students;
- make the concepts they are teaching and assessing seem irrelevant;
- provide too little time for students to perform tasks, and also cover concepts without going deep into their meaning;
- put pressure on students, making them feel as if they are failures.

The relation of the above student and lecturer factors escalates the possibility of a student using a surface approach to learning. Biggs and Tang (2011:26) claim that students might continue to use a surface approach even when a lecturer uses the best teaching and assessment methods. According to Trigwell and Prosser (1991:253), it is easier to create an activity that supports a surface learning approach than an activity that supports a deep learning approach. It is therefore very important that lecturers avoid assessments that support a surface approach.

2.2.4 Deep learning approach

According to Biggs and Tang (2011:26), the deep learning approach, unlike the surface learning approach, occurs when a student feels he/she needs to be actively involved in activities, and also has to obtain a deep understanding of the task. This requires students to have a good background with appropriate prior understanding. Biggs and Tang (2011:26) further state that students who use this approach have a positive attitude towards the tasks they are performing. In other words, they show interest, see the significance of the task, try to question the task, and experience gratification in the learning process. They ask questions and expect valuable answers.

2.2.4.1 Why/when do students apply a deep learning approach?

Various authors outline reasons why students implement a deep learning approach from both the student’s and lecturer’s perspectives. They state that students take a deep approach when they:

- are actively engaged in tasks in a meaningful and appropriate way (Biggs & Tang, 2011:26-27; Lublin, 2003:3);
- have the ability to focus on the core concepts (Biggs & Tang, 2011:26-27);

- prefer working conceptually instead of working with separate details (Biggs &Tang, 2011:26-27);
- are subjected to a problem-based course design (Newble & Clarke, 1986:269; Sadlo & Richardson, 2003:256);
- try to evaluate content and want proof of concepts (Lublin, 2003:3);
- have intrinsic interest in the subject (Lublin, 2003:3);
- apply whatever they learn to a real world situation (Lublin, 2003:3):
- study beyond the course requirements (Lublin, 2003:3).

2.2.4.2 How do lecturers influence students to take a deep approach to learning?

According to Biggs and Tang (2011:25), lecturers influence students to take a deep learning approach when they:

- teach in a way that clearly elicits the details of the topic or subject;
- implement teaching methods that actively engage students, i.e., by asking questions frequently; giving them problems to solve, etc.;
- teach by adding to what students already know and not stating facts that they already do know;
- identify and address students' misconceptions pertaining to a topic or subject;
- assess students for core concepts rather than for unrelated facts which cause students to only list facts;
- teach and assess students using methods that support the main aims and learning outcomes of the course.

According to Biggs and Tang (2011:27), the relationship of the above student and lecturer factors that lecturers use in their teaching, influences the possibility of a student using either a deep or a surface learning approach. Good lecturers motivate their students to know, make them curious about the subject, and build on their previous understanding of concepts. These are the very things that a less capable lecturer will not do. Biggs and Tang (2011:27) state that a student's desired learning approach also depends on factors such as the student's capability, previous knowledge, the lecturer's teaching methods, course materials, and assessments.

2.2.5 Strategic/achieving learning approach

In the 1970s, interview-based research performed in Britain and Sweden (in Richardson, 2005:10) identified a third learning approach called the strategic learning approach. This was supported by Biggs (1987:19-20) who stated that the strategic learning approach comprises learning that ensures that students achieve high grades and/or better career prospects through a deeper understanding of concepts. He points out that each learning approach is influenced by learning motives and learning strategies.

There is a clear difference between the strategic/achieving learning approach and the other two learning approaches (surface and deep), due to the fact that the achieving approach relates to the strategic ways in which students establish the context of the learning activities, such as the time and energy they put in the tasks, whereas surface and deep learning approaches define ways in which students engage with the content of tasks. The achieving approach can therefore be related to the deep or surface, or both, learning approaches.

2.2.5.1 Why/when do students take a strategic approach to learning?

According to Lublin (2003:4), students use the strategic learning approach when they:

- have the intention of achieving high marks;
- use their time and energy effectively;
- see to it that their course materials are accurate;
- peruse past examination papers to gain knowledge concerning what to expect in current examinations;
- take into consideration any hint about marking schemes.

2.2.5.2 How do lecturers influence students to take a strategic approach to learning?

According to Lublin (2003:4), lecturers influence students to take a strategic approach when they:

- teach students to be engaged with their teaching-learning activities (TLAs);
- teach students to learn beyond the course curriculum and/or requirements;
- allow students to explore beyond the content taught in the classroom.

When the strategic approach is linked with the deep approach, students engage very well with and will be successful in the subject (Biggs, 1987:20-21).

2.2.6 Teaching and learning issues that affect students' learning approaches

The following teaching and learning issues affect students' learning approaches:

2.2.6.1 Workload

When students feel that the workload is excessive, they tend to apply the surface approach to learning. This, however, puts pressure on lecturers as they are always torn between either spoon-feeding the students to make them pass exams, or adjusting the content of the subject to actively involve students (Lublin, 2003:6; Evans, Kirby & Fabrigar, 2003:510).

Lublin (2003:7) states that one can avoid workload pressure by practising the following:

- Contacting other lecturers to see if there are ways to rationalize the content of the subject in order to avoid pressure.
- Being realistic with what you expect from students. The lecturer can discuss the work with them and, if possible, spread the work across the week or semester.
- Discussing the best way of studying the subject with the students; they can then give their opinion and realise the effort they need to apply in studying the subject.

2.2.6.2 Assessment and learning outcomes

Lublin (2003:8) and Evans, Kirby, and Fabrigar (2003:510) indicate that assessment is the tool that mostly determines the learning approach that a student adopts. When assessment tasks are not appropriate, students are able to acquire good marks by memorising concepts. Assessments by lecturers therefore influence students' learning approaches. Students use the surface approach in their learning when assessment tasks only require them to list concepts without elaborating on those concepts (Biggs & Tang, 2011:24). The students tend to memorise the concepts without having a deep understanding (see 2.2.3). Assessments that allow students only to memorise concepts are often not aligned with the aims of the subject being taught. Biggs and Tang (2011:24-25) emphasise that when students use a surface learning approach it proves that something is lacking in the lecturers' teaching and assessment methods; and this needs to be addressed.

According to Biggs and Tang (2011:197), lecturers perceive learning outcomes as the important aspects of learning that students have to accomplish at the end of their course. However, Ramsden (1992:187) states that, from the students' viewpoint, the course they are studying is characterized by assessment.

Due to this misconception, students concentrate more on what they perceive they will be assessed on. This idea is what Elton (1987:92) refers to as "backwash." Biggs and Tang (2011:197) state that backwash becomes negative in institutions where their assessment is predominately exam-based. In such an environment lecturers intentionally teach their students ways and techniques of answering exam questions. When this happens, students rather go through past papers and identify trends of questions and answers without having a deeper understanding of what they are studying. In other words, students concentrate on just passing rather than understanding (surface learning approach) and that is negative backwash.

However, positive backwash occurs when lecturers integrate the intended learning outcomes in the assessments they give to their students. When this integration takes place, students will be able to learn and show their understanding of the learning outcomes. This will change the way they learn; that is, they will move from a surface to a deep learning approach (Biggs & Tang, 2011:198).

Tian (2007:387) emphasises that "a good assessment method should be able to distinguish between deep learners and surface learners; this will ensure that deep learners are rewarded and surface learners are penalized." Tian's research established that assessment in the form of essays rewarded deep learners and penalized those who used a surface learning approach.

Prosser and Trigwell (1999:4) conclude that deep learning approaches, which are more complete ways of understanding a concept, have the tendency of producing high quality learning outcomes.

2.2.6.3 Teaching-learning activities (TLAs)

There should be a relationship between learning outcomes and TLAs. The TLAs used by lecturers affect the learning approaches of students. If, for instance, the learning outcomes require students to implement higher-order thinking (related to action verbs such as apply, evaluate, analyse, examine, argue, and justify), then the lecturer's TLAs should support these capabilities. The TLAs may then require students to be involved in group discussions, solve problem-based questions and/or write essays. When this happens, students will begin to think about the subject and be actively engaged in all activities which, in the end, will encourage a deep learning approach (Lublin, 2003:9; Evans, Kirby & Fabrigar, 2003:510).

Conversely, the conventional way of lecturing encourages students to be passive instead of engaging in the subject, which in turn prevents them from developing higher level cognitive capabilities, which are usually stated in learning outcomes. Teaching which motivates students to be independent, active learners tend to encourage a deep learning approach (Lublin, 2003:9; Evans, Kirby & Fabrigar, 2003:510).

2.2.6.4 Student choices

Students are interested in different subjects, and when they show interest in a particular subject they are motivated to learn and will participate fully in all activities associated with that subject. This promotes a deep learning approach. However, students are sometimes forced to take subjects that they are not interested in. These subjects might be compulsory or even elective. When this happens, they just follow the course requirements and their main approach is surface learning, which is to see them through and pass the course (Lublin, 2003:9-10).

Although there are other contextual factors (e.g., lecturing styles, types of TLAs offered, etc.), students may also implement a deep learning approach when they are allowed to make their own subject choices. Where this is not possible, students should be taught in a way that will kindle an interest in the subjects that they have to take (Lublin, 2003:9-10). According to Lublin (2003:6-10), several other factors can also affect the choice of a student's learning approach. These may include workload, assessment, extrinsic motivation, traditional tertiary teaching, interactive teaching, and poor assessment.

2.2.7 Conclusion: student learning approaches

Arguably, one cannot be either a surface or a deep learner. Instead, one can learn concepts in a surface or a deep manner. Students' approaches to learning differ from task to task as well as within different disciplines/subjects (Ramsden, 2003:49). While some of the students focus on memorising and organising unrelated series of course content in order to enhance their knowledge, others focus on a way of putting together and conceptualising personal meaning from the same material. According to Ramsden (2003:51), the best two known questionnaires for examining different learning approaches were created by Biggs and Entwistle, and their colleagues.

In research done by Svensson (1977:233-243), he asked students to read experiments and theoretical studies. He recognised surface and deep learning approaches in both reading experiments and theoretical studies, and established that learning approaches and learning outcomes have close relationships. It was found that 99% of students who used a deep approach in reading the experiments and theoretical studies excelled in all their examinations.

It can be confirmed from the above literature that students learn through different approaches. However, these approaches are affected by many factors. All literature referred to above shows that a surface learning approach should not be accepted in the context of higher education, since students who use this approach tend to easily forget what they have learned. They cannot apply knowledge which they do not properly understand. Conversely, students who use a deep learning approach tend to have a deeper understanding of what they have learned and attempt to achieve more than what the course requires. I believe that such students become successful, even after completing their education, because they are able to think critically.

The third approach discussed above, which is the achieving/strategic approach to learning, is often used by deep learners who intend to achieve excellence or high grades in their courses (see 2.2.5). The strategic, deep learner is a fulfilled learner. Through my teaching I have encountered students who apply all three approaches and I agree that factors such as teaching and assessment methods, workload, and time, affect a learner's approach. I also agree with Biggs (1987:19-21) and Lublin (2003:3) that, if lecturers use effective teaching and assessment methods, students will be encouraged to learn using a deep learning approach and ultimately, a strategic/achieving approach to learning.

I am also of the opinion that students who use a deep and a strategic learning approach are more satisfied than learners who merely take a surface learning approach.

2.3 ACTIVE LEARNING

This section discusses the overview of active learning, active learning activities, and authentic learning.

2.3.1 Overview of active learning

The current state of higher education no longer supports the passive intake of information by students where lecturers' present information and students just sit back and listen. It rather portrays an image of the need for active involvement and engagement of students (Bassendowski & Petrucka, 2013:665-667).

According to Prince (2004:223), active learning takes place when the lecturer applies "any instructional method that engages students in the learning process." It requires that students think about what they are doing while completing learning activities. Active learning also enhances critical thinking due to the fact that it requires of students to apply theory to real-world problems (Prince, 2004:223; Cavanagh, 2011:23-25). Through reading, writing, talking, and even acting out certain scenarios, students are provided with the opportunity to solve real-life problems. Active learning also engages students in higher order thinking activities such as synthesis, analysis, and evaluation (Fitzsimons, 2014:11-14).

For lecturers to engage students in their teaching, Bonwell and Elson (1991:2) and Cavanagh (2011:28-29) advise that they should be exposed to learning activities between their lectures. They point out that this will actively engage the students and help them to learn. Although there are time constraints when comparing active teaching-learning strategies to traditional teaching-learning strategies, one has to weigh this up against the considerable benefits that active learning provides for students, such as improved in-depth, long-term learning as well as developing new writing, coordination, collaboration, research, and leadership skills (Cavanagh, 2011:23-25).

Bonwell and Elson (1991:24) clearly state that teaching that takes place only in the traditional classroom affects the way students learn. They also say that if the aim of a lecturer is to improve the critical thinking skills of students, they will have to implement different teaching strategies. Bonwell and Elson (1991:36) also state that if the learning outcome of a subject only encourages students to recall information at the end of the semester, then discussion will be preferred to a lecture. The discussion will enable students to apply their knowledge to situations, change their attitudes, solve problems, think critically, and motivate them to learn further in the course they are engaged in.

Machemer and Crawford (2007:10) claim that active learning does not mean that lectures should not take place, but instead it should allow students to reflect on, assess, explore, and communicate what they have learned.

According to Bassendowski and Petrucka (2013:665-667), in order for teaching and learning to move into the twenty-first century, it is imperative for pedagogies to be reinvented. Educators therefore need to transform their teaching strategies from the more traditional methods of merely passing on information to students (e.g., through lecturing) to more student-centred activities that encourage and enhance student collaboration and student engagement. In support of this theory, one of the most important aspects that educational institutions can perform today is to provide student-centred learning environments (Doyle, 2008:15): a student-centred learning environment enables students to take full control of and responsibility for their learning. This affords them the opportunity to choose what and how they want to learn. A student-centred teaching approach substitutes lectures with active learning, and enhances collaboration between students and their peers. A student-centred teaching environment needs lecturers to motivate students to learn or create opportunities to learn, and this will also help students to take responsibility for their own learning (Felder & Brent, 1996:43).

Cavanagh (2011:28-30) concludes that if students collaborate on activities, their understanding of the content may improve as they engage actively in the learning process. Bonwell and Elson (1991:2) also state that active learning “involves students in doing things and thinking about the things they are doing.” Simply put by Millis (2012:1): “active learning occurs when students read, write, discuss and solve problems, which in turn, help them to learn more.” Although many academics claim that lecturing is still the most important tool to effectively deliver module content, especially when content is complex and classes are large, there is increasing evidence confirming the significant influence that active learning has on the students’ learning, understanding, and critical thinking skills (Komarraju & Karau, 2008:70-82; Fitzsimons, 2014:11-14).

2.3.2 Active learning activities

Lumpkin, Achen, and Dodd (2015:124) indicate the following active learning activities that improve student learning:

2.3.2.1 Exploratory writing activities

Lumpkin *et al.* (2015:124) advise that if lecturers are able to combine their lectures with short assignment writings or prescribe different writing exercises to be carried out in the interim periods between classes, students' learning may be of high quality. They contend that students become more engaged in discussions, are ready for class, and think critically when exploratory writing activities are given in class. Bean (2011:7) adds that "perhaps more than any other instructional tool, exploratory writing transforms the way students study for a course because it can make active critical thinking about course subject matter part of each day's homework."

Fry and Villagomez (2012:173) emphasise that if students "write-to-learn," they obtain a better understanding of the topic they are dealing with. They become able to reason and understand through writing.

Many other researchers have suggested the use of minute papers (Mansson, 2013:343-344; Millis, 2012:3). Minute papers help students to reflect (in writing) on what they learned in class by answering questions such as "What did you learn today?" or "What was not clear to you in today's lesson?" This type of write-up helps the students to critically think about the lesson that was taught for the day and greatly improves their learning and understanding (Anderson & Bums, 2013:221; Stead, 2005:119). Students also become adept at linking concepts, applying active learning, getting instant feedback, and applying what they have learned to real-world situations.

2.3.2.2 Small-group discussions

This active learning strategy enables students to interact with each other to have a better understanding of the subject. Through small-group discussions students are able to acquire new knowledge from their peers (Millis, 2012:2).

Various authors such as Ambrose, Bridges, Lovett, DiPietro, and Norman (2010:182-187); Cavanagh (2011:24-27); Doyle (2008:57-58); Millis (2012:2); and Prince (2004:223, 231) confirm that small-group discussion is a very effective learning tool. In support of the effectiveness of group discussion, Hamann, Pollock, and Wilson (2012:72) stress that when lecturers implement small-group discussions, students get to know each other better, ask questions about the subject, show interest in the course, and become satisfied with what they discuss.

With group discussions, students are able to check for understanding and have a deeper reflection on course material, which results in enhanced student engagement and improved student learning (Cooper & Robinson, 2000:19; Doyle, 2008:57-58).

Doyle (2008:57-58) also adds that group discussions help students to develop an interest in learning since they are able to freely express their views/opinions on the topic being discussed. This tends to improve students' self-confidence. Group discussions also help students to have an understanding of the different peers in the group (group dynamics) and how their opinions differ and/or relate to theirs. According to Doyle (2008:57-58), group discussions enable students to think critically and in different ways.

2.3.3 Authentic learning

Students should be motivated to come up with solutions for real-world problems. They should be involved in their learning. This should be prevalent in their preference towards doing rather than listening. This process is described by Lombardi (2007:1-12) as authentic learning. Lombardi (2007:2) defines authentic learning as "learning that typically focuses on real-world, complex problems and their solutions, using role-playing exercises, problem-based activities, case studies, and participation in virtual communities of practice." Lombardi (2007:10) further states that in order for students to continue to be competitive in the job market, they need to be flexible in dealing with uncertainty in the workplace and adhere to the high standards set for them by the professional world. Students need to be well prepared in becoming employees of choice, and an increased exposure to authentic learning activities can do just that.

In order for educators to carefully design authentic tasks that would encourage active learning, Reeves and McKenny (2013:15) highlight ten characteristics of authentic tasks. In my opinion, three of these characteristics are particularly pertinent, namely: activities should provide opportunities to collaborate; have real-world relevancy; and engender reflection. These three are of importance to me because assessment tasks that are designed with these characteristics allow students to apply a deep learning approach (see 2.2.4) and ultimately improve their learning.

According to Donovan, Green, and Mason (2014:170) collaboration takes place when students are willingly working together towards a common goal, while sharing responsibilities and making necessary compromises to ensure that the outcome of a specific task is reached. Throughout this process of collaboration, it is important that students value each other's inputs and suggestions. The importance of collaboration is reinforced by the fact that the professional world is becoming more collaborative; therefore, it is vital for students to be exposed to collaborative activities, providing them with the much-needed experience of working in groups or teams to develop effective teamwork skills (Fredrick, 2008:12-13). Furthermore, it is stated that student achievement, student attitudes, and student retention are also improved through collaboration (Prince, 2004:227).

According to Prince (2004:228) and Frederick (2008:13), tasks that lecturers design for their students should have real-world relevance since it enables students to practically apply these tasks in the IT industry. Furthermore, Prince (2004:228); Frederick (2008:13); and Donovan, Green, and Mason (2014:170) emphasise that authentic tasks should allow students to reflect on what they have done in order to improve on them.

2.3.4 Conclusion: active learning

The studies referred to above confirm the importance of including activities in lectures in order to engage students. Active learning thus includes any activity that encourages students to participate in activities that involve them with the module content, which in turn enhances their critical thinking, especially if they are given the opportunity to apply theory in practice.

The question that arises is whether there is any connection between student learning approaches and active learning. When students are given authentic tasks that enable them to be fully involved such as group discussions, essay writing, research tasks, etc., they become able to think critically and come up with solutions. This is an example of a deep learning approach (see 2.2.4). Conversely, if students are not involved in the learning process, they tend to merely learn and reproduce what the lecturer has taught them without having a deep understanding of the content. This is an example of surface learning (see 2.2.3). Thus, active learning, which can be encouraged through the right teaching method, encourages students to use a deep approach to learning. Furthermore, through active learning, students applying a deep learning approach, strive to attain higher marks, and reach a point of satisfaction in their learning (self-actualisation). This also relates to a strategic/achieving approach to learning (see 2.2.5).

2.4 STUDENT ENGAGEMENT IN TEACHING-LEARNING ACTIVITIES

One key focus of higher education institutions is to enhance teaching and learning, and this can be achieved through student engagement (Strydom, Basson & Mentz, 2010:1).

2.4.1 Origin of the student engagement movement

According to Trowler (2010:2), research on student engagement was begun by Tyler in the early 1900s. His focus was on the significance of the amount of time that students spend on learning activities. Although student engagement has been around for a long time, it was officially mentioned in Alexander Astin's work on student involvement where he established that there are positive academic results in any form of student involvement (Astin, 1984:307).

2.4.2 Overview of student engagement

Trowler (2010:3); and Hu and Kuh (2001:3) define student engagement as the relationship between the time, energy, and resources spent by both students and their institutions to enhance student experience, their learning outcomes, their performance, and the institution's reputation. Student engagement has also been defined by Kuh, Kinzie, Buckley, Bridges, and Hayek (2007:33) as "participation in educationally effective practices, both inside and outside the classroom, which lead to a range of measurable outcomes," and as the degree of students' involvement in learning activities, that research in higher education has proven to be connected with the quality of learning outcomes (Krause & Coates, 2008:493).

Kuh (2009a:683) combined these definitions of student engagement as the time and energy students spend on tasks that are associated with the intended learning outcomes of the institution, and what the institution does to motivate students to engage in these tasks.

In his research, Mann (2001:7) juxtaposes engagement with separation, suggesting that the engagement-separation dyad is a more suitable model to understand students' relationships with their learning as opposed to the surface, strategic, and deep triad of Biggs (1987:19-20).

According to Harper and Quaye (2009a:5), there is more to engagement than mere involvement. They further state that it involves a student's feelings and interest in activities. From this perspective, engagement requires institutions to implement effective policies and regulations that will motivate students to participate in their courses and the other services they provide.

2.4.3 Dimensions of student engagement

Fredricks, Blumenfeld, and Paris (2004:62-63) identify the following three dimensions of student engagement:

2.4.3.1 Behavioural engagement

Students exhibiting behavioural engagement will make every effort to avoid negative behaviour such as absenteeism, disruption, and unacceptable noise in class. They always attend lectures and get involved in class activities with enthusiasm.

2.4.3.2 Emotional engagement

Students who are emotionally engaged show interest and have a feeling of belonging.

2.4.3.3 Cognitive engagement

Students who are cognitively engaged spend enough time and effort in their learning. They always go beyond course requirements, meet or exceed assignment requirements, and delight in challenges.

2.4.4 Characteristics of student engagement

According to Coates (2007:122), student engagement should include the following five characteristics: active and cooperative learning; involvement in challenging academic tasks; constructive relationship with academic staff; involvement in improving educational experiences; and a feeling of belonging, encouraged through the institution's learning environment/community.

These characteristics were measured by Coates (2009:7) based on six engagement scales. The first scale is academic challenge (the degree to which assessments force students to learn). The second scale is active learning (students' determination to build more knowledge). The third scale is student and staff relationships (the level of students' interaction with staff). The fourth scale is improving educational experiences (contribution in extending educational tasks). The fifth scale is supportive learning environment (feeling of belonging within the institution's community), and lastly work-integrated learning (incorporation of employment-focused work experience into the study).

Individual student learning, structure and process, and identity are the three main foci of student engagement in the literature. For the purpose of this literature review, individual student learning will be the primary focus.

According to Coates (2007:122), individual student learning involves the attention shown by the student during learning; the interest the student shows in learning; the involvement of the student in learning; the active participation of the student in learning; and "studentcenteredness" – that is, involving the student in the creation, design, and delivery of assessment in their learning.

2.4.5 Student engagement styles

Student engagement styles are deemed important in this study on e-assessment because it enables the lecturer to discern how the students participate in the various assessment tasks. The lecturer may be able to design e-assessment tasks according to the students' engagement styles.

According to Coates (2007:132-134), student engagement styles are as follows:

2.4.5.1 Intense

Students using the intense style of engagement tend to fully involve themselves with their studies. They find their lecturers as welcoming and see their learning environment as conducive and helpful to their studies (Coates, 2007:132-133).

2.4.5.2 Independent

Students exhibiting this style of engagement seem to be more focused on their academic rather than their social life. They find their lecturers accommodating and helpful since they provide their students with constructive feedback. Nevertheless, these students find it difficult to work with other students, either in or out of the classroom. They hardly involve themselves in any social activities that take place in the institution (Coates, 2007:133-134).

2.4.5.3 Collaborative

These students are more involved in the social aspect of the institution and their studies. They are not as academically centred as students that exhibit an independent style of engagement. They participate in almost all activities that occur in the institution and relate very well with their peers and staff (Coates, 2007:134).

2.4.5.4 Passive

Passive students hardly participate in either social or academic activities. This style of engagement does not enhance learning (Coates, 2007:134).

Coates warns that the above engagement styles should not be seen as permanent characteristics of students, as students can change their engagement styles over time (Coates, 2007:132).

2.4.6 Reasons why students engage in activities/tasks

In e-assessment, students' engagement is important. The reasons why students engage in activities are discussed in the study because if lecturers and institutions fail to understand why students engage in activities, they may not be able to design appropriate e-assessment tasks for their students. Lecturers need to know and understand why their students engage with their learning in order to benefit from e-assessment.

The literature provides reasons why students engage with their learning.

2.4.6.1 Engagement to improve learning

According to Coates (2005:26), since student engagement allows students to participate/ engage in different academic activities, it leads to high-quality learning. Graham, Tripp, Seawright, and Joeckel (2007:233-234) emphasise that the idea of students engaging in learning processes or activities to improve their learning, is not a new concept. National and international student engagement surveys have proven that enhanced student engagement yields better results (Trowler, 2010:22).

2.4.6.2 Engagement to improve throughput rates and retention

Retaining students and achieving better throughput rates are of high priority in any institution. When students are engaged they improve their learning and their pass rates, and these factors encourage students to remain in the institution. In this case, students see the institution as one of high quality. When students are not engaged, they fail and eventually leave the institution (Kuh, Cruce, Shoup, Kinzie & Gonyea, 2008:555).

2.4.6.3 Engagement for curricular relevance

Engaging students in the learning design gives them the impression of an improved curriculum, and this is of importance to them. Nevertheless, improvement of curricular relevance can be achieved by implementing some of the approaches informed by student engagement data, as shown by the National Survey of Student Engagement (NSSE) (2009b:10).

2.4.6.4 Engagement for institutional benefit

Student engagement increases an institution's reputation and finances. Coates (2005:32) claims that data of real student engagement provide evidence of quality assurance and determines an institution's productivity. Since "student engagement comes close to providing necessary and sufficient information about student learning" (Coates, 2005:32), student engagement data are appropriate in determining quality. Kuh (2009a:685) supports this by stating that engagement data add value to the institution. Markwell (2007:15) emphasises that institutions often approach their alumni to generate funds. These alumni support their institutions (through donations) in return for what they have accomplished.

2.4.7 How can students, staff and institutions benefit from engagement?

I am of the opinion that this section is important to the study because successful implementation of e-assessment requires effective student, staff, and institutional engagement. In e-assessment, students should know what they will acquire after putting their time and energy into the learning activities. Institutions need to put in place effective policies to assist students in their learning.

Various studies have shown that the beneficiaries of engagement are students, managers, and the higher education system (Kuh, 2009a:685-698; Coates, 2010:13; Coates, 2005:32; Krause, 2005:3-4). Student engagement does not occur automatically. If one expects engagement to occur without doing anything, it can be equated to “magical thinking” (Chang, Chang & Ledesma, 2005:10-11). Kuh, Kinzie, Schuh, and Whitt (2005:44-51) explain that student engagement involves two actions. Firstly, what students do (the time and energy they put into their learning activities) and secondly, what institutions do (the effectiveness of policies and practices put in place to help students in their learning), to influence student engagement. This means that for student engagement to occur there should be collaboration between students, staff, and the institution.

According to Bensimon (2009:23), students will only benefit from engagement if they spend enough time and energy on their learning tasks and if policies are geared towards positive learning outcomes. Kuh, Palmer, and Kish (2003:25) say that the more students are engaged in the learning process, the more they are able to analyse, solve problems, and become satisfied with their studies. They further state that student engagement allows students to live a satisfied life, even after leaving school, and integrates them into the workplace.

Umbach and Wawrzynski (2005:173) point out that academic staff also need to contribute to student engagement. Coates (2005:26) suggests that academic staff should be available for consultation after lectures, and should relate what students read and discuss to real-world situations. According to Markwell (2007:18), lecturers should find effective ways of interacting with their students, regardless of class size. Edgerten (1997:32) states that teaching approaches such as problem-solving learning, collaborative learning, and student research are “pedagogies of engagement” because they ensure that students are actively involved in their learning task.

These studies confirm that the involvement of staff in student engagement is of importance.

Institutions must ensure that enough resources or course materials are available for students to use. Institutions need to employ effective teaching and learning methods for their students (Coates, 2005:26-27). Kuh *et al*. (2007:44) concur with Coates (2005:26-27) that institutions should design their curriculum in a way that enables students to engage effectively. Their support services and course structure should motivate students to engage in tasks in order to achieve satisfaction, learn independently, and achieve better grades. According to Chickering and Gamson (1987:3-7), there are seven principles that can improve student learning and personal growth. In essence, these principles are: effective interaction between students and staff; support among students; active learning; quick feedback; submitting tasks on time; high expectations of students; and acknowledging different talents and ways of learning. Institutions should create an environment in which these principles are present.

Institutions are enabled to know their students' level of involvement in tasks through student engagement surveys which, in turn, if appropriately acted upon, improves the quality of learning (Trowler, 2010:29). Where there are no consistent indicators of student learning, student engagement surveys provide "process indicators or proxies for student learning outcomes" (Kuh, 2009a:683-706).

Based on an analysis of the 20 most engaging institutions in the USA, six common institutional characteristics and conditions essential for student engagement were identified (Kuh *et al.,* 2005:44-51). These properties and conditions enable student engagement to flourish and help create institutional cultures that promote student success. The six institutional features and conditions that are vital for student engagement are: an effective mission statement and institutional policy; a student-centred teaching and learning approach; a conducive learning environment that supports the institution's policies; explaining the methods that increase students' development to lecturers; establishing an institutional culture and beliefs that will enhance the quality of the institution; and ensuring that student achievement and the value of learning are the responsibility of everyone in the institution.

2.4.8 Student engagement, active learning and motivation

I regard this section as particularly important because without motivation students tend not to perform e-assessment tasks. The aspect of active learning and motivation is crucial to e-assessment because if lecturers fail to design engaging tasks (e.g., discussion forums) and do not motivate the students, then e-assessment may not be effective or take place at all as suggested by Barkley (2010:6).

Barkley (2010:6) states that it is good for students to have passion, interest, and motivation but that it is insignificant if the motivation, passion, and interest do not result in learning. Barkley further states that the "product of student engagement is motivation and active learning." She emphasises that student engagement will never take place if one of these components is not available. In Figure 2.1 below, it can be seen that student engagement is placed in the intersection of motivation and active learning.

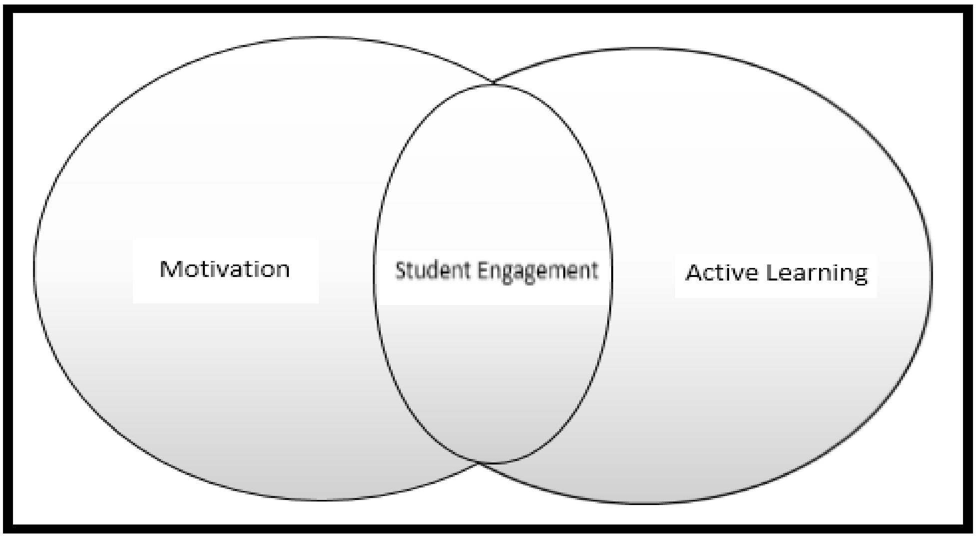

Figure 2.1: Venn diagram model of Student Engagement

Source: Adapted from Barkley (2010:6)

Barkley further indicates that this intersection limits the effect of each. She concludes that student engagement can be better explained using a "double helix" where active learning and motivation are spirals working together effectively, as shown in Figure 2.2.

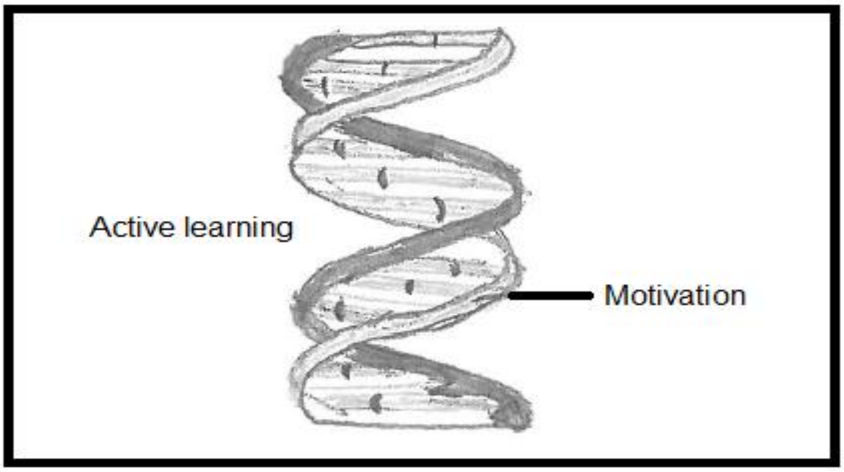

Figure 2.2: Double helix model of Student Engagement

Source: Adapted from Barkley (2010:8)

Barkley (2010:8) also states that student engagement involves a “process and a product that is experienced on a continuum and results from the synergistic interaction between motivation and active learning.”

According to Brophy (2004:4), motivation in the classroom can be defined as the degree of interest, attention, and energy that students expend in their learning. Brophy’s definition focuses on an individual’s intrinsic state and not on extrinsic factors such as rewards and punishment (these were stressed in the early behaviourist studies of motivation).

Brophy (2004:4) further contends that most research done on motivation theories can be grouped within an “expectancy × value” model. This model states that the energy that people are ready to spend on an activity is the product of the level to which they anticipate to be able to perform the activity successfully (their expectancy) and the level to which they value the rewards and opportunity to engage in doing the activity itself (its value). Effort is, however, also seen as a product because no effort will be made if there is no expectancy or value. Students want to spend time and effort on activities they enjoy and that will eventually lead to success. This means that students are strongly motivated by what they think is significant and by what they think they can achieve. This relates to what Biggs and Tang (2011:197) refer to as a backwash effect on student learning (see 2.2.6.2).

2.4.9 Theories of motivation

I deem theories of motivation important to my study on e-assessment because lecturers and institutions need to know what the students expect from e-assessment tasks, and how to deal with those expectations. The theories of motivation may enable lecturers to design e-assessment tasks that are learning appropriate and that may motivate students to participate in those tasks.

Barkley (2010:11) describes the following three theories of motivation that deal with student expectations:

2.4.9.1 Self-efficacy theory

This theory asserts that the confidence that students have in completing an activity successfully is more significant than the difficulty of the activity itself. Students are motivated to participate in those activities that they have confidence in completing successfully (Barkley, 2010:11-12).

2.4.9.2 Attribution theory

This theory states that students think that their success or failure is based on different factors such as capability, time, effort, stress, luck, ease or difficulty of examinations, etc. Their confidence is based on their past failures or success (Barkley, 2010:12).

2.4.9.3 Self-worth theory

The self-worth theory suggests that people are intensely encouraged to maintain their self-worth/self-esteem. “When students do not succeed, they would prefer to question and have others question their effort (they’re lazy) rather than their ability (they’re dumb).” This model helps us understand why students sometimes do not even attempt to participate in an activity that they feel they will not succeed in (Barkley, 2010:12)

2.4.10 Types of students in a classroom

E-assessment tasks should be designed with the students in mind. I included this section in the study because lecturers and institutions can have effective e-assessment systems if they know the students they are dealing with. Lecturers may design e-assessment tasks that meet the needs of the students if they know the types of students they have in their classrooms.

Covington (in Barkley, 2010:12) and Covington and Mueller (2001:165-166) identify four types of students in a classroom. Other researchers such as Brent and Felder (2005:60) have identified four other types of students, namely: the diverger student, the assimilator student, the converger student, and the accommodator student.

For the purpose of this study, the types of students identified by Covington (in Barkley, 2010:12) and Covington and Mueller (2001:165-166) will be discussed.

2.4.10.1 Success-oriented students

These students take their work seriously and always perform well in class. They find satisfaction in difficult and challenging activities. Even if they fail occasionally, they are able to maintain their self-worth. These are students who apply both a deep learning approach (see 2.2.4) and a strategic learning approach (see 2.2.5).

2.4.10.2 Overstrivers

They are students who, although they succeed in their tasks and take pleasure in challenging tasks, worry too much about their performance and grades. They take new activities seriously and try their utmost to succeed as they regard failure as synonymous with a low capability.

These students also apply both a deep learning approach (see 2.2.4) and a strategic learning approach (see 2.2.5).

2.4.10.3 Failure avoiders

These are students who are anxious and, due to the fact that they have not been successful in the past, are afraid of failing a learning activity that might suggest that they are incapable. To avoid embarrassment, they do not attempt challenging tasks. When this occurs, such students apply a surface learning approach (see 2.2.3).

2.4.10.4 Failure accepters

These are students who are neither satisfied with success nor dissatisfied with failure. They simply do not engage in the learning process (Barkley, 2010:12-13). These students tend to use a surface learning approach (see 2.2.3).

While expectancy plays an important role in the study of student motivation, value is also critical. Students are motivated if they see the learning activity as one with value. Lecturers can motivate students by increasing the value of the learning process. Some lecturers use strategies such as rewards and incentives to motivate their students. While these extrinsic strategies may increase students' motivation, they do not necessarily develop students' intrinsic motivation to truly engage in their own learning (Barkley, 2010:13-14). According to Windham (2005:5), students can engage in learning through "interaction, exploration, relevancy and multimedia."

Taylor and Parsons (2011:8-14) briefly describe the above-mentioned aspects as follows:

- **Interaction** – Healthy and respectful interaction (virtual or physical) between students and staff improves student engagement.
- **Exploration** – Students are more engaged during discussions, problem-solving activities, and exploring the internet in order to find solutions to problems.
- **Multimedia and technology** – Multimedia and technology help students to learn beyond the classroom. The use of YouTube, Facebook, Twitter, cameras, video and video editing, projectors, SmartBoards, sound-recording equipment, animation and gaming software and the ubiquitous PowerPoint, enable students to actively engage in their learning and to take responsibility for their own learning. In other words, these technologies help students to control and enhance their own learning.

2.4.11 Student engagement principles

Student engagement principles are crucial to my study on e-assessment because this enables lecturers to create effective e-assessment tasks that may help students to fully participate and subsequently enhance their learning. I believe that if these principles are applied in the development of e-assessment tasks, students' engagement in the tasks may improve. E-assessment tasks require student engagement which, when effectively applied, may increase the number of students who actively engage in e-assessment tasks.

According to Krause (2005:12-14), there are ten "working principles" that can improve student engagement. These principles are supported by the Quality Assurance Agency in Higher Education (QAA) (2014:11) and the GuildHE (2015:9-27):

2.4.11.1 Create and maintain a conducive learning environment

Lecturers should encourage students to become part of the learning community, give a clear and up-to-date course outline and encourage discussion, teamwork, and innovation among students.

2.4.11.2 Importance and quality of academic work

Lecturers should advise students to be dedicated to their studies by explaining the outcome of spending enough time in learning. They should teach students how to balance their studies with their normal life.

2.4.11.3 Identify and respond to the needs of students from different backgrounds and their effect on student engagement

Lecturers should ensure that they are aware of their students' needs, goals, aims, and what motivates them. They should also consider the different subgroups in their class and devise a strategy to meet their students' needs based on their backgrounds. This enables students to feel comfortable and fully engage in the learning process.

2.4.11.4 Ensure that expectations are clear and reactive

Students should be made aware of the lecturer's expectations, which should be repeated from time to time. Lecturers should involve students in the expectation-building process by listening to their expectations and coming to an agreement with the students (if possible) as to what is expected of them. However, the expectations should be of a high standard in order to ensure quality of learning. These expectations should also be realistic.

2.4.11.5 Encourage social interactions

Lecturers can engage small groups of students in discussions and problem-solving activities which will improve their thinking and learning. In a large group, students can be involved in a 'question-answer' exercise. Furthermore, online platforms can be used for thread discussions and interaction.

2.4.11.6 Become aware of students' problems

Students should be made aware that lecturers are indeed mindful of the pressure or workload they are facing in their learning, and acknowledge that many students may be misrepresenting tasks. Lecturers should be clear and pre-emptive in handling issues that negatively affect student engagement.

2.4.11.7 Provide strategies that will help students

Lecturers should encourage students who are self-motivated and independently engaged in the learning process. During stressful periods such as examinations, lecturers need to motivate students and discuss ways of effectively managing their time. Lecturers should identify students' problems timeously; they should not feel that they have to deal with their problems alone.

2.4.11.8 Encourage students through proper/authentic assessment

Feedback of continuous assessment should be given to students from the outset. Lecturers should positively use the backwash effect on students' learning by aligning assessments with the learning outcomes (Biggs & Tang, 2011:198). They need to create assessments that will allow students to work together in and outside the classroom. Students should be involved in self-assessment and peer assessment (see 2.9.3.2). This helps them to be independent learners and take responsibility of their own learning.

2.4.11.9 Carefully monitor the online learning process (as applicable)

Since online content does not replace classroom lectures, lecturers should ensure that their classes are interesting in order to facilitate student attendance and engagement. When academic content is online, lecturers need to devise strategies that will involve students in class. Lecturers should use the online platform to link their students with other students across the world. This improves collaboration, learning, and student engagement.

2.4.11.10 Become aware of the complexity of student engagement policies and procedures

Engagement involves a relationship between students, their learning activities, and the institution. Engagement should encourage students to take responsibility for their own learning. Student engagement changes from time to time and these changes should be identified and modified accordingly.

2.4.12 Benchmarks of effective educational practice at engaging institutions

I am of the opinion that institutions and lecturers should identify and implement effective educational practice in their e-assessment. These standards are important because e-assessment tasks that apply and/or follow these standards may enhance students' learning. Lecturers should develop e-assessment tasks that may cause students to think critically (e.g., scenario questions) and should prepare the e-assessment platform for effective communication and collaboration. These benchmarks, when effectively applied, may motivate students to participate in e-assessment tasks.

Kuh *et al.* (2003:25); Clelia, Jose-Javier, Angela, Natalia, Rodrigo, and Fabian (2014:3-4); McClenney (2006:50-51); and the Community College Survey of Student Engagement (CCSSE) (2003:1-3) contend that institutions can be guided by five standards which will enhance their students' learning and the institution's outcomes. These benchmarks are also included in the South African Surveys of Student Engagement (SASSE). They are:

2.4.12.1 Level of students' assessment tasks (ATs)

The level of students' ATs should be challenging. Student learning is improved when their activities are sophisticated and innovative (Kuh *et al*., 2005:11).

2.4.12.2 Learning environment

There should be a conducive and interactive learning environment for students and their peers to interact, collaborate, and reflect on what they have learned (Kuh *et al*., 2005:11).

2.4.12.3 Collaboration and communication

There should be collaboration and communication between students and lecturers. This will enable lecturers to assist students with sophisticated tasks. Ideally, lecturers should be accessible to their students whenever necessary (Kuh *et al*., 2005:12).

2.4.12.4 Participation in community projects

Students should be afforded the opportunity to participate in workshops and community projects. They will then be able to apply in practice the knowledge they have acquired (Kuh *et al*., 2005:12).

2.4.12.5 Academic and social institutional support

The institution should support its students academically and socially. There should be a cordial relationship between students and staff. This will help students feel comfortable at the institution (Kuh *et al.,* 2005:13).

2.4.13 Conclusion: student engagement

The reviewed literature confirms that student engagement indeed improves learning outcomes, critical thinking, and performance in terms of grades. However, most of the mentioned research studies indicate that improved learning outcomes come from different sources, and not only through student engagement. It is also clear from the literature that student engagement, active learning, and strategic and deep student learning approaches work hand-in-hand. Students will, for example, be able to use a deep learning approach if lecturers fully engage them in the learning process (see 2.2.4.1).

2.5 HIGH-IMPACT TEACHING-LEARNING ACTIVITIES / PRACTICES

I discuss the high-impact teaching-learning activities/practices in my study on e-assessment because lecturers as well as institutions need to know the activities that they can include in their e-assessment tasks in order to produce employable graduates. These practices are very important to the study because in e-assessment lecturers may include videos of other lecturers teaching a specific topic, share other students' work and experiences of their study abroad, and create learning communities where students interact with their lecturers and peers. When these practices are implemented in e-assessment tasks, students' learning may improve, which justifies its inclusion in this study.

In 2008, George Kuh, a member of the Association of American Colleges and Universities (AAC & U) issued a report on high-impact educational practices: what they are, who has access to them, and why they matter. This report was of great interest to academics and higher education institutions in the United States of America (USA) particularly on the use of specific educational practices that have been proven through research to have a significant impact on students' way of learning, which would ultimately generate successful graduates.

High-impact practice (HIP) is now the most common term used for these practices (Kuh, 2008:9; McNair & Albertine, 2012:4).

2.5.1 Benefits of HIPs

Some of the proven and tested benefits of HIPs are mentioned here. HIPs improve the retention and engagement rates of students (Kuh, 2008:9); ensure that students are actively engaged in the learning process and enable them to acquire the experience and knowledge needed by future employers (McNair & Albertine, 2012:4); and help students become successful graduates (McNair & Albertine, 2012:4).

2.5.2 What are the high-impact practices that impact on students' learning approaches and are supported by research evidence?

In this section, the ten HIPs published by Kuh (2008:9-11) will be discussed. Other researchers such as Brownell and Swaner (2010:1-3); Murray (2015:473, 475, 478); Kilgo, Sheets, and Pascarella (2011:18-20); and Brownell and Swaner (2009:28-30) support Kuh in that these high-impact practices enhance students' learning. These high-impact practices are:

2.5.2.1 First-year seminars and experiences

This practice enables institutions to integrate programmes or seminars into their first-year students' curriculum. This enables smaller groups of students to interact with their peers and lecturers regularly. It enhances students' writing skills, thinking abilities, capabilities, communication, and ability to read and interpret information logically.

2.5.2.2 Common intellectual experiences

This practice originates from the "core curriculum" concept. It integrates similar courses or educational programmes that allow students to engage in a "learning community." Students are able to learn in collaboration with other students around the globe using technology; thus, they have access to different and/or similar programmes of study.

2.5.2.3 Learning communities

The aim of learning communities is to create an environment where students can learn from other students who are studying different and/or similar courses. In such an environment, lecturers pose questions to their students; students combine courses and work in groups with their peers and their lecturers. In addition, students from different disciplines have the opportunity to discuss similar topics which would help them understand these topics from different perspectives.

2.5.2.4 Writing-intensive courses

Students across different programmes of study and levels are expected to become involved in different ways of writing within their specific area of study. If this practice takes place repeatedly across different curricula, the students' writing skills, communication skills, thinking ability and information interpretation ability will improve.

2.5.2.5 Collaborative assignments and projects

Active and collaborative learning are two important practices that higher education institutions should adopt. With collaboration, students are able to learn and solve problems. They can also acquire new knowledge and a deeper understanding of concepts from their peers who have different experiences and who are from different backgrounds. Collaborative learning can take place through study groups, group assignments and projects, and team-projects.

2.5.2.6 Undergraduate research

Many higher education institutions now involve their undergraduate students across all disciplines in research. The aim behind this practice is to engage students with vigorously challenged questions, practical observation, innovative technologies, and the ability to provide answers to significant research questions.

2.5.2.7 Diversity/global learning

This practice includes courses that give students the chance to learn about other people's life experiences, cultures, beliefs, and opinions that are different from theirs. This exposure will help students to learn more about people's racial issues, ethnicity, gender issues, inequality and discrimination, and social injustice. Many institutions have exchange programmes where students from a particular institution visit another institution in a different country, and vice versa. Such exchange programmes enable students to acquire experience of learning with other people which then eventually improves their own interpersonal relationship skills; in some instances, they even learn new languages.

2.5.2.8 Service learning, community-based learning

These courses are more focused on helping the community and often take place outside the classroom. Service/community learning helps students to apply their knowledge from the classroom to real-world situations. Furthermore, students who participate in such courses gain experience because they get the opportunity of working with skilful and experienced people in the community. They can eventually build a good rapport with such people, which can hopefully lead to employment in the future.

2.5.2.9 *Internships*

Internships help students to attain work-related experience because they get the chance to be trained in their area of expertise. If students undertake the internship for course credits, they either complete a project or write a report at the end of their internships. Generally, these reports or projects are endorsed by their lecturers.

2.5.2.10 *Capstone courses and projects*

These courses and projects take place when students are about to complete their studies. In such projects, students are required to apply the knowledge they have acquired during their degree programme. Depending on the discipline and/or faculty, projects may include a dissertation, portfolio, software deliverable, artwork exhibition, etc.

2.5.3 Why are HIPs so effective with students?

This section is important to this study because e-assessment should include activities that may enhance students' learning. In my opinion, the reasons why HIPS are effective with students correspond to e-assessment tasks. These reasons were included in the study in order for lecturers to incorporate them in their e-assessment tasks. For instance, HIP is effective because students interact regularly with their peers and lecturers concerning important topics and activities. How can this be done in e-assessment tasks? The lecturer may create discussion forums where students can interact with him/her. Lecturers need to be aware of these reasons for effective design of e-assessment tasks.

Research has tested HIPs and proven that they are very effective. Reasons why HIPs are so effective with students are as follows (Kuh, 2008:14-15): students dedicate themselves, their time, and effort to different activities; interact regularly with their peers and lecturers concerning important topics and activities; are exposed to people with diverse experience, beliefs, and backgrounds; are regularly assessed and are given frequent constructive feedback on their work or learning activities; have opportunities to apply what they have learned in different environments (in or outside the classroom); and their lives can change due to practices such as service learning, internships, and diversity/global learning. These reasons are supported by Brownell and Swaner (2009:28-30); Murray (2015:475, 478); and Kinzie (2012:1-3) in their research.

2.5.4 HIPs and employability

I am of the opinion that every graduate's desire is to get employed or acquire the necessary skills to set up his/her own business after graduating. This section is important to this study because lecturers need to understand how they can design e-assessment tasks that may prepare students for industry. Andrews and Higson (2008:419) and Yorke and Knight (2006:2) emphasise that employers require graduates that possess both soft skills (skills that can be neither taught nor measured, for example, decision making, creative and authentic thinking, communication skills, etc.) and hard skills (skills that are taught and can be measured, for example, programming, physics, etc.). Hence, institutions should make every effort to integrate employability into their programmes.

ILO (2004:2) defines employability as the "portable competencies and qualifications that enhance an individual's capacity to make use of the education and training opportunities available in order to secure and retain decent work, to progress within the enterprise and between jobs, and to cope with changing technology and labor market conditions."

From this definition, the key concepts relate to employability competencies (soft skills) and qualifications (hard skills). These could easily be made available to students if institutions engage their students in HIPs in line with the nature of the practices.

Yorke and Knight (2006:29) define employability as the "set of skills, knowledge and personal attributes that make an individual more likely to secure and be successful in their chosen occupation(s) to their own benefit, the workforce, the community and economy." The fundamental aspects of this definition are skills, knowledge, and personal attributes (which involve soft and hard skills).

Drawing from both definitions, I therefore define employability as the necessary skills (both soft and hard skills) and experience required by a student to pursue his/her profession of choice in order to make a better living for him-/herself and society at large.

I predict that graduates from institutions that implement HIPs will most probably acquire the necessary skills and competencies necessary to be employed.

2.5.5 Conclusion: high-impact teaching-learning activities/practices

In conclusion, institutions should make HIPs a reality and priority for their students by considering their benefits. Because of the various activities involved in HIPs, I am confident that the integration of these practices into curricula will deliver graduates who will be well prepared to make a success of their careers.

One fundamental aspect of HIPs is student engagement (see 2.4). If institutions participate in these educational practices, student engagement should improve, they should be able to achieve both their personal and educational goals, and acquire the relevant experience they need. In summary, I am of the view that the time has come for institutions to integrate these high-impact practices into their assessments in order to produce graduates who will be ready to face their respective job markets.

The following section will focus on assessment *of* learning (summative assessment), assessment *for* learning (formative assessment) and assessment *as* learning (self-and peer assessment).

2.6 ASSESSMENT OF LEARNING (SUMMATIVE ASSESSMENT), ASSESSMENT FOR LEARNING (FORMATIVE ASSESSMENT), AND ASSESSMENT AS LEARNING (SELF- AND PEER ASSESSMENT) IN HIGHER EDUCATION

Assessment is an extremely important part of the teaching and learning process in any higher education institution (Brink & Lautenbach, 2011:503; Lafuente, Remesal & Valdivia, 2014:443; JISC, 2007:7). Angelo (1995:7) and the QAA (2012:4) define assessment as the continuous process used for evaluating students' understanding and capabilities, which may in turn improve students' learning. Assessment involves the process of gathering evidence of learning from the tasks that students have performed, evaluating the evidence, and ultimately making decisions concerning their work (SAQA, 2001:15). Black and Wiliam (2010:82) explain that assessment involves all tasks that are performed by lecturers and students to provide information that can analytically be used to change teaching and learning.

The JISC (2006:2) states that assessment relates to what students perceive to be significant and the time they will invest in it. Students then tend to focus on the contents they view as more significant. This concept is linked to what Elton (1987:92) refers to as the backwash effect of assessment on student learning (see 2.2.6.2). According to Biggs and Tang (2011:197), backwash becomes negative when students aim at just passing an examination without having deeper understanding, which is a surface learning approach. Positive backwash occurs when the intended learning outcome is integrated into the assessment. In this case, students tend to learn with understanding and change from surface learning to deep learning (see 2.2.3 and 2.2.4; Biggs & Tang, 2011:198).

Rowntree (1987:1) states that one will be able to ascertain the value of a higher education institution by looking at its assessment policies. In addition, due to the significance of assessment, it is impossible for students to avoid it. Boud (1995:35) says: "Students can, with difficulty, escape from the effects of poor teaching; they cannot (if they want to graduate) escape the effects of poor assessment."

I believe that in order for students' learning to improve, lecturers need to implement appropriate assessment practices, and institutions need to adopt appropriate assessment policies. Poor assessment may have a negative effect on student learning.

Since this thesis concentrates on (e)-assessment in a South African higher education context, South African and institutional policies, procedures, and guidelines are focused on in this section.

2.6.1 The purposes of assessment

Various authors have identified the reasons why assessments are undertaken. The purposes of assessment are to:

- enhance student learning (Buzzetto-More & Alade, 2006:253; JISC, 2006:2);
- determine if a student has passed or failed a course (JISC, 2006:2; QAA, 2012:4);
- recognise the strengths and weaknesses of students (Buzzetto-More & Alade, 2006:253; JISC, 2006:2; QAA, 2012:4);
- evaluate and enhance the efficiency of different methods of teaching (Buzzetto-More & Alade, 2006:253; Nicol & Milligan, 2006:1);
- evaluate and enhance the efficiency of curriculum instructions (Buzzetto-More & Alade 2006:253; Bull & McKenna, 2004:3);
- encourage effective teaching (Buzzetto-More & Alade, 2006:253);
- offer institutional data that will improve decision making (Buzzetto-More & Alade, 2006:253; QAA, 2012:4);
- create cordial relationships between students and lecturers (Buzzetto-More & Alade, 2006:253);
- provide appropriate feedback to both students and lecturers (Bull & McKenna, 2004:3, JISC, 2006:2; QAA, 2012:4).

The above illustrates how critical this is in higher institution. Good assessment may improve the learning of students and the teaching of lecturers.

2.6.2 Principles of good assessment

Due to the significance of assessment, a number of authors have devised sound assessment principles that institutions and lecturers can use to ensure effective assessment.

2.6.2.1 Fairness

Fairness requires that assessment should not be biased. In other words, an assessment should not advantage or disadvantage a student (SAQA, 2001:16-17; QAA, 2012:6-7). Assessment is deemed fair if the assessment policies are known and clear to students and all other participants (Tinoca, 2012:214).

2.6.2.2 Validity

An assessment is valid if it is “fit for purpose” (Davidson & McKenzie, 2009:4). This means that a valid assessment tests exactly what it is meant to test (QAA, 2012:6-7; CHE HEQC, 2004:134). For an assessment to be valid, lecturers should communicate the assessment criteria; the learning outcomes; the content to cover; the assessment methods (tasks performed by the lecturers such as observation, evaluation, and questioning); and instruments (e.g., projects, assignments, tests, multiple choice questions, and/or examinations). This may enable the students to gain knowledge about what is expected of them (Dierick & Dochy, 2001:318-320; SAQA, 2001:16-17, 29).

2.6.2.3 Reliability

Assessment reliability is about consistency and accuracy. Consistency in assessment refers to making the same decision for assessment that has the same or similar learning outcomes for all students at different points in time (SAQA, 2001:16-17; CHE HEQC, 2004:131). An assessment is deemed consistent if it is aligned with the learning outcomes, assessment criteria, teaching/learning activities, and the assessment policies in use (Tinoca, 2012:213-214). It should also involve different assessment approaches, methods, instruments, and lecturers (Dierick & Dochy, 2001:314). This corresponds to fair assessment, according to which all students should be treated equally. The results of student assessment should not be based on the expectations about the students and a student’s age, gender, or ethnicity (SAQA, 2001:16-17).

2.6.2.4 Practicability

The practicability (or feasibility) of assessment is highly significant as it requires resources such as time, cost of training, and equipment (SAQA, 2001:16-17; Tinoca, 2012:214). To evaluate the practicability of assessment, one should answer two main questions. Firstly, “Is it efficient?” This involves an evaluation of the impact that assessment has on students, lecturers, and the institution. The second question is, “Is it sustainable?” When answering this question, one has to take into consideration students’ prior knowledge, financial means, material and human resources, time, training, educational level, and how familiar students and lecturers are with the assessment methods, instruments and marking/grading tools. In other words, there should be an certainty that the assessment implementation will be successful (Tinoca, 2012:214).

2.6.2.5 Credibility

A combination of fairness, validity, reliability, and practicability ensures the credibility of assessment (credibility = fairness + validity + reliability + practicability) (SAQA, 2001:19).

2.6.3 Conclusion: principles of good assessment

I am convinced that for assessment to be credible, lecturers should make a concerted effort to create assessment that is fair, valid, reliable, and practicable, as indicated by SAQA (2001:16-17). Credible assessment will enhance students' learning because it encourages students to be sincere about their own learning and apply a deep learning approach. Lecturers' teaching will also improve if they consider and balance these principles of good assessment. It will require more knowledge and understanding from lecturers to carefully design and implement assessments. Institutions should therefore ensure that their lecturers create assessments that are appropriate and ethical. This is only possible if the institutions put appropriate assessment policies and procedures in place.

2.7 CONSTRUCTIVE ALIGNMENT OF TEACHING, ASSESSMENT, AND MARKING/ GRADING WITH THE INTENDED LEARNING OUTCOMES

Institutions should integrate and align their entire assessment policy with their curriculum design (QAA, 2012:7). Lecturers also need to align their assessment tasks with the institution's assessment policy and procedures as well as with the disciplines they are teaching (CHE HEQC, 2004:124). According to Biggs and Tang (2011:100), there is indeed a need for lecturers to constructively align their teaching and assessments with the intended learning outcomes.

2.7.1 Origin of constructive alignment

According to Biggs and Tang (2011:95), the term constructive alignment came into being during Biggs's experiment with his students' portfolio assessments. Without providing any clue, students were asked to compile a portfolio and provide proof of what they had learned during a relevant course. In other words, the students had to think about what they had learned and provide proof of their work. The students were able to complete the assessment task successfully.

Biggs and Tang (2011:95) state that the students in the mentioned experiment succeeded in their assessment tasks by using two ideologies, namely learning by using “constructivist theory” and through “alignment between the learning outcomes of the course, the teaching/learning activities and the assessment task.” The terms for these two combined ideologies resulted in the term “constructive alignment.”

2.7.2 Definition of constructive alignment

Biggs and Tang (2011:97) refer to “constructive” in the term “constructive alignment” as the process through which students use an assessment task to build their understanding by reflecting on what they have learned. They further refer to “alignment” in “constructive alignment” as the process through which assessment tasks are directly linked and integrated into students’ intended learning outcomes.

2.7.3 Stages of curriculum design

Biggs and Tang (2011:100) and the QAA (2012:7) suggest the following stages that may enable institutions to design their curriculum appropriately.

- Identify/formulate appropriate (intended) learning outcomes.
- Plan appropriate teaching-learning activities.
- Plan appropriate assessment tasks for the students.
- Evaluate, grade, or mark the assessment tasks.

Each of these stages will now be discussed.

2.7.3.1 Intended learning outcomes (ILOs)

During the course design process, decisions should be made about the intended learning outcomes (ILOs) that need to be achieved (QAA, 2012:7). According to Biggs and Tang (2011:100), an ILO describes what students are required to know and accomplish at the end of their course. Biggs and Tang (2011:114) further describe the different levels of learning outcome statements. These are as follows:

- At the “institutional” level, an ILO describes what graduates of the institution are expected to do.
- At the “degree programme” level, an ILO describes what graduates from the specific “degree programme” are expected to do. The same would therefore also apply to certificate or diploma programmes.

- At the “course” level, an ILO describes what is expected of students at the end of their course.

Biggs and Tang (2011:100-101) emphasise that during the design process, active verbs (such as explain, apply, reflect, and evaluate) should be used for the ILO statements. They furthermore emphasise that using passive verbs such as “understanding” is meaningless since students will not have the level of understanding required, and how they should demonstrate their understanding. Active verbs tell students exactly what to do in an assessment task, whereas passive verbs are too vague for students to identify what is expected of them.

2.7.3.2 Teaching-learning activities (TLAs)

Teaching-learning activities (TLAs) refer to lecturers’ teaching methods and the learning activities the students are exposed to. The lecturer should create learning activities that enable students to complete assessment tasks with ease (QAA, 2012:7). These learning activities should also enable students to clearly identify the learning outcomes they need to attain (Biggs & Tang, 2011:100). The verbs used in describing TLAs should be similar to those used in ILOs.

2.7.3.3 Assessment tasks (ATs)

According to QAA (2012:7), once the learning outcomes have been selected or created, the lecturer has to ensure that all assessment tasks (ATs) align with the learning outcomes. Biggs and Tang (2011:100-101) caution lecturers to use active verbs (such as explain, apply, reflect, and evaluate) in their assessment tasks. They further state that based on students’ performance in the assessment tasks, lecturers should be able to determine the ILOs that students did or did not meet. The verbs used in setting ATs should be similar to those used in ILOs.

2.7.3.4 Grading/evaluation/marking of assessment tasks (ATs)

This is the final step where students are graded based on the evidence they produced. Students’ evidence of learning should provide proof that all the intended learning outcomes outlined in the assessment tasks, have been met. Normally, the evaluation of students’ ATs takes place in two forms. Grading and marking are done either by assessing students’ evidence and/or results against the stipulated assessment criteria, or adding up the results from different ATs and awarding a final grade or mark. A grading or marking tool (e.g., a rubric, checklist, memorandum, etc.) must be designed by the lecturer for this exercise (Biggs & Tang, 2011:104).

2.7.4 Conclusion: Constructive alignment

I am of the opinion that if ILOs are clearly stated and integrated into TLAs and ATs, students will understand how they are progressing in the learning process. For this reason, constructive alignment may eventually serve to improve their learning. With regard to the course design process, lecturers may have to repeat some or all of the stages in order to facilitate accurate integration of the TLAs and ATs with the ILOs. In addition, it is important to note the requirement that the active verbs used in the formulation of ILOs, TLAs, ATs, and assessment criteria (as contained in the marking/grading tools) should be the same, or at least directly related to one another.

2.8 ASSESSMENT AND EVIDENCE OF LEARNING

According to SAQA (2001:36), the main idea behind all types of assessment is to gather evidence. Evidence of learning is defined by SAQA (2001:36) as the proof provided by a student to demonstrate that he/she has met the course's learning outcomes. For lecturers to make the right decisions about students' work, they have to gather enough evidence.

2.8.1 Characteristics of evidence of learning

The Australian Skills Quality Authority (ASQA) (2015:9), the Department of Education and Training (DET) (2008), and SAQA (2001:36-38) emphasise that evidence of learning in the South African higher education context should have the following characteristics:

2.8.1.1 Assessment evidence should be valid

This means that the lecturer should ensure that the evidence provides proof of how the intended learning outcomes have been achieved (ASQA, 2015:9; DET, 2008:4; SAQA, 2001:36). Attainment of ILOs is usually demonstrated through evidence that a number of related assessment criteria have (collectively) been satisfied.

2.8.1.2 Assessment evidence should be authentic

The evidence of learning that the student provides should be his/her own work. It is lecturers' responsibility to ensure that students have done the work on their own. If the assessment task is assessed through observation, it may be easier for the lecturer to determine the authenticity of students' work. However, with other methods of assessments (e.g., when evaluating or marking ATs) it may be difficult for lecturers to determine whether or not students did the work themselves. Nowadays, software such as Turnitin may be used by lecturers to check the authenticity of students' work (for instance essays, assignment, projects, etc.) (ASQA, 2015:9;

DET, 2008:4; SAQA, 2001:37). Evidence can also be labelled “authentic” evidence provided that the student is able to perform a task in a real-life situation.

2.8.1.3 Assessment evidence should be enough/sufficient

For a student to be declared competent for a specific course, he/she should provide sufficient evidence. Such evidence should confirm that all the learning outcomes and the assessment criteria have indeed been achieved or satisfied (ASQA, 2015:9; DET, 2008:4; SAQA, 2001:37).

2.8.1.4 Assessment evidence should be current/up-to-date

The evidence provided by the student should be current. In other words, it should still be relevant at the time of delivery (ASQA, 2015:9; DET, 2008:4; SAQA, 2001:37).

2.8.2 Types of evidence

According to the DET (2008:10) and SAQA (2001:38-39), there are different types of evidence of learning in the South African context. These are as follows:

2.8.2.1 Direct evidence

This type of evidence is seen as the most appropriate type. Evidence provided by students is directly observed by the lecturer. It also proves authenticity of students’ work. Examples are evidence collected through/from direct observation, oral questions, tests, examinations, and project demonstrations (DET, 2008:10; SAQA, 2001:38).

2.8.2.2 Indirect evidence

This is where students provide evidence from other sources that the lecturer cannot observe directly. It may be difficult to authenticate this type of evidence. Examples are evidence collected through/from group work, appraisal forms, student qualifications, performance reviews, etc. (DET, 2008:10; SAQA, 2001:38).

2.8.2.3 Historical evidence

This type of evidence is based on the student’s capabilities and past experience. It is the least appropriate type of evidence because it does not show that the student in question will still be able to exhibit that ability. Examples are evidence collected through/from qualifications, certificates, awards, dissertations, thesis, appraisal forms, etc. (DET, 2008:10; SAQA, 2001:39)

2.8.3 Conclusion: Assessment and evidence of learning

Evidence is very important in the assessment *of/for/as* student learning. When lecturers request evidence from students, they will establish from the evidence whether or not the students have done the work on their own and how well they have succeeded. I believe that instead of using only specific evidence, lecturers can integrate different types of evidence in order to obtain sufficient evidence. Nevertheless, it is important that lecturers provide assessment opportunities for students that will deliver evidence of learning that is valid, sufficient, authentic, and current.

2.9 FORMS OF ASSESSMENT

A form of assessment is an approach or strategy for assessing students that relate to a particular major purpose. For example, if the major purpose is to use assessment to enable students to improve their learning, the “form” of assessment is called “formative assessment.” There are many forms of assessment. However, for the purpose of this study the following forms of assessment will be discussed in this section: assessment of learning (summative assessment); assessment for learning (formative assessment); and assessment as learning (self-and peer assessment) (Earl & Katz, 2006:27; NSW, 2012:1). These forms of assessment collectively enable students to continuously provide evidence of their learning (including learning progress and performance) in the teaching-learning situation (NSW, 2012:1).

2.9.1 Assessment of learning

Assessment of learning refers to approaches or strategies created to verify students’ knowledge, skills, and attitudes at a particular point in time and determine whether or not they have met the course’s learning outcomes (Earl & Katz, 2006:55; NSW, 2012:2; SAQA, 2001:26). Information (evidence) gathered may be used by lecturers to decide whether or not a student can go ahead with his/her studies. In other words, assessment of learning is used to assess, verify, and indicate students’ levels of learning after a particular learning period. This may help lecturers make the right decisions about students’ work and their progress (Earl & Katz, 2006:55). The NIU (2011:3) refers to assessment of learning as “product-based” assessment, since it represents the product of the learning and teaching process. As a form of assessment, assessment of learning is also referred to as “summative assessment.”

Assessment of learning is created to collect students’ proof of performance for lecturers, parents, head of departments, the students themselves, and employers (Earl & Katz, 2006:55). A lecturer may decide to conduct assessment of learning (summative assessment) after completing a section or chapter of work, a course, and/or at the end of a semester (Biggs

& Tang, 2011:196; Earl & Katz, 2006:55; SAQA, 2001:26). Students are then evaluated based on the work they have done. The grades or marks that are awarded to students are based on the validity and authenticity of their work. Since decisions made by lecturers in assessment of learning may affect the students' future, lecturers need to ensure that grades or marks awarded to students are valid, fair, and reliable (see 2.6.2.1, 2.6.2.2, 2.6.2.3; Earl & Katz, 2006:55).

2.9.1.1 The role of lecturers in the assessment of learning

For assessment of learning to be effective, lecturers must provide reason(s) why they are carrying out assessment of learning and whether or not students are ready for the assessment (Earl & Katz, 2006:55; SAQA, 2001:26) as well as clarification of what students should learn or expect (Earl & Katz, 2006:55). Furthermore, they need to explain the procedures that may make it likely for students to prove their competence or capability (Earl & Katz, 2006:55) and the different assessment methods and tasks for assessing the same learning outcome (Earl & Katz, 2006:55). Lecturers should explain the details of how the assessment will take place (Earl & Katz, 2006:56) and the approaches that students may take if they are not satisfied with their grades/marks (Earl & Katz, 2006:56).

2.9.1.2 Assessment instruments or tasks for assessment of learning

The assessment instruments or tasks used for assessment of learning should focus on the intended learning outcomes of the module, and describe the procedures that students have to follow in order to provide evidence that they have achieved the learning outcomes. The assessment methods and instruments should enable students to demonstrate their understanding and provide enough information to defend the credibility and quality of their work. This will enable the lecturer and others to use their assessment results for the student's learning progress (Earl & Katz, 2006:57).

Semester tests, examinations, dissertations, portfolios, presentations (e.g., video presentations), product deliverables, projects, discussions, etc. are all examples of assessment tasks (instruments) that may be used in the assessment of learning (Earl & Katz, 2006:57; NIU, 2011:3).

2.9.1.3 Tools for evaluating, grading or marking summative assessment tasks

According to the NIU (2011:3) and Race (2001:7) lecturers may create grading or marking tools such as assessment rubrics for the assessment of learning. It will be ideal for lecturers to hand out the assessment rubrics or the relevant assessment criteria to students before they do the assessments, since it will help them to know exactly what is expected of them. The NIU

(2011:3) further states that rubrics may help the lecturer to be fair in grading/marking students' work, since the same criteria will be used to assess all students. Other grading/marking tools include a memorandum, checklist, or a marking scheme.

2.9.1.4 Assessment of learning and feedback

In assessment of learning, feedback has less impact on students' learning as opposed to assessment for learning and assessment as learning. The reason for this is that students may sometimes not receive feedback on their assessment after a summative semester test and/or examination. However, assessment of learning will be effective if lecturers provide constructive feedback to students as to why they achieved a grade or mark and what their errors and misconceptions are (Earl & Katz, 2006:55).

According to Black and Wiliam (1998a:7), feedback in assessment of learning is often ignored by students, due to the grading or marking system used. Students often rather focus on the marks awarded by the lecturer and not the feedback provided. However, students are able to determine whether or not they have been successful in their learning using both their grades/marks and the feedback provided by their lecturers (Earl & Katz, 2006:59-60).

2.9.1.5 Conclusion: assessment of learning

Assessment of learning is based on the final work of students at the end of the year, course/qualification, semester, or even a chapter/theme/unit. In assessment of learning, students are required to understand the course work very well before they attempt the assessment. This means that students need to ask their lecturers questions about the concepts they do not understand before they undertake any assessment of learning. Biggs and Tang (2011:196) state that students are often afraid of this type of assessment as their future may depend on it. For this reason, I believe it is the lecturer's responsibility to ensure that students always know exactly what is expected of them, since students can fail the assessment if the tasks, questions and/or instructions are not clear.

2.9.2 Assessment for learning

Assessment for learning is highly significant to students' learning and lecturers' teaching (Yorke, 2001:115; Black & Wiliam, 1998a:7) and should occur throughout the learning and teaching process (SAQA, 2001:26; Heritage, 2007:141). Assessment for learning is planned and performed by lecturers to identify the strengths and weaknesses of their students. Information (evidence) that the lecturers gather from their students may be used to provide constructive feedback to students as to where they erred and what they did well; this may help students improve their learning (Earl & Katz, 2006:29; Sadler, 1998:77). According to the NSW

(2012:1), assessment for learning focuses on the improvement of student learning. SAQA (2001:26) concurs with the NSW that credits are usually not awarded in assessment for learning and it does not relate to any form of summative assessment (assessment of learning). As a form of assessment, assessment for learning is also referred to as “formative assessment.”

2.9.2.1 The role of the lecturer in assessment for learning

Lecturers’ responsibilities in assessment for learning are as follows:

2.9.2.1.1 Intended learning outcomes (ILOs)

Lecturers need to align their teaching, all assessment tasks, and grading/marking tools with the intended learning outcomes. This may require the lecturer to implement different teaching methods and use different assessment tasks in order to improve student learning (Earl & Katz, 2006:29; Heritage, 2007:141).

2.9.2.1.2 Students’ learning needs

The lecturer has to discover the specific academic needs of his/her students (Earl & Katz, 2006:29; Heritage, 2007:141). The lecturer therefore needs to identify students’ prior knowledge of the specific course. If their existing knowledge is inadequate, the lecturer will know that it will take extra effort for those students to meet the intended course learning outcomes. A student with enough prior knowledge may be able to eventually meet all the intended learning outcomes (Heritage, 2007:141). This means that lecturers need to help students in planning their future learning by providing constructive feedback on both summative and formative assessments (SAQA, 2001:26). The lecturer may also have to adjust the assessment tasks, materials, and resources for formative assessment to suit students’ needs (Earl & Katz, 2006:29).

2.9.2.1.3 Feedback in assessment for learning

The lecturer has to provide prompt and constructive feedback to students, i.e., show the student the way forward in the learning process. There should be constant feedback between the lecturer and the student until the student understands clearly what he/she needs to improve. This is made possible through assessment for learning. In other words, effective feedback to students is crucial in assessment for learning. Lack of feedback forfeits the purpose of assessment for learning, namely to improve learning (Biggs & Tang, 2011:195; Orsmond, Merry & Reiling, 2000:24; Black & Wiliam, 1998b:143; Juwah, Macfarlane-Dick, Matthew, Nicol, Ross & Smith, 2004:3).

According to research conducted by Black and Wiliam (1998a:7), effective formative feedback enhances the quality of assessment. The JISC (2006:21) states that feedback is relevant only if students are able to use the feedback to enhance their own learning and performance in a similar assessment later on in the learning process. Black, Harrison, Lee, Marshall, and Wiliam (2004:10, 14) support the JISC in that feedback is effective if it challenges students to think critically and enhance their performance. The JISC (2006:21) also advises that feedback should be timely since students tend to ignore feedback that is provided long after the assessment. Summative assessment could become formative in nature if prompt and constructive feedback is provided by the lecturer.

2.9.2.1.4 Students' involvement in assessment for learning

In assessment for learning, students' learning may be enhanced if they actively engage in their own assessment. Students should also acquire the ability of assessing themselves and their peers. This may enable them to share ideas with their peers and their lecturers. They may eventually become able to reflect on what they have learned through self-assessment and contact their lecturers for help in areas that they find difficult. The students may even improve their learning in that area and assess their progress (Heritage, 2007:141; Black & Wiliam, 1998b:144).

2.9.2.2 Approaches to assessment for learning

According to Heritage (2007:141), three main approaches can be used in assessment for learning in order to gather evidence of students' learning. Unplanned assessment for learning takes place unexpectedly during lectures or in class. For example, a lecturer, while teaching, may stop to clarify a student's misunderstanding of a concept he/she taught previously. When this happens, the lecturer has to divert and answer and assist the student (Heritage, 2007:141). This assessment is therefore mainly formative in nature. Planned assessment for learning is where the lecturer goes to class with already prepared questions to assess students' understanding of what they have learned (Heritage, 2007:141). Course-integrated assessment is already integrated into the course that students are studying. For instance, some courses have learning activities that students are required to answer after each lesson (Heritage, 2007:141).

2.9.2.3 Formal and informal assessment for learning

According to Yorke (2005:225), assessment for learning can either be formal or informal. Formal assessment for learning may be provided by lecturers, other academic staff, and students (Yorke, 2003:479). According to Yorke (2005:225), assessment for learning is formal if it follows the order set out below:

1. The lecturer indicates the assessment criteria that students need to meet in their assessment task.
2. The student is able to understand the assessment task based on the criteria.
3. The student performs the assessment task.
4. The student's work is rated, in line with the assessment criteria, by the lecturer.
5. The lecturer provides prompt feedback on the student's performance and how the student can improve on the task.
6. Students re-work their assessment tasks in order to improve on their previous efforts.

As indicated earlier, some summative assessment tasks may take a formative nature provided that prompt and constructive feedback is provided.

Informal assessment for learning takes place during the course of teaching and learning and is mainly formative in nature. It is not integrated into the course design. For example, students may ask a question while attempting a teaching-learning activity or an assessment task, and the lecturer may give immediate feedback. Informal assessment for learning can be done by anyone. For instance, parents, friends, and siblings of the student can provide the specific feedback on the task that is to be performed (Yorke, 2003:479).

2.9.2.4 Assessment tasks associated with assessment for learning

Whenever a lecturer plans and designs an assessment for a learning task, he/she should have in mind the type of information and/or evidence students should provide, and select an appropriate type of assessment task. The assessment task chosen by the lecturer should give students the opportunity to exhibit their different ways of learning (Earl & Katz, 2006:31).

Assessments tasks, that might be used for assessment for learning, include class observations; quizzes; group discussions and activities; journal or article reviews; question-and-answer sessions; discussions between students and lecturers (e.g. video discussions); and presentations in class (Earl & Katz, 2006:31; NIU, 2011:3).

2.9.2.5 Conclusion: assessment for learning

For assessment for learning (formative assessment) to be productive, lecturers need to have a positive attitude towards it. They must see assessment for learning as an assessment form that may have a significant impact on students' learning. For positive results, lecturers may integrate assessment for learning into teaching-learning activities.

Lecturers also need to know that in assessment for learning, students are part of the teaching-learning and assessment process. Students should ideally be given the opportunity to assess their own work and that of their peers. Lecturers should also welcome students' opinions and suggestions during the learning process.

Assessment for learning may be successful if the lecturers are properly trained in this regard. I believe that lecturers should be allowed to assess students only if they have been trained and acquired the necessary knowledge, competence, and experience to perform student assessment. In-house training of lecturers should ideally be done regularly. This will enable lecturers to keep abreast of any changes that take place in the field of assessment. Although such programmes may require time, money, and effort, it may be beneficial to lecturers, institutions, and the students' learning.

2.9.3 Assessment as learning

In assessment as learning, students are required to assess themselves continuously. They continuously check their own learning, ask themselves questions, and come up with approaches that will enhance their understanding of the relevant concepts (NSW, 2012:1). The main aim of assessment as learning is for students to develop new abilities and take responsibility for their own learning (Earl & Katz, 2006:41).

Assessment as learning replaces the idea that lecturers have to transfer knowledge to students, since it ensures that students critically analyse concepts, and learn new ideas on their own. In assessment as learning, students are highly connected with their learning and assessment. In other words, assessment as learning ensures that students critically monitor their own learning, amend their mistakes, and formulate new ideas that will improve their learning (Earl & Katz, 2006:41). By allowing students to continuously assess their own learning, they eventually become able to assess their peers. In this sense, assessment as learning is a type of assessment for learning that focuses intensively on empowerment of the student in the learning and assessment process.

2.9.3.1 The role of lecturers in assessment as learning

Regardless of the fact that students are their own assessors in assessment as learning, lecturers still play a role. It is the lecturer's responsibility to create appropriate self-/and peer assessment tasks and opportunities. These are then used by the students to learn on their own and make their own decisions (Earl & Katz, 2006:41).

The role of lecturers in assessment as learning is to teach students how to set goals and how they can achieve those goals; help students to develop effective self-monitoring strategies and ask themselves honest questions that will guide them to succeed in their learning; monitor students' learning and provide them with constructive feedback; ensure that students get assistance whenever they encounter problems; and motivate students to improve on their self- and peer assessment abilities (Earl & Katz, 2006:41; Heritage, 2007:141; Miller, 2002:10).

2.9.3.2 Self-and peer assessment in the context of assessment as learning

In assessment as learning, self- and peer assessment are key (NSW, 2012:1). In self-assessment, students assess and make decisions about their own work (Race, 2001:4; Spiller, 2012:3; Miller, 2002:10). Simply put, self-assessment takes place when students decide to focus on their own work in order to enhance their own performance when they identify the gaps between their "current and desired performance" (McMillan & Hearn, 2008:40). The work that students assess may include assignments, tests, essays, and presentations (Race, 2001:4).

Peer assessment, on the other hand, is where students assess other students' work. The assessment tasks may include peers' assignments, tests, essays, group projects and video presentations. In peer assessment, however, students' decisions are often hidden from one another. Normally, the students are selected randomly in peer assessment to avoid unfair decision-making and evaluation (Race, 2001:5; Miller, 2002:11). The lecturer is responsible for ensuring that students act on the feedback given to them by their peers (Miller, 2002:11).

Benefits of self- and peer assessment include the following:

- It improves students' learning (Race, 2001:6; Nulty, 2009:3; Lindsay & Clarke, 2001:15).
- It helps students to be involved in the assessment process, which makes them feel that they own the assessment process (Race, 2001:6; Nulty, 2009:3; Miller, 2002:11).
- It gives students satisfaction since they are their own assessors (Nulty, 2009:3; Miller, 2002:11).
- It enables students to become independent learners (Race, 2001:7; Spiller, 2012:4).
- It enables students to think critically about their own work (Race, 2001:7; Spiller, 2012:4).
- It helps students become life-long learners (Race, 2001:7; Harrison & Harlen, 2006:188).
- It encourages students to share ideas with their peers and learn from each other (Miller, 2002:11; Marcangelo, 2010:3).

2.9.3.2.1 Challenges of self- and peer assessment

Miller (2002:11-12) and Marcangelo (2010:3) identified possible challenges of self- and peer assessment. It may sometimes be seen as an artificial process, since students may not have a clear understanding of the process and may not be willing to engage in the process. There is considerable time and effort involved in the initiation and creation of the self- and peer assessment tasks and corresponding grading or marking tools. It is a time-consuming task training students to use the assessment grading or marking tool well, and also for students to provide constructive feedback to others. Furthermore, students may complete the self-/peer assessment form (e.g., the grading/marking tool) unwillingly, due to a heavy workload.

2.9.3.3 Conclusion: assessment as learning

Assessment as learning builds the knowledge and thinking skills of students. However, I believe lecturers have to create an environment that will enable students to be assertive and effective assessors. Lecturers have to be available at all times in order to assist students whenever they face any challenges in their self- and peer assessments. There should definitely be opportunities for students to vigorously engage in and assess their own learning effectively as well as provide effective feedback to their peers. Furthermore, it is important to note that assessment as learning is actually an intensive form of assessment for learning (Andrade & Du, 2007:160; Spiller, 2012:4).

2.10 ASSESSMENT STANDARDS / REFERENCES

Regardless of the aim or form of an assessment, that is, whether it is assessment of/for/as learning, there should be a standard and reference point (Knight, 2001:17). The two main assessment reference points used in education are “criterion-referenced assessment” and “norm-referenced assessment” (Biggs & Tang, 2011:208; Knight, 2001:17; SAQA, 2001:25).

2.10.1 Characteristics of criterion-referenced assessment

Criterion-referenced assessment is a form of assessment of which the major purpose is to assess individual students against particular criteria (Biggs & Tang, 2011:208; Knight, 2001:17; SAQA, 2001:25).

Various authors have identified characteristics of the criterion-referenced assessment: decisions are made based on assessing students’ work against specific criteria (Knight, 2001:18; SAQA, 2001:25); students are assessed individually and it is centred on the individual student’s learning and performance (Biggs & Tang, 2011:209; Knight, 2001:18; SAQA, 2001:25); the assessment criteria are pre-defined (Biggs & Tang, 2011:209; Knight, 2001:17; SAQA, 2001:25); the criteria clearly explain the structure of the assessment and what is expected (SAQA, 2001:25); the assessment criteria are used to grade or mark the individual student's work (Biggs & Tang, 2011:209; Knight, 2001:17; SAQA, 2001:25); and it represents assessment for learning (Biggs & Tang, 2011:209), even when it is used for summative purposes.

2.10.2 Characteristics of norm-referenced assessment

Norm-referenced assessment is a form of assessment of which the major purpose is to compare different students' performances with each other (Biggs & Tang, 2011:208; Knight, 2001:17; SAQA, 2001:25).

In norm-referenced assessment, decisions are made about students' learning and progress by comparing them with each other (Biggs & Tang, 2011:209; Knight, 2001:17; SAQA, 2001:25); students are assessed in groups or classes (SAQA, 2001:25); students are graded and rated (rank-ordered) from the highest to the lowest (SAQA, 2001:25; Biggs & Tang, 2011:209); assessments are mainly based on the curriculum (SAQA, 2001:25); students' marks are averaged and compared with each other, as well as with a particular norm (Biggs & Tang, 2011:209; SAQA, 2001:25); and it mainly represents assessment of learning (Biggs & Tang, 2011:209).

2.10.3 Conclusion: assessment standards / references

Any one of the above forms of assessment may be used in higher education, depending on the institution and the relevant teaching-learning context. If criterion-referenced assessment is used, then students' performances are based on their own personal work. Students' work will then be aligned with the assessment criteria emanating from the learning outcomes in order to verify whether or not the students are competent. On the other hand, norm-referenced assessment involves assessing groups of students simultaneously. The average marks and related statistical measures of the students are then used to make decisions. I believe that if norm-referenced assessment is the only form of assessment in an institution, students will exploit it, which in turn will lead to surface learning (see 2.2.3). An ideal would rather be a mixture of both forms of assessment in order to serve quality purposes.

2.11 CONCLUSION: HOW STUDENTS LEARN - IMPLICATIONS FOR TEACHING, LEARNING, AND ASSESSMENT IN HIGHER EDUCATION

With regard to how students learn, I believe that there is a relationship between a deep approach to learning, active learning, student engagement, and high-impact practices (HIPs). If HIPs are implemented by institutions they will promote active learning, student engagement, and consequently improve students' learning (see 2.5.3). When students are actively engaged in the learning process, they are more likely to apply deep and strategic approaches in their learning (see 2.2.4.1, 2.2.5.1). Conversely, if they are disengaged from the learning process, they will rather use a surface approach in their learning (see 2.2.3.1). In other words, students' learning approaches depend on how they are engaged in the learning process. Thus institutions, lecturers and students all need to work together in order to ensure a quality learning approach. Lecturers need to motivate their students (see 2.4.8); students need to have interest in their courses (see 2.2.4.1, 2.2.6.4) and also make an effort to study hard; institutions need to provide both students and staff the necessary resources to enhance their learning and teaching respectively (see 2.4.7). Through the effective integration of HIPs into students' curriculum, students will be actively engaged in the learning process and apply effective learning approaches which will eventually improve their learning (see 2.5.2, 2.5.3). Though evidence has shown that HIPs have a positive impact on all students (see 2.5.1, 2.5.3) institutions need to train and support their academic staff on how to effectively employ these practices in their assessment to enhance students' learning (see 2.5.3).

In terms of assessment, literature indicates that assessment is a key concept in teaching and learning in higher education institutions (see 2.6.1). All stakeholders (students, lecturers, administrators) should therefore work together to implement an effective assessment system.

In the context of assessment of learning, the lecturer is usually the sole decision maker. Lecturers' decisions are based on the students' level of performance (see 2.9.1.1). I am of the view that it is important for lecturers to be fair in their decision-making processes (see 2.9.1.1) since unfair decisions may jeopardise the purpose of students' learning and their future academic endeavours. Ideally, concepts such as age, gender, race, ethnicity, inter-personal relationships, and religion should not influence lecturers' decision in assessment of learning (see 2.9.1.1).

On the other hand, in assessment for learning, lecturers and other stakeholders, such as parents, friends, peers, etc. may become actively involved with the students' learning. Lecturers should devise specific forms, methods, and instruments (assessment tasks and grading tools) that may enhance students' learning (see 2.9.2.1, 2.9.2.5). Another very important concept in assessment for learning is the absolute importance of constructive feedback. Lecturers should provide feedback to students to inform them of their progress (what they did wrong or right) and how they can improve on their work in future. The feedback must be delivered in a constructive way (see 2.9.2.1.3).

The key stakeholder in assessment as learning is the student. Students should be empowered to develop strategies that may improve their own learning. I believe that assessment as learning may enable students to become responsible since they will manage and monitor the progress of their own learning as well as that of their peers (see 2.9.3.1). That is, they will become capable of assessing their peers' learning, provide constructive feedback to their peers, and learn from each other. Students will thus develop the capability of reflecting on their own work and making the necessary changes (see 2.9.3.1, 2.9.3.2).

I am of the view that there is no right or wrong form of assessment. However, a combination of these forms of assessment may be ideal and may enhance students' learning. Focusing on only summative assessment (assessment of learning) will affect students' learning negatively since it does not show the exact reflection of what students' have learned.

In conclusion, the way assessment tasks are designed and used by lecturers will determine how students learn. It is therefore important for lecturers to develop appropriate tasks for their students.

The next chapter introduces e-learning in the context of higher education, and outlines how assessment might be implemented in an e-learning environment. The latter is referred to as e-assessment.

CHAPTER 3

E-LEARNING AND E-ASSESSMENT IN HIGHER EDUCATION

3.1 INTRODUCTION

In this review, various studies on e-learning will be reviewed. The following aspects of e-learning will be discussed in this literature review as a background to e-assessment: the origin of e-learning; an overview of e-learning; modes or types of e-learning; the e-learning platform and environment; e-learning and student performance; advantages and disadvantages of e-learning; enabling factors and barriers to e-learning; critical success factors for e-learning implementation; e-learning and student motivation; and evaluating the effects of e-learning.

Subsequently, studies on e-assessment done by researchers will be reviewed. Concepts such as e-assessment feedback, compatibility and flexibility of e-assessment; benefits and challenges of e-assessment; components, and requirements for e-assessment will be looked at.

This chapter is divided into two main sections, namely e-learning and e-assessment in the context of higher education respectively. The first section will focus on e-learning in higher education.

3.2 E-LEARNING IN HIGHER EDUCATION

3.2.1 Origin of e-learning

According to Al-Yahya, George, and Alfaries (2015:69), in 1998 Elliot Masie was the first person to use the word e-learning. In e-learning, course material is delivered to students in non-traditional formats such as audio, video, pdf, etc. Different terms such as distance learning, online learning, networked learning, internet learning, distributed learning, virtual learning, computer-assisted learning, and web-based learning are sometimes used by researchers to represent e-learning (Wilson, 2001:1; Anderson, 2008:16; Naidu, 2006:1). I view all these terms as having one common denominator, namely information technology.

The difference between the traditional method of learning and e-learning is that the former focuses more on a situation where many students attend a lecture given by a lecturer in a classroom, whereas the latter is centred on students who learn independently and have access to a variety of resources online (McNeil, Robin & Miller, 2000:700).

Due to the affordability and ease of accessibility of information technology, many institutions have adopted e-learning (Anderson, 2008:2). Michael (2012:157) and Volery (2000:217) emphasise that e-learning has since become a necessity and not only an option for institutions if they intend to remain competitive. Although e-learning is a necessity, some institutions are failing to adopt an e-learning system (Michael, 2012:157; Saltmarsh & Sutherland-Smith, 2010:16).

Agnihotri and Agnihotri (2013:211) emphasise that although technology improves learning, it cannot replace lecturers. In their research, most students stressed that the e-learning system in question should only support traditional learning processes and not replace them. They further state that in e-learning students need to be more disciplined and mature. Benchicou, Aichouni, and Nehari (2010:328), after analysing literature on e-learning, conclude that e-learning should focus on the following four main aspects: the student, the e-learning content, the lecturer, and the technology used. However, in all these components, the student should be at the centre; that is, all these components should cater for the needs of the students.

3.2.2 Overview of e-learning

There is some argument concerning an appropriate definition for e-learning in different studies, the reason being that researchers from different sectors and with different skills tend to define e-learning according to their own knowledge and background. However, Holmes and Gardner (2006:14) state that the effect of information technology on pedagogical approaches and on education has resulted in disagreements since several academic articles on e-learning were published at the same time without the authors having had the luxury of previous publications, theories, and perspectives to rely on.

According to Anderson (2008:1), e-learning is the use of networked information and communication technology (ICT) to deliver teaching and learning. Nehme (2010:223); Nichols (2003:2); and Welsh, Wanberg, Brown, and Simmering (2003:246) define e-learning as the process of using ICTs and/or networks such as the Internet, a local area network, e-mails, discussion forums, chat systems, compact disc read-only memory (CD-ROMs), digital cameras, virtual learning environments (VLE), learning management systems (LMS), audio recordings, and videos to deliver learning information and material to students. Anderson (2008:1) states that e-learning should integrate all learning tasks performed by individual students or groups of students. He further emphasises that these tasks can be performed online or offline, and synchronously or asynchronously using a computer network, a standalone computer, and/or other digital devices.

Based on the above definitions by the different authors, I define e-learning (for the purpose of this study) as the process of delivering teaching and learning information and communication through a networked or standalone computer and/or other storage devices such as CD-ROMs, DVDs, satellites, etc.

3.2.3 Modes or types of e-learning

One effective way of communication is through the Internet and/or networked computers. Students can use the Internet and/or networked computers to share and obtain information. This can be done synchronously or asynchronously (Richard & Haya, 2009:184-185; Zengin, Arikan & Dogan, 2011:295). E-learning enables students to learn online material independently and/or participate in online lecturer-led classes (Ryan, 2001:54-55).

Various authors have identified different modes of e-learning. These are:

3.2.3.1 Synchronous/Individualised self-paced e-learning online

Students use either the Internet or an intranet to access their learning material. Students using this mode of study need to be highly disciplined and motivated (Naidu, 2006:1-2; Romiszowski, 2004:6). Algahtani (2011:51-53) calls this mode Internet-based.

3.2.3.2 Asynchronous/Individualised self-paced e-learning offline

Students access their learning material on a CD, DVD, external hard drive, etc., using a standalone computer. In such a situation, the Internet is not used (Naidu, 2006:1-2; Romiszowski, 2004:6). Algahtani (2011:51-53) refers to this mode as computer-based learning.

3.2.3.3 Synchronous group-based e-learning

A group of students and a lecturer attend “live” online classes at the same time (Biggs & Tang, 2011:71). This mode is more reminiscent of a traditional classroom since students can see the lecturer and ask him/her questions where immediate feedback is given (Naidu, 2006:1-2; Romiszowski, 2004:6). Due to the real time delivery of such courses it is, however, an expensive mode of studying. In this mode, students need to be physically present throughout the session (Gunasekaran, McNeil & Shaul, 2002:46-47)

3.2.3.4 Asynchronous group-based e-learning

This mode allows a group of students to interact with lecturers and other students but not at the same time. Every participant provides inputs when convenient, for example, by using e-mails and/or discussion boards (Biggs & Tang, 2011:71). Students sometimes attend classes and they get feedback from both lecturers and their peers. Unlike the individualised/independent and self-paced mode, students obtain enough assistance from peers and lecturers (Naidu, 2006:1-2; Romiszowski, 2004:6). Students can watch tutorial videos that have been uploaded on their LMS (Gunasekaran, McNeil & Shaul, 2002:46-47). This is the most commonly used mode of e-learning (Greenagel, 2002:4).

Some modules allow students to work together where forums are created to discuss concepts while other courses require independent study. If the module requires group work or discussions (collaboration) then online delivery (without the lecturer's help) will be most suitable. However, if students are required to work independently, then a blended-learning approach (combining online and classroom learning with lecturers' assistance) would be appropriate. Most institutions prefer the blended learning approach since it can accommodate different learners with different learning styles and approaches (see 2.2; Wagner, Hassanein & Head, 2008:27; Jack & Curt, 2001:56-58).

3.2.3.5 Conclusion: modes and types of e-learning

I believe that the different modes of e-learning have the potential to simplify the learning process, since students have the option of choosing the mode or type of e-learning mode that will suit them. Most e-learning students are usually employed and an asynchronous mode will best suit their circumstances. However, some students have the advantage of asking online tutors questions and getting instant feedback through the synchronous mode. Nevertheless, I am of the view that students who come from a low-income background will be disadvantaged in terms of the synchronous mode since this requires live streaming and extensive bandwidth usage, which is expensive. However, there may be instances where the online learning facilities might not be available. For this reason, lecturers should try their utmost to provide students with the material offline using CDs, DVDs, tutorial videos, etc. Therefore, students should be provided with alternative modes of e-learning whenever necessary. I believe that a blend of these options would make e-learning a suitable learning option.

3.2.4 E-learning platform and environment

Naidu (2006:43) and McIntosh (2015:5) define a learning management system (LMS) as a set of software tools used by lecturers for managing, monitoring, and assisting various teaching and learning activities.

With e-learning management platforms, lecturers are required to input the content of their courses in a template and uploading it on the Internet for students to use. The two main management platforms that are used interchangeably are learning management systems (LMS) and learning content management systems (LCMS) (Algahtani, 2011:53-54).

An LMS is a software platform that allows lecturers to manage, update, upload, and monitor students' tasks online. It does not necessarily focus on content only but can facilitate tasks either synchronously or asynchronously. Moodle and Blackboard are typical examples of LMS that are used in higher education institutions. An LCMS, on the other hand, focuses more on content that lecturers are able to create and re-use. This means that an LMS is based on learning management whereas an LCMS is based on content management. However, these terms are often used interchangeably (with the LCMS incorporated into an LMS) (Algahtani, 2011:53-54).

Benefits of a learning management system (LMS) include its in-built security and privacy. With these security measures, students and guests should provide authentication (through a username and password) to access online material. The intellectual property of lecturers are also protected; it is very difficult for unauthorised people to access content; student assignments and tests are secure, and students have access to up-to-date material (MacPhee, Shelley & Karcz, 2003:15). The most commonly used LMSs are Moodle and Blackboard (Knorr, 2012:1; MacPhee, Shelley & Karcz, 2003:28-29; Al-Hujran, Aloudat, Al-Hennawi & Ismail, 2013:1197). For the purpose of this literature study, Moodle will be the focal point, since it is the LMS used at the institution that is focused on in this study.

3.2.4.1 Moodle as an LMS

Moodle is an open source software system that enables lecturers to deliver/teach courses and students to learn and improve their own learning. The acronym Moodle is used for the Modular Object Oriented Dynamic Learning Environment. As it is an open source tool, Moodle can be customised to fit an institution's needs, policies, and regulations. Institutions can also add additional features to the LMS to suit their criteria (Alkhateeb, Almaghayreh, Aljawarneh, Muhsin & Nsour, 2010:3)

The installation, upgrade, and usage of Moodle is very straightforward and uncomplicated. Moodle installation can be done on several servers without any extra cost. It is also compatible with Windows, MAC, and Linux operating systems. The main idea behind the creation of Moodle is to support teaching and learning (Kibble, Kingsbury, Ramirez, Schlegel & Sokolove, 2007:377)

Security should be of great importance when it comes to online learning. The built-in security that comes with e-learning tools is not always effective enough. Since Moodle is open sourced, developers are able to improve on the security of the LMS by adding codes that will prevent hackers from accessing online content. Each student requires an account to access Moodle. Once a student enters his/her username and password, he or she will be able to see the modules he/she has been registered for in the institution. Students can view all learning material pertaining to their modules and download them if they wish to do so. Lecturers are also registered as users but have more privileges, such as editing content, deleting content, and updating content (Herdiana & Shafie, 2008:29-30).

Typical assessment tasks supported by the Moodle LMS includes calculations, calculated multi-choice questions, calculated simple questions, embedded questions (closed tests), essay questions, matching questions, multiple-choice questions, numerical questions, stack questions, random short-answer matching questions, short-answer questions, true/false questions, and description questions.

Moodle is flexible and stable. With Moodle forums can be used to convey information to a larger group of students. In their research, Alkhateeb, Almaghayreh, Aljawarneh, Muhsin, and Nsour (2010:4-5) found that Moodle is an effective platform for learning.

3.2.4.2 Types of e-learning environment

Zeitoun (2008:16) identifies a reality learning environment and a virtual learning environment as the two main types of e-learning environments. Nevertheless, other researchers have come up with a third learning environment, namely the "personal learning environment" (Algahtani, 2011:55).

The first two types of e-learning environment require the intervention of lecturers and the institution. In the third, the student takes complete control of his/her learning. In a reality learning environment (RLE), classrooms are unfortunately not fully equipped for e-learning. There might only be a few computers available to students. In a virtual learning environment (VLE), learning takes place online and students are able to interact with lecturers and peers, either synchronously or asynchronously (Algahtani, 2011:56). According to Conole and Oliver (2007:135) a VLE includes a set of digital tools used to support learning practices. Examples of such tools will be online discussion forums, online chats, tools for assessment (such as multiple-choice questions, column matching, short questions, etc.). Moodle, and Blackboard are examples of platforms where VLEs can be implemented. With regard to a personal learning environment (PLE), students learn independently. VLEs are mostly used environment for e-learning (Algahtani, 2011:56).

3.2.4.3 Conclusion: e-learning platform and environment

I am of the opinion that the LMS platform chosen by an institution should be based on the needs of that institution. Since Moodle, as an open source platform, can be transformed to meet the institution's needs and, most importantly, improve the security of online material by adding an additional code to the platform, as suggested by Herdiana and Shafie (2008:29-30), it is a reliable option for e-learning in higher education institutions.

3.2.5 E-learning and student performance

According to Lieberman (2000:25) the most important aspect of an e-learning environment is students' involvement or engagement in the teaching-learning process. E-learners are usually more able to become actively involved in group discussions and group activities, compared to traditional students. However, O'Connell (2002:15) disputes this statement by saying that students who are quiet will not necessarily involve themselves in online discussions because they believe that some students might still be able to control the discussion platform. A lecturer who does not exercise the skills of effective classroom management might fail to control students in a traditional classroom (Nia & Marandi, 2014:78-81). The same might happen in an online class if the lecturer does not execute effective online management principles. In online learning there are principles of effective discussion/engagement as well as netiquette rules (Nia & Marandi, 2014:78-81). The use of these principles contributes in creating an environment conducive to optimum online teaching and learning.

Nevertheless, many studies prove that e-learners perform better than traditional classroom students. A study conducted by Scott (2000:102) with students from the Carnegie Mellon University (CMU) in the USA, shows that the students making use of an e-learning system performed better than those who used the traditional method. The students used the e-learning system to create and control their own businesses online, examine the business plans of their competitors, and monitor how their businesses are performing online. These online simulation activities were not available to traditional students. Holley (2002:114) purports that through the use of e-learning, students acquire practical knowledge of the courses they are studying, which has the potential to greatly improve their performance.

An e-learning system should not only improve students' grades, but also assist to prepare students for the world of work. Effective implementation of e-learning has the potential to enhance students' performance. However, if institutions fail to implement appropriate policies and strategies pertaining to e-learning, students might not be able to achieve better grades. I believe that in an e-learning environment, students' performance will improve if they are self-disciplined, self-motivated and willing to learn, because they are responsible and in control of their own learning (see 2.4.8).

3.2.6 Advantages of e-learning

Literature has identified many benefits that come with e-learning. For example, research done by Barker and Wendel (2001:9) proved that online students improved significantly in their learning compared to traditional students in terms of research, using a computer, decision making, sophisticated problem-solving, time management, critical thinking, and independent learning.

With the introduction of e-learning, the aspiration of lifelong learning is now possible since e-learning systems make it easier for different groups of people (workers, older persons, the disabled) to have access to education. Since e-learning supports lifelong learning it may be seen as a better option to traditional classroom learning (Lee, Hsieh & Chen, 2013:173; Zhang, Zhao, Zhou & Nunamaker, 2004:78-79; Serwatka, 2002:47).

In reporting on their own research, Al-Yahya, George, and Alfaries (2015:73-74) mention a system called Ontology E-learning (OeLe), which has been designed for assessment purposes. This system marks students' assessments automatically and provides instant feedback to students.

3.2.6.1 Some additional advantages of e-learning

Other studies report the following benefits of e-learning to students and lecturers (online and offline):

a. E-learning (online and offline) is convenient and flexible since it enables students to access their material from anywhere and choose to learn from any location (O'Donoghue, Singh & Dorward, 2001:528; Park, 2009:150; Holley, 2002:113; JISC, 2004:7; Burgess, 2003:8-9; Hiltz & Turoff, 2005:60). This flexibility increases the number of students that could be enrolled in an institution because the barriers of time and place are removed (Owino, 2013:12).

b. Online e-learning improves interaction (between students and lecturers) and group work through the use of discussion forums and chat rooms without distance being a hindrance (Mapuva & Muyengwa, 2009:225; JISC, 2004:7; Owino, 2013:12). Although e-learning enables students to interact with or share information with lecturers, students will only benefit from online learning if there is ''a critical engagement with information'' (Le Grange, 2004:89).

c. Both online and offline e-learning systems accommodate all types of students (part time or full time) since the students can pursue their courses from any location without having to travel as all learning material would be available either online or offline (downloaded onto students' computers) (Hemsley, 2002:27; JISC, 2004:7).

d. E-learning systems (both online and offline) allow students to learn at places that they feel more comfortable with; they can therefore learn independently and take control of the learning process (Sadler-Smith, 2000:475; JISC, 2004:7; Zhang, Zhao, Zhou & Nunamaker, 2004:76; Holmes & Gardner, 2006:14; Zeitoun, 2008:15).

e. Online and offline e-learning systems enable disabled students to study from their homes (Brown, Cromby & Staden, 2001:294; Owino, 2013:12).

f. The videos, simulations, and multimedia used in both online and offline e-learning systems may encourage students to learn since they have the potential to solve problems and perform sophisticated tasks (JISC, 2004:7; Johns, 2003:431). Students can use and exhibit various learning styles or approaches (see 2.2) and tasks can be carried out using different formats (Benchicou, Aichouni & Nehari, 2010:329-330).

g. Online e-learning systems may afford students the opportunity to receive immediate feedback, and monitor their progress through their online assessments (Benchicou, Aichouni & Nehari, 2010:329-330; Burgess, 2003:8-9).

h. Both online and offline e-learning systems negate the issue of staff shortages that normally occur in a traditional classroom since one lecturer can cater for many students (Abaidoo & Arkorful, 2014:401-403).

i. E-learning systems (online and offline) minimise the use of paper since some (or all) assessments take place either online or on a standalone computer (Alkhateeb, Almaghayreh, Aljawarneh, Muhsin & Nsour, 2010:2).

3.2.6.2 Conclusion: advantages of e-learning

Based on these benefits, I conclude that if e-learning is effectively implemented, it will be to the advantage of students, lecturers, and institutions alike. Literature indicates satisfaction and flexibility as the main benefits of e-learning, and students will learn to take responsibility for their own learning and their future in the workplace. Through e-learning students are provided with opportunities to take full control of their own studies. They are allowed to do assessments in their own time and may re-attempt them until they acquire an in-depth understanding of the assessment. Thus, an e-learning system may also encourage deep learning (see 2.2.4). Lecturers are also able to re-use assessments (as part of a data bank of random assessment tasks), which in turn reduces the time required to design assessment tasks. Institutions will be able to enrol more students due to the flexibility of anywhere, anytime e-learning. Their retention rates may also be improved if students' performance rates increase as a result of the adoption of an e-learning system.

Higher education institutions therefore need to educate all their stakeholders on the importance of e-learning. As seen in the literature reported above, it is evident that e-learning provides many benefits, but only if implemented properly. Students' learning can improve if they actively participate in the online activities their lecturers share with them. It is very important that the idea behind e-learning should not be about the technology involved but rather about pedagogy. Pedagogical approaches should be integrated into the available technology to support e-learning students. On the other hand, I am convinced that without appropriate instructional methods, technology alone will not improve students' learning.

Research studies have, however, also shown that there are some important disadvantages to e-learning. These disadvantages are discussed in the next section.

3.2.7 Disadvantages of e-learning

Research conducted by Delahunty (2012:416) shows that students' uncertainties about interpreting others' attitudes and values, lack of real-time communication, concerns about where an individual perceives he/she fits in a group, as well as the relatively short duration of the course intake, are some of the problematic issues online students encounter. The issue of real-time communication might also be questioned if the synchronous mode of e-learning does not allow enough opportunity for students to interact with their lecturers and other peers in real time (see 3.2.3.3).

3.2.7.1 Some additional disadvantages of e-learning

Other authors identify the following disadvantages of e-learning experienced by students and lecturers (online and offline):

a. Students may lose the feeling of belonging and start to wonder if they are doing their tasks correctly. Thus, lack of human contact might have a negative effect (Abaidoo & Arkorful, 2014:401-403; Burgess, 2003:8-9; Zhang, Zhao, Zhou & Nunamaker, 2004:76).

b. E-learning is less effective if lecturers are not available to assist students when they require clarification and/or explanation of the concepts they are learning (Abaidoo & Arkorful, 2014:401-403).

c. E-learning students (especially those using the offline mode) may have a problem with communication skills since they seldom discuss their assessment tasks with their peers and lecturers (Abaidoo & Arkorful, 2014:401-403; Barker & Wendel, 2001:9).

d. E-learning may minimise the social interaction at institutions and the role played by lecturers (Abaidoo & Arkorful, 2014:401-403)

e. Not all courses are ideal for e-learning. Courses that require actions from the lecturer such as physical education, music, etc. will not lend themselves to sheer e-learning (Abaidoo & Arkorful, 2014:401-403).

f. In an asynchronous e-learning system, students do not receive immediate feedback (Zhang, Zhao, Zhou & Nunamaker, 2004:76).

g. A considerable amount of time is required for lecturers to prepare e-learning courses and provide feedback (Burgess, 2003:8-9; Zhang, Zhao, Zhou & Nunamaker, 2004:76).

Gordon (2014:9) claims that the flexibility of e-learning can become a problem if students find it difficult to identify where to learn and how to learn. Students may also face many distractions at their chosen place of learning. When this happens, students will lose concentration and eventually end up not learning at all. This can be detrimental to their studies (Gordon, 2014:9).

As far as lecturers are concerned, Gordon (2014:9) states that although lecturers are able to assess students with different needs through different formats of technology (such as videos, simulations, and audio), and it can enhance collaboration between the students and the lecturer, it nevertheless becomes difficult for lecturers to “identify, select and adopt” educational policies that will improve learning outcomes (Gordon, 2014:9). Lastly, institutions often struggle to develop an effective e-learning system that will support flexible learning and improve student learning (Gordon, 2014:9).

O’Donoghue, Singh, and Dorward (2001:529) also fear that if students are allowed to learn when situated in own comfort zones, they might not be fully committed to the learning process. Shabha (2000:237) concurs that students learning from home may be interrupted by people and/or other distractions which will eventually prevent the student from concentrating. For these reasons, institutions need to ensure that their e-learning courses are appropriate and meet the needs of students.

3.2.7.2 Conclusion: disadvantages of e-learning

Based on the above-mentioned disadvantages, I conclude that the adoption of e-learning should also accommodate students’ individual personalities. The literature above argues that e-learning eliminates the human contact of classroom learning and hence might weaken students' communication skills. Another issue is flexibility. Although these problems do exist, they depend on the type of online student. I believe that if students are mature and disciplined individuals and that they enjoy the courses they are studying, these problems will not affect them. In terms of communication skills, synchronous (live) e-learning opportunities will allow students to communicate with peers and lecturers, which in turn will help to improve the communication skills of these students. In other words, these disadvantages could be overcome through effective planning and careful implementation of an e-learning system.

3.2.8 Possible barriers to e-learning

Apart from the disadvantages of e-learning, there are some barriers/challenges that might hinder students, lecturers, and institutions from adopting or mastering e-learning. Benchicou, Aichouni, and Nehari (2010:331) identify personal, learning approach, pedagogical, situational, institutional, content, and technical barriers to e-learning. The main situational and institutional barriers are the absence of an e-learning plan or policy, and an appropriate infrastructure for the system. In addition, the nature of the institution, students' self-confidence, their knowledge of computer usage, their age, educational level and gender are some factors that might hinder students from effectively using e-learning systems.

Some general barriers to e-learning that have been found in different literature sources consulted are as follows:

3.2.8.1 Lack of awareness about the importance and potential of e-learning and what it entails

One important element of e-learning is to inform students of its existence, and provide clear reasons for its implementation (Bhuasiri, Xaymoungkhoun, Zo, Rho & Ciganek, 2012:844-845; Bharuthram & Kies, 2013:411). If students are not made aware of the existence, importance, and potential of an e-learning system, then the benefits that come with the system (such as improved teaching and learning, cost saving, etc.) will not materialise (Ali & Magalhaes, 2008:39; Pituch & Lee, 2006:223). It is therefore important that lecturers and students are conscientised about the expected effectiveness of an e-learning system before it can be fully beneficial. Furthermore, if lecturers and students lack an understanding of e-learning, they might feel that there is no point in using the system.

3.2.8.2 Lecturers' and students' refusal to use the e-learning system

Various educational practices change when e-learning is implemented (Hassanzadeh, Kanaani & Elahi, 2012:10959). Due to the effect of these changes, lecturers are usually reluctant to move from their traditional way of teaching towards the use of an e-learning system (Al-Halabi & Al-Hawari, 2010:1). Similarly, students are often hesitant to change from their traditional way of acquiring their material (hard copies) to the new e-learning system (online). In research conducted by Tan, Nabb, Aagard, and Kim (2010:13), they found that students still preferred using hard copies of material and making their own notes on paper, as opposed to online material.

3.2.8.3 The unavailability of an e-learning website

Availability, accessibility, and reliability are key to the success of e-learning systems (Motaghian, Hassanzadeh & Moghadam, 2013:160; Sun, Tsai, Finger, Chen & Yeh, 2008:1185; Al-Harbi, 2011:35). According to Ribiero (2002:85), to ensure that students benefit from e-learning, institutions must ensure that study material and resources are always available on the system and that students can constantly interact with their lecturers. In research conducted by Al-Hujran, Aloudat, Al-Hennawi, and Ismail (2013:1200), students complained that the website was not working properly most of the time and that they felt frustrated when they needed material on the site urgently. This may be a challenge for students. It is the institution's responsibility to ensure that the e-learning website is always functional and, in case of any problem, the website should be restored immediately. Holley (2002:116) and Shabha (2000:238) state that many students may come from families whose income is low and they might therefore not be able to afford their own computers. If students do not have access to computers and the Internet, they will be disadvantaged since these resources are the basic requirements for e-learning.

3.2.8.4 The institution and lecturers' role in determining students' use of e-learning tools

It is the institution's responsibility to motivate both students and lecturers to use the e-learning system. However, this will only be possible if the institution performs regular maintenance on the system, lecturers upload up-to-date teaching and learning material, the institution creates an easy-to-use interface, and continuously train both students and lecturers (Bhuasiri, Xaymoungkhoun, Zo, Rho & Ciganek, 2012:846). People with the technical expertise should be available to maintain the e-learning system and also attend to students who are faced with issues with regard to accessing the system. The success or failure of an e-learning system also depends on the role of lecturers (Motaghian, Hassanzadeh & Moghadam, 2013:159). Students will be motivated to use the system if they realise that their lecturers are using it, and they will be forced to use the system if lecturers present their activities online (Maldonado, 2011:67-68).

3.2.8.5 Lack of assertiveness among students

Many institutions are faced with challenges where students are not assertive enough to use the e-learning system and to interact with lecturers. If the e-learning system is not implemented properly, students' learning will be affected negatively because they might not know how to do online assessments or access online course material; they might therefore be too inhibited to interact with lecturers (Serwatka, 2002:27). Institutions therefore need to educate their students properly about the e-learning system before deploying it (Hartley, 2000:38). This can be done by ascertaining the educational needs of the students. This will enable them to implement an e-learning system that will meet the needs of their students and consequently enhance student learning (Fry, 2001:236).

3.2.8.6 Reluctance to adapt to a change in the learning process

It is believed that e-learning implementation has the potential to change the learning styles and/or approaches of students. According to O'Neill, Singh, and O'Donoghue (2004:317) students who are mostly inactive in a traditional environment will benefit from an e-learning environment since they will have no other option than to learn independently and become actively involved in the learning process. Hawkes and Cambre (2000:26) agree by pointing out that students will only see the positive results of e-learning if they are in control of their own learning. Kershaw (1996:45-46) warns that students will not immediately exhibit self-confidence and/or produce good results in an e-learning environment if they are not afforded continuous interaction with their lecturers. Cooper (1999:26) also emphasises that only students who have the ability to learn independently will initially see e-learning as beneficial. For this reason, the implementation of e-learning by institutions should accommodate different students' needs and their learning approaches and should not be implemented across the board immediately. If institutions fail to consider these factors, students will not benefit.

3.2.8.7 Students being isolated from each other

Bourner and Flowers (1997:79-80) state that the incorporation of technology in higher education institutions should involve frequent interaction between students and lecturers. However, O'Neill, Singh, and O'Donoghue (2004:317) argue that if students cannot study without interacting with lecturers, then they will also not be able to read a book in a library on their own. Therefore, students need to be able to do extensive research on their own and take responsibility for their own learning in an e-learning environment (Michailidou & Economides, 2003:132; Moore, 2000:14). This stresses the importance of students' frequent interaction with lecturers and other students.

3.2.8.8 Ignoring students' needs and competencies

When implementing an e-learning system for the first time, institutions need to consider their students' needs and competencies in the use of technology. They can offer workshops for the students on how to use the system and how to access learning material from the system. Lecturers' contributions are also important for the success of an e-learning system because they can guide the students whenever they encounter problems (O'Neill, Singh & O'Donoghue, 2004:317).

3.2.8.9 Lack of appropriate quality assurance measures

There is a general concern that online courses are not always of high quality. Copeland (2001:2) states that many online courses forfeit quality assurance and that this has made it very difficult for legitimate online institutions to prove to the world and employers that they offer quality courses. Caudron (2001:44) advises that institutions should provide students with quality online courses that will enable them to become employable after completing the course. However, although students should acquire a variety of skills in an e-learning environment, they may lack the interpersonal skills that the traditional environment provides. If institutions implement quality control measures online, they will enable the system to provide quality learning. Employers often show more interest in students who have acquired degrees through online learning because they believe such students have put in extra effort and time to complete the course; they require workers who are disciplined, self-confident, fit the organisation, have an appropriate qualification, and appropriate experience (Caudron, 2001:44-45).

For lecturers, the following are some of the possible barriers in e-learning:

3.2.8.10 Changing one's own teaching style

According to McFadzean (2001:53), e-learning requires lecturers to adapt and/or change their teaching styles to accommodate the online environment. McFadzean (2001:54-55) states that in an e-learning environment, lecturers need to change from the traditional lecturer-centred (where only lecturers control the learning) to a student-centred teaching style (where the students take control of their own learning). The role of a lecturer should be to help students reach a point where they feel satisfied with their own work. In such an e-learning environment, the lecturer will no longer provide students with information but will rather help and encourages students to look for information of their own accord. According to Moore (2001:1), students will take responsibility for their own learning if they are expected to prepare, present, and participate in the learning process.

3.2.8.11 Changes in lecturers' workload

Institutions planning to implement e-learning should train and develop their lecturers (Copeland, 2001:2). The training is necessary to ensure that lecturers are using the system effectively (Wilson, 2001:5-6). The problem here is the effect that such training might have on their workload, especially those lecturers who have no experience in technology. Nicolau, Nicolaidou, and Contantinou (2005:607) emphasise that due to the effect of training and the implementation of e-learning on their workload, lecturers should be rewarded for their additional effort. The absence of rewards and incentives may discourage lecturers to use an online system in their teaching.

3.2.8.12 Conclusion: possible barriers to e-learning

Most of the barriers identified above can be eliminated if institutions take control, adapt, and implement clear policies and procedures regarding their e-learning systems. Institutions need to be cognisant of their students' needs, train their lecturers, and provide adequate resources and infrastructure before implementing an e-learning system. Another important factor that will help overcome these barriers is immediate and regular technical support for both students and lecturers. When students and lecturers become frustrated due to a technical problem, they will not be motivated to use the system. Although students and lecturers play a role in the effective implementation of an e-learning system, the institution plays a more significant role.

3.2.9 Critical success factors (CSFs) for e-learning implementation

In order for institutions to succeed in the implementation of e-learning in their courses, they need to look at some of the critical success factors (CSFs) for e-learning. CSFs enable institutions to examine what other institutions around the globe are doing to sustain and improve their e-learning systems and learn from them (Benchicou, Aichouni & Nehari, 2010:330; Ribiero, 2002:85). Institutions and lecturers need to understand how students feel about the e-learning system, and how the institution can help them improve their teaching and learning through the e-learning system (Koohang & Durante, 2003:107). Soliciting the opinions and perceptions of lecturers and students of their use of an e-learning system will enable the institution to improve the system. Investigating perceptions may also motivate lecturers and students to use the system more often and more effectively (Grandon, Alshare & Kwan, 2005:47).

According to Selim (2007:409); and Zhang and Bhattacharyya (2007:219), the following are some CSFs to consider in e-learning implementation:

- Attitude of lecturers towards the technology.

- Lecturers' teaching styles.
- Students' motivation and knowledge of the technology.
- Students' interaction and cooperation.
- Structure and content of e-learning tasks.
- Availability of the Internet to students and lecturers.
- Availability of a proper e-learning infrastructure.
- Institutions' support and involvement in the assessment development process.
- Availability of qualified technical staff to assist lecturers and students.

Other studies suggest the following as the main factors to consider when implementing e-learning:

3.2.9.1 Institutional management

To successfully implement e-learning, it is important to know how student learning takes place online, and management in the institution should be kept up-to-date in this regard (Govindasamy, 2002:287; JISC, 2004:40).

3.2.9.2 Changes in organisational structure

With the implementation of e-learning, the organisational structure at the institution should also change. Shabha (2000:237) indicates that technology has broken the barrier of rigid organisational structures. The JISC (2004:40) concurs that institutions can only benefit from e-learning if they make their organisational structures more flexible. Scott (2000:37) cautions that institutions need to do this in order to keep abreast with other higher education institutions.

3.2.9.3 Staff training

If staff is unfamiliar with operating an e-learning system, they will be reluctant to use it in their teaching. According to Volery (2000:57), lecturers are key to effective implementation of e-learning (but not the technology itself), since they are the ones who will assist students in using the system properly in their own learning. They should therefore be trained in this regard. Wilson (2001:8) also purports that lecturers' "attitudes towards technology, teaching style and control of technology" are factors that eventually also determine students' level of commitment to e-learning because positive lecturer attitudes have the potential to create a favourable learning environment for students. Holley (2002:117) supports this by pointing out that students are always positive about their learning if their lecturers have a positive attitude towards their teaching methods. However, Charlesworth (2002:178) argues that “contemporary lecturers” are not reluctant to undergo training in the use of technology; rather, they are ignorant of how to incorporate the technology into their teaching. Nevertheless, there is a high possibility for contemporary lecturers to accept and use technology in this digital age as new educational technologies provide opportunities for gains in educational effectiveness (Yalcin, Yalcin, Yalcin Sagirli, Yalcin, Koc, 2011:436). Lecturers should, however, be encouraged to not merely duplicate their traditional teaching online (Coldwell, 2003:181).

3.2.9.4 Creating a conducive e-learning environment

If students have a favourable learning environment, they will be willing to learn. According to Hartley (2000:37), problems associated with large group work in a traditional environment is removed in an e-learning environment since many students can join group discussions from different places.

3.2.9.5 Knowing your students

It is important for lecturers to know the type of students they have (in terms of their maturity, knowledge of technology, learning experience, how they manage their time, whether they are working or not, and how they learn, etc.) (see 2.4.5, 2.4.10; JISC, 2004:52-53). Literature indicates that mature students are more readily encouraged to use technology as compared to younger students, due to its flexibility (Khan, 2005:183). Lecturers should therefore create online questionnaires in order to determine the type of students they will be teaching online (Willis, 1993:1).

3.2.9.6 Students’ experience in the use of information technology

Another significant factor to consider is the students’ level of experience with regard to technology. According to Clarke (2003:7) and Chokri (2012:184), although e-learning changes the way lecturers teach and uplift educational standards, students’ level of technology experience must be considered before implementing e-learning courses, or else they might not be motivated to participate in any activities online.

3.2.9.7 Aligning content to the course curriculum

In e-learning the content taught should be properly aligned to the course learning outcomes. E-learning activities should be significant and assessment tasks must include clear instructions (Anderson & McCormick, 2005:2-6; Chokri, 2012:184). This is what Biggs and Tang (2011:97) call constructive alignment (see 2.7.1). Thus, e-learning and e-assessment tasks should both be aligned with the intended learning outcomes. In this way, students will be empowered to apply a deep approach to learning (see 2.2.4).

3.2.9.8 Pedagogical advantage of innovative approaches

An e-learning environment should not only focus on technology but should focus more on student learning. Students should understand the essence of the system and it should fulfil their educational needs (Anderson & McCormick, 2005:2-6).

3.2.9.9 Learning approaches

Students must be allowed to select the learning approach they are comfortable with (see 2.2.3, 2.2.4, 2.2.5). This will enable students to learn effectively since they have control (Anderson & McCormick, 2005:2-6).

3.2.9.10 Formative assessment

E-learning should provide students with formative assessment opportunities where constructive feedback is given to students promptly (see 2.9.2). With appropriate and constructive feedback, students are able to monitor their own progress in the learning process. (Anderson & McCormick, 2005:2-6)

3.2.9.11 Summative assessment

Summative assessment may also be effectively administered through an e-learning system (see 2.9.1). It should be “valid and reliable.” Such assessments should be clear to students, lecturers, and parents and should not have a negative backwash effect on student learning (see 2.2.6.2; Anderson & McCormick, 2005:2-6).

3.2.9.12 Coherence, consistency, and transparency

The “pedagogy” of the e-learning system should be clear and reliable in the same way that the “objectives, content, student activity and assessment” are aligned with each other. The system must be coherent, consistent, transparent, and available to all (Anderson & McCormick, 2005:2-6).

3.2.9.13 Cost effectiveness

The technology used in the implementation of e-learning systems should be affordable and practicable (see 2.6.3.4; Anderson & McCormick, 2005:2-6).

3.2.9.14 Conclusion: critical success factors (CSFs) for e-learning implementation

If the institution fails to do a feasibility study before implementing the e-learning system, it might fail. All stakeholders, namely students, lecturers, technical staff, and administrators should be fully involved in (before and during) the development process for effective implementation. Students' needs and their technological expertise, lecturers' expertise in pedagogy and technology, and institutions' available infrastructure are some of the most important and often vital factors that need to be considered. Institutions will be able to implement e-learning effectively if they adhere to some and/or all of the above principles. These principles will guide them to successfully deliver an appropriate e-learning system.

3.2.10 E-learning and student motivation

Students' motivation in an e-learning environment is a very significant concept that institutions and lecturers should look into when implementing an e-learning system. Students' motivation and concentration can be enhanced using Keller's ARCS model (Keller, 1987:2-10) The acronym ARCS represents Attention (A), Relevance (R), Confidence (C), and Satisfaction (S). The enhancement of these four concepts will increase students' motivation.

3.2.10.1 Keller's ARCS model

According to this model, the first task is that lecturers command the attention of students in an online environment. This is much easier in a traditional classroom than in an online system. In an e-learning environment it will be very difficult for a lecturer to determine whether students are paying attention or not. For lecturers to hold students' interest, they need to design challenging and creative online learning and assessment tasks such as discussions and/or even online games. These activities and assessment tasks will motivate and draw students' attention.

Online activities and assessment tasks should be created in such a way that students will indeed be interested in answering them (Stansfield, McLellan & Connolly, 2004:173, 176). Lecturers may create tasks that relate to students' future jobs, or tasks that relate to current issues in their field of study (Keller, 1987:3). This will encourage students to participate in the tasks since they will recognise its relevance (the second concept of Keller's model). Lecturers can also boost students' confidence (the third element) by creating discussion forums where students will be in control and express their opinions without feeling intimidated. Although some students might feel shy or are not confident enough to participate in classroom discussions, they might be motivated to engage in online discussion (O'Regan, 2003:78, 89; Kift & Field, 2009:5). Studies have shown that immediate feedback and response provided to students in an online environment enhance the confidence of these students (Chirwa, 2008:14).

When students are rewarded for their hard work, they experience a sense of satisfaction. The reward may even be in the form of merely acknowledging him/her through an encouraging comment pertaining to the student's participation in an online discussion, or providing online badges or constructive feedback to students' work. When students receive such acknowledgements from lecturers they feel motivated to work harder. They also see that the lecturer respects their opinions, and consequently gain satisfaction (the fourth element) from that (Keller, 1987:6).

3.2.10.2 Goal-directedness

The aim of an online activity is also a motivational factor. If the aim of the online task is not clear enough, then students will not be motivated to perform that task (Pintrich, Marx & Boyle, 1993:167-168). It is very important that lecturers provide clear aims for their online tasks in order to enable students to understand why the task is necessary (Khan, 2005:183). If students understand the idea behind online activities, they will be motivated to engage in them.

Lecturers can use the following approaches to set clear goals for online activities (Laurillard, 2002b:200):

- Make known to the students the significance of the activities and why they should engage in them.
- Identify the learning outcomes that relate to the assessment tasks, and clarify what students need to achieve in the task (Khan, 2005:183).
- The task should be time bound. Students should be aware of the time allocated for the completion of a task.
- Give students examples to go through to build their confidence and increase their motivation before giving them the actual task.

3.2.10.3 Conclusion: e-learning and student motivation

An e-learning system will not effectively serve its purpose if students are not motivated to use it. For this reason, institutions as well as lecturers should apply strategies that will encourage students to use the online system. This can be achieved if lecturers create online activities and assessment tasks that students find interesting, challenging, significant, and that also meet their learning needs. Lecturers need to engage students in the online environment, and motivate participating students through rewards such as digital badges, and constructive feedback and comments. Students will also be motivated if the online content is always available and they can receive help with their online problems immediately. Lastly, the need for goal-directedness confirms the necessity of constructive alignment in course design, teaching, and assessment.

3.2.11 Evaluating the effects of e-learning

Naidu (2006:71) defines evaluation as the "systematic acquisition of feedback on the use, worth and impact of some activity, program or process in relation to its intended outcomes." The main aim of any evaluation process is to assist management or leadership in decision making. It is therefore important for institutions to have an evaluation strategy that will help them establish the effects of their teaching and learning system. For example, institutions can acquire information and feedback from students, lecturers, and other stakeholders such as administrative staffs with regard to their e-learning system. Through this exercise, institutions will be empowered to provide quality service and an effective e-learning system to their students and lecturers (Naidu, 2006:71).

3.2.11.1 Evaluation methods

Naidu (2006:71-72) identifies "front-end analysis, formative evaluation, summative evaluation and monitoring" as the four main methods of evaluating educational activities.

a. Front-end analysis

This analysis involves the different ways that an institution would use to identify the readiness of their students and lecturers in terms of using the e-learning system for teaching and learning. This analysis can be done by conducting surveys. Performing such a front-end analysis on a regular basis, especially before implementing the e-learning, will help institutions identify the needs of their students and lecturers, their expectations, and opinions (Naidu, 2006:72).

b. Formative evaluation

This is the process of acquiring feedback from students, lecturers, and other stakeholders during the e-learning implementation process. The aim of a formative evaluation is to detect potentially problematic issues in the system. Once an issue is identified, the institution would then improve and adjust the e-learning system during the implementation stage. Surveys and interviews are some of the instruments that can be used for this type of evaluation (Naidu, 2006:72).

c. Summative evaluation

This type of evaluation will help the institution identify the full effects and results of e-learning on teaching and learning. Such an evaluation is done when students complete their e-learning course. The main idea behind this evaluation is to ascertain how the system has improved the teaching and learning, and whether or not the standards set by the institution have been achieved (Naidu, 2006:72).

d. Monitoring

Monitoring is done to identify how students and lecturers integrate the e-learning system in their teaching and learning activities. Information gathered during this process will enable the institution to determine how the e-learning system impacts teaching and learning activities (Naidu, 2006:72). Monitoring may also be viewed as a form of formative evaluation

3.2.11.2 Conclusion: evaluating the effects of e-learning

E-learning evaluation is important for management and leadership to make sound decisions with regard to the effects e-learning might have on students. For this reason, the various e-learning evaluation methods should be iterated throughout the e-learning process in order to continuously enhance their learning.

3.2.12 Conclusion: e-learning in higher education

Students should take full advantage of an e-learning environment since it occurs outside the classroom. Through e-learning, students can learn to be independent in their studies and how to become lifelong learners. Lecturers are also able to utilise the e-learning platform to assess students using real-world scenarios/authentic assessment tasks; this gives students the practical experience of the course they are studying (see 2.3.3). Lecturers play a key role in the e-learning system environment, and they should have an in-depth understanding of how the system works since this will enable them to assist students who may be faced with challenges (see 3.2.9.3). Transition from traditional learning to e-learning requires lecturers to change their teaching styles (see 3.2.8.10). If e-learning is effectively implemented students will be empowered to do e-assessments without hesitation (see 3.2.8.5, 3.2.9.4, 3.2.10).

In Samarawickrema and Stacey's (2007:330) studies, they found that e-learning implementation is not so much based on lecturers' knowledge of technology but rather on their motivation, readiness to change, readiness to learn, and readiness to apply new methods (see 3.2.8.2, 3.2.8.10, 3.2.9). Their research also proves that lecturers' need to have continuous training and support on how to use e-learning technology appropriately in their teaching (see 3.2.9.3). Such training may include teaching practice; learning approaches; pedagogy related to the online environment; Internet copyright law; management and moderation of online classes; quality assurance issues; and a critical approach to technology, learning designs, and formative evaluation approaches (Samarawickrema & Stacey, 2007:330).

Nevertheless, with the availability of sufficient time, resources and the help of management and leadership, lecturers should be able to make this move without difficulty. Institutions planning to deliver online courses should determine whether the course is viable to be delivered online, should create conducive environment that ensures the feasibility, should determine the mode that will be used to deliver the course, and should ensure that enough resources are available for the course.

Throughout this section on e-learning in higher education, reference has consistently been made to assessment as part of an e-learning system. The phenomenon of assessment in the context of e-learning is discussed in more detail in the next section.

3.3 E-ASSESSMENT IN HIGHER EDUCATION

3.3.1 Overview of e-assessment

Due to the advancement of technology and e-learning systems, there is also a high demand for ways and means of assessing students in such a system (Brink & Lautenbach, 2011:503). Assessment is indeed a very important aspect of the teaching and learning process in any higher education institution (see 2.6.1; Lafuente, Remesal & Valdivia, 2014:443; JISC, 2007:7; Brink & Lautenbach, 2011:503).

Globally, most institutions implementing traditional assessments in the form of high stake examinations are faced with various malpractices such as lecturers taking bribes to leak questions or invigilators favouring some students. Other issues faced by traditional assessments include the load on lecturers in terms of marking, organising and recording of student scripts, costs involved in the printing of examination papers or assessments, security issues, etc. (Osuji, 2012:140). As student numbers increase in higher education institutions, logistics also become an issue. E-assessment may therefore be a good way of meeting this demand (Walker, Topping & Rodrigues, 2008:221).

Assessment is often viewed as a key component in higher education. According to the JISC (2006:2), assessment portrays what students perceive to be significant and the time they invest in them. Rowntree (1987:1) states that one is able to determine the value of an institution by looking at its assessment policies and practices. Due to the significance of assessment, it is impossible for students to avoid it. Boud (1995: 35) says: “Students can, with difficulty, escape from the effects of poor teaching, they cannot (by definition if they want to graduate) escape the effects of poor assessment.”

Different researchers have diverse ways of defining e-assessment. Below are some definitions of e-assessment:

According to Crisp (2011:5); Howarth (2015:4); and Office of qualifications and examinations regulation (Ofqual) (cited in Winkley, 2010:4), e-assessment involves the use of any technological device to create, deliver, store and/or report students' assessment marks and feedback. Examples of devices that can be used to create and implement e-assessment tasks include laptops, desktop computers, smartphones, iPads, Android tablets, etc. Different media formats such as Word documents, portable document formats (e.g., pdf), videos, images, simulations, or games may be used to support e-assessment. With the advent of new technologies, students' abilities and skills can be tested through e-assessment (Crisp, 2011:5). The JISC (2007:43) states that e-assessment can be defined as "end-to-end electronic assessment processes" where "information and communications technologies (ICT) are used for the presentation of assessment activity and the recording of responses." These processes involve students, lecturers, institutions, and society as a whole.

These definitions emphasise the importance of using technology in the implementation of assessment. This means that information and communications technologies (ICTs) are absolute necessities for e-assessment. The advancement of ICTs in higher education can also not be overlooked. These technologies have made it possible and easy to distribute learning material either online or offline. E-learning, which is the process of learning using ICTs such as desktop and/or laptop computers, software, digital cameras, etc., has become very popular in higher education (JISC, 2004:10). E-assessment (the electronic delivery of assessment) is therefore an element of e-learning that has the potential to become a preferred form of assessment, as opposed to the traditional way of assessing students (JISC, 2004:8). This means that if technology is effectively applied in assessments, then students' learning might also improve.

3.3.2 Major components of an e-assessment system

Howarth (2015:4) states that an e-assessment system usually consists of two major components. These are:

- An assessment engine, which consists of the hardware and software needed to design and deliver the assessment task (AT) or test.
- An item bank, which contains the questions and/or instructions. Questions and instructions in an item bank are generated randomly by the assessment engine to deliver the AT or test.

3.3.3 E-assessment delivery platforms

E-assessment can be delivered in two ways. The first is web-based delivery, where students use the Internet to access the assessment tasks (online e-assessment) (see 3.2.3.1). The second option is download delivery, where the assessment tasks/tests are downloaded onto the students' computers in the appropriate assessment centres at the correct date and time and released when the student arrives for the assessment (offline e-assessment) (see 3.2.3.2). The download approach is mostly used for high-stakes assessments. With this approach, more security measures are implemented to avoid undesirable exposure of the assessments (Howarth, 2015:6).

The major difference between the two approaches (online and/or offline) is that web-based assessments, as is the case with e-learning activities, can be done anywhere at any time as long as there is an Internet connection; downloaded or offline assessments, on the other hand, can take place with a computer anywhere and at any time (see 3.2.3.1, 3.2.3.2; Howarth, 2015:6). Crisp (2011:5) supports Howarth by saying that institutions can place their assessments on their servers for students to access at any time and from anywhere, provided they have access to the server.

Institutions can decide to use e-assessment facilities that are already built into a learning management system such as Moodle or Blackboard, or they can use a standalone assessment tool such as Test Pilot, Questionmark Perception, A-Tutor, or Maple T.A (Osuji, 2012:144; Winkley, 2010:4-5). Typical assessment tasks supported by the Moodle LMS include calculation questions, calculated multi-choice questions, calculated simple questions, cloze questions, essay questions, matching questions, multiple-choice questions, numerical questions, random short-answer matching questions, short-answer questions, true/false questions, and description questions (see 3.2.4.1). With regard to A-Tutor, the questions supported include Likert-type questions, matching (graphical) questions, matching (simple) questions, multiple-choice questions, open-ended questions, ordering questions, and true/false questions (Osuji, 2012:144).

Based on the above, I believe that institutions can customise their own e-assessment platform to meet their particular needs. For example, Moodle is an open source tool which can be customised to fit an institution's policies, procedures, and regulations. Institutions can add additional features to the LMS to suit their needs (see 3.2.4.1).

3.3.4 What can be assessed through e-assessment?

The JISC (2006:7) and DFES (2005:75) both state that there is an assumption that e-assessment tasks mainly comprise multiple-choice questions (MCQs) and cannot be used to assess higher cognitive order thinking skills. Various studies have also shown concern with regard to the integrity of e-assessment tasks (Conole & Warburton, 2005:21), in particular as to whether e-assessment tasks can test higher order learning, and whether staff have enough time to develop good ATs (Hepplestone & Helm, 2003:164-165). Gibbs (2006:18) also adds that there is a concern that e-assessment activities encourage a surface learning approach (see 2.2.3), and that any implementation of e-assessment must consider this.

However, Farrell and Rushby (2016:109), the JISC (2006:7), and Jordan (2011:151) dispute the above assumptions by saying that if MCQs are properly designed, they can still assess higher order skills. Various authors such as Crisp (2011:5), Craven (2009:3,7), the JISC (2006:11), and Howarth (2015:4) concur that there is more to e-assessment than only MCQs because Wikis, blogs, self-reviews, peer-reviews, scenario questions, simulation software, role plays, and observations can all be used in e-assessments to assess students' higher order thinking abilities as well as their hands-on skills. Winkley (2010:5) agrees that e-assessment tasks have the potential to require students to implement a deep approach (see 2.2.4) in performing tasks.

A lecturer might decide to create an easy assessment that requires less time or effort to grade, or to take his/her time to create an assessment that requires higher order thinking from the student. I therefore believe that e-assessment tasks have the capability to encourage a deep learning approach (see 2.2.4) and assess higher order thinking. This is, however, only possible if the lecturer has the experience and training to create high quality questions or tasks that will not only require students to merely recall concepts but to apply, analyse, evaluate, and create. Thus, lecturers should be able to provide tasks that enhance student learning, and maintain high expectations.

According to Crisp (2011:9), it is not difficult to construct MCQs. However, generating well-constructed MCQs involve considerable effort. MCQs are easy to mark by means of the appropriate computer software and then provide instant feedback. With regard to short questions, however, it is relatively difficult to grade student responses automatically because the lecturer (assessor) must make some decisions in terms of unforeseen responses that may be deemed acceptable.

If a lecturer does not consider all possible students' responses to a question or task, the computer software might mark most of the students' responses as incorrect. For instance, a question may be, “what is the full meaning of UFS?” The lecturer will input the correct answer as the “University of the Free State.” If, for example, a student’s response is “University of the Free State,” the computer software will mark it as wrong. It is therefore important for assessors to consider (foresee) different options when using short questions in an e-assessment.

E-assessment is supported by Craven (2009:3); who emphasises that in an “objective or convergent assessment” where the marking scheme is based on only one correct answer, automatic marking is very effective. On the other hand, in “subjective or divergent assessment” where different answers might be acceptable, automatic marking can be very difficult. In terms of subjective assessment, technologies are built into e-assessments in order to ease the assessment delivery process, but that process is not automated. There should not be a misconception that objective e-assessments are bad, but rather that they can be very detrimental if not created in an effective way (Craven, 2009:7). Boyle and Hutchison (2009:306) and Bennet (1998:5) state that the type of questions or tasks that will be assessed in e-assessment may change completely from one generation to the next.

I conclude that the most significant point is for lecturers to ensure that they do not replace authenticity when designing an e-assessment task with convenience (easy marking).

3.3.5 Interoperability in e-assessment

It is sometimes difficult to access e-assessments on specific computers (due to their different operating systems) and web browsers. This makes interoperability and accessibility of e-assessments difficult. Various standards have been implemented to deal with the issues of accessibility and interoperability of e-assessments across different web browsers and computer operating systems. These include the “World Wide Web Consortium standards; the Centre for Educational Technology Interoperability Standards (CETIS); and the Sharable Content Object Reference Model (SCORM).” These standards ensure that users can work with e-assessments on any computer operating system. They also help assessors to copy assessment tasks and/or tests from one platform to another without compromising integrity (Crisp, 2011:9).

I am of the opinion that these standards justify the “anywhere, anytime” benefits of e-assessment since students may access their tasks on or off campus on any platform, and lecturers may develop e-assessments on any computer operating system and copy these onto the institution’s server operating system without encountering any problems.

3.3.6 Principles of e-assessment

According to Benson (2003:71), the principles used in traditional assessment (see 2.6.2), should not differ from that of e-assessment. Tinoca (2012:213); JISC (2007:8); and Brink and Lautenbach (2011:503-504) concur that an e-assessment activity is considered credible if it is authentic, consistent, transparent, practical, accessible, timely, appropriate, and accurately measures the required results and quality of the supporting system (see 2.6.2). Brink and Lautenbach (2011:503-504) state that students and lecturers alike may benefit significantly from e-assessment if there is a connection between learning outcomes, instruction, and assessment.

Various authors have identified a number of principles pertaining to e-assessment:

3.3.6.1 Authentic

An e-assessment activity is deemed authentic if it is sophisticated/challenging, related to real world situations, and depicts the skills needed in real life (Baartman, Bastiaens, Kirschner & Vleuten, 2007:120; Dierick & Dochy, 2001:308; Gulikers, Bastiaens & Kirschner, 2004:68), and are of importance to students, lecturers and institutions (Baartman *et al.,* 2007:120; Gulikers *et al.,* 2004:68). Authenticity of e-assessment might also relate to the validity of assessment as explained in section 2.6.2.2.

3.3.6.2 Consistent

An e-assessment activity is deemed consistent if the activity is aligned with the learning outcomes, assessment criteria, and the relevant e-assessment policies (Tinoca, 2012:213-214). It should also involve different e-assessment approaches, tasks, and assessors (Dierick & Dochy, 2001:314). If e-assessment is considered consistent, it can by extension be viewed as reliable (see 2.6.2.3)

3.3.6.3 Transparent

An e-assessment task/activity is transparent if it encourages students to actively engage in the e-assessment task/activity. This can be achieved by making all the e-assessment policies and criteria known and clear to students and all other participants (Tinoca, 2012:214). The assessment criteria being used for the e-assessment activity should be made available before the e-assessment task commences (Dierick & Dochy, 2001:318-320), and must be clear and unambiguous in order that students understand what is expected of them. In addition, the assessment criteria should be applied consistently when assessing different students' work. In essence, transparency relates to fairness as an important principle (see 2.6.2.1).

3.3.6.4 Practicability

The practicability or feasibility of e-assessment activities is highly significant since e-assessment requires numerous resources such as time and cost of training (see 2.6.2.4).

I am of the opinion that institutions considering using e-assessment should be equipped with the necessary resources (time, digital equipment, expertise, etc.) in order to create and implement e-assessment that supports the above-mentioned criteria. Some assessors often design e-assessment tasks that are virtually impossible for students to complete. When that happens, students become hesitant to attempt any subsequent e-assessment questions/tasks.

3.3.7 Feedback in e-assessment

According to Jordan and Mitchell (2009:371), immediate and constructive feedback is vital for effective learning. Lecturers should provide students with constructive feedback after each assessment in order to enable them to know how they are progressing. Because many e-assessments provide immediate feedback to students' responses, students are empowered by continually being kept informed as to their progress; or the lack thereof (Winkley, 2010:19). Effective feedback in e-assessment also encourages the proper utilisation of learning material (Buchanan, 2000:199) and increases students' motivation, performance, and their learning process (see 2.9.2.1.3; Sorensen, 2013:173; Yorke, 2001:116, 119; Nicol, 2007:610; Walker, Topping & Rodrigues, 2008:233). Indeed, Dalziel (2001:3-4) advises students and lecturers to use e-assessment due to its potential for immediate feedback.

From the above it can be seen that feedback is an essential part of e-assessment since it enables students to improve their learning and performance. This proves that feedback remains critical to students in e-assessment. Debuse, Lawley, and Shibl (2008:374) state that feedback in e-assessment should be "informative, specific, personalized, timely, consistent, detailed and legible." Assessment feedback given by lecturers to students should address the individual student's needs, should be constructive, and should be delivered at the time when students need it most (see 2.9.2.1.3).

I believe that effective and prompt feedback will encourage students to fully participate in e-assessment tasks because they know that they will get feedback pertaining to their level of understanding, their abilities, and how to enhance their performance. To summarise the above with regard to feedback in e-assessment, effective and prompt feedback will motivate students, build their confidence, improve their grades, and enable them to improve on their own learning. With the benefits that come with feedback in e-assessment, institutions indeed have to implement the available e-assessment technology in order to improve their students' learning.

3.3.8 Flexibility in e-assessment

A great deal of research has been done on the flexibility that comes with e-assessment. In the context of e-assessment, students can access automatically marked tests anywhere and at any time. Blogs, wikis, and discussion forums can also be included as e-assessment tasks and therefore make e-assessment user-friendly and flexible (O'Reilly, 2005:2; Gordon, 2014:11; PingSoft, 2007:1; Winkley, 2010:19). E-assessment marking tools also enable students to easily navigate their tests. Students are able to move back and forth when attempting e-assessment tasks, rendering it more flexible (O'Reilly, 2005:7). PingSoft (2007:1) states that e-assessment can be used for all kinds of assessment tasks/tests and have the capability of recovering information in case of any unforeseen event, for example, in case of a power failure, students can continue with their work when the power is restored.

However, I question PingSoft's (2007:1) statement that e-assessment is suitable for all courses. For instance, it might not always be appropriate for sophisticated programming and engineering courses. Nevertheless, e-assessment is flexible, user-friendly, motivates students, and creates a common platform for all students to engage and interact.

Wallace and Clariana (2000:7) report that students who are not familiar with the e-assessment system and technology, do not perform well in e-assessments. I therefore believe that institutions and lecturers should train and encourage students in this regard. Implementing e-assessment will also help students who are less adept at using technology to gain some computer skills which would pave the way for actively engaging in e-assessment tasks.

To conclude this section, it is evident that e-assessment provides flexibility to its users, which may encourage its use among students and lecturers. Due to the flexible nature and other benefits of e-assessment, HEIs need to acknowledge this new development in assessment in order to be competitive in this digital age.

3.3.9 Compatibility of e-assessment

According to Rogers (1995:224), "compatibility is the degree to which an innovation is perceived as consistent with existing values, past experiences, and needs of potential adopters."

If an innovation is not compatible with past, existing, and future practices its implementation might be delayed. People normally revisit previous concepts and practices in order to acquire a better understanding of new concepts and practices. This implies that it is difficult for people to employ new developments if they do not have a frame of reference on which to base their designs. By applying previous ideas and perspectives, people can measure the certainty and sustainability of the innovation (Rogers, 1995:224).

Compatibility of e-assessment platforms is a growing area of interest in higher education. Most approaches currently used in e-assessment actually originate from traditional assessment (Halff, 2008:79-80). In e-assessment, ATs/test questions are often flexible as they still have time limits, and students can move between questions, review questions, etc. (see 3.3.8).

In conclusion, e-assessment might currently be more suitable as opposed to traditional assessment since it has the potential to minimise stress among students, improve decision making among administrators, and reduce costs and time. As an innovation, it has the possibility of enhancing learning and teaching at HEIs.

3.3.10 Benefits of e-assessment

There are many benefits that come with e-assessment, whether used for formative or summative purposes. In e-assessment many students can be assessed within a given timeframe, especially if their answers are marked automatically. Other pedagogical benefits include immediate student and lecturer feedback; the ability to repeat and randomise ATs/tests; the consistency and fairness of computer-marked assessment; students' ability to complete assessments anywhere and at any time (time saving); and opportunities for students to take responsibility for their own learning (Chalmers & McAusland, 2002:3; Morris, 2008:331; JISC, 2006:7; Howarth, 2015:8).

Other literature also indicates that students can be enabled through e-assessment to identify and reflect on what they have been taught and have learned in the context of blended learning (which includes e-assessment as a component) (see 3.2.3.4), thus improving the quality of the student learning experience (Dermo, 2009:203). Ideally, any assessment, if implemented correctly, may assist in improving teaching and learning outcomes (Bennett, 2011:6; Clements & Cord, 2013:114-115). Various studies point out that the innovativeness and significance of e-assessment depend largely on automated marking and to what extent it eases lecturers' workload (Noorbehbahani & Kardan, 2011:338; Stödberg, 2012:602).

Howarth (2015:8) also indicates that it is less costly to develop e-assessment tasks; it is easy to implement since there is no need to hand out question papers and mark them afterwards; students with special needs or disabilities can adjust the font size and change colours; voice notes can be created for students to listen to, using their headphones; ATs are delivered securely, and marking is more reliable.

The preceding information shows that many studies make mention of similar benefits such as immediate feedback, access anywhere and anytime, improved learning, etc. These benefits are realised if e-assessments are designed properly and accurately. Sim, Holifield, and Brown (2004:222) make a profound statement, namely: “The perceived benefits of computer assisted assessment (CAA) (e.g., freeing lecturers' time) can be illusive if no institutional strategy or support is offered; successful implementation may be left to chance and CAA may be developed in an anarchic fashion. In order to utilize the features within software packages, staff training and development is necessary and this may not be feasible without institutional support.” It is also clear that ICT can play a vital role in the area of assessment, which could eventually lead to improved student performance. I believe that due to these benefits, higher education institutions should not shy away from implementing e-assessment in their courses.

3.3.11 Challenges in e-assessment

Despite the benefits reported above, there are also some challenges that institutions, lecturers, and students face in the context of e-assessment. According to Brink and Lautenbach (2011:511), the most significant challenge in an e-assessment system is security. Due to the fact that students can access e-assessments from anywhere, some institutions are reluctant to implement e-assessments for high-stake examinations. Nevertheless, according to Crisp (2011:9), there are some security measures that could be put into place to secure e-assessments in high-stakes examinations. These may include individual passwords or encrypted smart cards, restriction to particular computers by specifying Internet protocol addresses; live remote monitoring of students through the use of webcams, keystroke biometrics, and fingerprint and facial recognition systems (Crisp, 2011:9). Crisp emphasises that only authorised participants should have access to the e-assessment system and its contents. I fear that since e-assessment activities might be intercepted by hackers and that students might be impersonated during e-assessment activities, these security measures should be in place when assessing high-stakes examinations.

Studies done by Osuji (2012:146) and Craven (2009:7) show that other challenges include the cost of a computer or laptop; Internet cost (cost of buying data); power supply problems, and lack of sufficient technical infrastructure to support e-assessment. Measures such as high-speed Internet infrastructure and cameras in assessment rooms are expensive. Possible failure of equipment and lack of quality are also challenges that should be considered carefully. In the research done by Walker, Topping, and Rodrigues (2008:233), they identified the use of spontaneous types of questions, the formulation of assessment instructions, the phrasing of questions, and the clarity and flexibility of marking as assessment design challenges.

The JISC (2007:19, 25, 31) divide challenges in e-assessment into three parts:

a. Challenges for institutions (JISC, 2007:19): Some challenges in e-assessment for institutions include the development of an e-assessment policy that integrates pedagogical and practical aims; the introduction of viable approaches to support computer-based assessment; the setting up of a viable IT infrastructure to support e-assessment; and the compilation of policies and procedures to ensure reliability and validity of e-assessment.
b. Challenges for lecturers (JISC, 2007:25): The challenges lecturers face in e-assessment include making e-assessments available to all students; integrating the e-assessment design with learning outcomes and student needs; a possible lack of experience to have full control of the use of e-assessment methods; and adapting to changes in assessment practices.
c. Challenges for students (JISC, 2007:31): The challenges for students are the possible inability to access assessment tasks on some computer operating systems; possible inability to access assessment tasks at particular times, when required; and combining the possibilities of new technologies in the assessment process.

Other studies have also identified the following challenges of e-assessments:

a. The time needed to create e-assessment tasks cannot be overlooked. The creation of e-assessment activities require time and experience on the part of the lecturer since the lecturer needs to ensure that the activities continue to be of a high standard (JISC, 2006:8).
b. Another challenge is “misleading clues.” When students notice that specific areas of the course are often assessed through e-assessment activities, they tend to devote more of their study time to those areas. This relates to what Biggs and Tang (2011:197-198) refer to as the backwash effect on student learning (see 2.2.6.2); this can be alarming if it encourages a surface approach to learning (see 2.2.3; Clarke, Lindsay, McKenna & New, 2004:253).
c. Since a substantial amount of time is required to design quality questions, some lecturers might create questions or tasks that assess only lower-order skills. Lecturers who are not comfortable with the use of an e-assessment system also tend to design poor assessments (Mackenzie, 2003:186).

d. Another challenge is inequality. According to a study done by Clariana and Wallace (2002:598-599), higher performing students did well in computer-assisted assessment tests as opposed to traditional assessment tests. They observed that the higher performing students easily adjust to new assessment methods. Based on this, Noyes, Garland, and Robbins (2004:112-113) argue that computer-assisted assessments might not be fair to lower-performing students since they might feel that it takes too much effort and time to complete e-assessments.

The above-mentioned challenges may hinder accessibility and the implementation of e-assessment. Institutions should therefore take into consideration their students' and lecturers' experiences and perceptions well before and during the implementation of an e-assessment system.

Since the teaching approaches of lecturers and the way in which they manage e-assessments differ from the way they teach in the classroom, it is important for lecturers to have adequate training on how to implement e-assessment effectively. When lecturers have full knowledge and experience of the e-assessment facilities they are using, it encourages them to be in charge of their teaching and assessment. When this happens, lecturers will be able to deal with the challenges that they might face and also look more qualified from the students' point of view (Brink & Lautenbach, 2011:508). For academic staff, e-assessment must add value to the processes of learning and teaching in order to warrant changing from conventional assessment practices (JISC, 2007:25). Institutions also need to review their courses and assessment practices frequently if they want to ensure the effective implementation of e-assessment (Bull, 1999:123-124).

3.3.12 Requirements for successful e-assessment

To implement e-assessment there is a need for appropriate software, servers, network infrastructure, student computers, administrative staff support, and assessment tasks. E-assessment guidelines, procedures, and policies need to be made visible and shared with students, lecturers, administrative staff, specialist support staff, external examiners, and academic and quality assurance managers to help them understand how the e-assessment system works (JISC, 2006:12)

The JISC (2016:12-16), Osuji (2012:148-151), and the Scottish Qualifications Authority (SQA) (2007:21-29, 33-34) all emphasise that the implementation of e-assessment should have the following requirements:

3.3.12.1 Delivery system requirements

E-assessment delivery systems must have the following:

- Server requirements must be in place.
- The system should have Internet connectivity.
- Candidates should have access to a browser on any operating system.
- The system should be able to randomise questions/tasks.
- The system should be able to automatically add up/calculate marks.

(JISC, 2016:12-13; Osuji, 2012:148 & SQA, 2007:21-22)

3.3.12.2 Control mechanisms

The following control measures are mandatory:

- It should be possible to set a time limit for an assessment task.
- The e-assessment system should allow candidates to revert to previous questions/tasks and make corrections.
- The e-assessment system should limit the number of times a student is allowed to re-attempt a task.

(JISC, 2016:13; Osuji, 2012:148)

3.3.12.3 System feedback

An e-assessment system must enable the assessor to allow/disallow the following forms of feedback:

- Test/assessment task feedback can be turned on or off.
- Feedback on specific questions can be turned on or off.
- Feedback can be customised per question.
- The system indicates which student responses were wrong and which ones were correct.
- Extra time can be set for students to go through the feedback.

(Osuji, 2012:149; SQA, 2007:29, 34)

3.3.12.4 Other essential requirements of the e-assessment system

- Multimedia such as images, sound, videos, and animation can be used in a question or task.

- The system should allow preview of questions/tasks during or after compilation.

  (JISC, 2016:16; Osuji, 2012:149; SQA, 2007:23)

3.3.12.5 Programme requirements

The system should allow the following:

- It should allow the lecturer to preview the test/task from the students' viewpoint.
- It should allow student responses and assessment results to be exported into Excel, text, or any other format required.
- Question numbers should be clearly visible.
- The system should show which questions/tasks were attempted/not attempted.
- The time remaining for answering a question/performing a task should be displayed.

(JISC, 2016:12-13; Osuji, 2012:149)

3.3.12.6 Stability and speed

An e-assessment system should be stable and fast:

- The e-assessment system should be stable while the assessor is compiling the task.
- Regardless of the number of students who are completing the task (e.g., at the same time), the system should remain stable.
- In case when there is a power failure during the assessment task, the system should save students' answers.
- The delivery of tests, videos, and graphics from the server to the student's computer should be fast and not be delayed.

(JISC, 2016:13; Osuji, 2012:150; SQA, 2007:23)

3.3.12.7 Security

As far as security is concerned, the system should make the following possible:

- Only students who are registered should be able to access the test/assessment task.
- It should allow that the test/task can be made available at pre-specified times and dates.
- The number of times students can access a test/task can be set.
- The time a student logs on and off should be recorded and made available.
- Students should be authenticated (by using usernames and password) when accessing a test or task.

(JISC, 2016:14; Osuji, 2012:150; SQA, 2007:24)

3.3.12.8 Reporting

It should be possible to obtain results of student performance in the following formats/ways:

- Students' numbers, names and marks in Excel, Word, and text formats.
- Results per topic per student.
- Students' average performance.
- Average time used by the students to complete the test/assessment task.
- Date and time of taking the test/accessing the task.
- Time taken by each individual student to complete the test/assessment task.

(Osuji, 2012:150; SQA, 2007:34)

3.3.12.9 Support and training

The system should make the following support possible:

- Technical support in the institution.
- Proper and adequate training should be given to both students and staff to enable them to use and benefit fully from the implementation of e-assessment.
- In the event of a technical problem occurring, there should be a prompt response.
- A service legal agreement should be in place.

(Osuji, 2012:150; SQA, 2007:27-28)

3.3.12.10 Evaluation of the e-assessment system

It should be possible to evaluate the effectiveness of the system in different ways:

- An institution may implement the e-assessment system on their network for pilot testing.
- An institution may obtain permission to use the e-assessment system in a "live" test/assessment situation for a specified period of time.
- Evaluation of the e-assessment system can be done by consulting different stakeholders, e.g., students, lecturers, ICT staff, and other relevant stakeholders.

(Osuji, 2012:151; SQA, 2007:25-26)

3.3.12.11 Other features required of the e-assessment system

- Students should be able to see how they have answered their assessment questions at a later stage, without being able to make changes.

- Questions with answers can be saved in the question bank.
- A test/assessment task can be saved in text format.

(Osuji, 2012:150; SQA, 2007:33)

3.3.12.12 Conclusion: requirements for successful e-assessment

In addition to Osuji's (2012:148-150) outline of requirements for e-assessment implementation, it should be mentioned that institutions using e-assessment systems on LMSs might feel somewhat restricted since LMSs are not standalone assessment tools. I believe that the most important factors or requirements are delivery speed, feedback, training, and security. If the delivery times of assessment tasks are too limited, students might not be able to complete their tasks in time, which will not be fair to them. Training should also be given to the lecturers and students in order for the lecturers to design assessment tasks that assess higher cognitive skills, and for students to use the e-assessment system effectively in their learning. In terms of security, the institution should ensure that students are identified through authentication methods. If all the above requirements are met, e-assessment can be of great benefit to the institution, students, and lecturers.

3.3.13 Conclusion: e-assessment in higher education

The literature review on e-assessment in higher education confirms that e-assessment has the potential to support and even improve student learning, provided that the assessment tasks are properly designed. In his research, Swan (2004:891-894) created an online quiz for first-year physics students. The results showed that the participation rate and student satisfaction were high. The students stated that online quizzes enabled them to learn more regularly, as these quizzes helped them to practice how to solve problems. They also found the instant feedback provided as particularly valuable. According to Swan (2004:894), arguably, quizzes assist in identifying weak students who need immediate intervention. Jordan (2011:147-148) also purports that students become more involved in e-assessment activities if they know that those activities are part of the overall course assessment.

I am of the view that students will be willing to participate in an e-assessment task if the results count towards their semester marks since it will motivate them to engage with what they have to learn. For this reason, students' perceptions of e-assessment should be taken seriously. In addition, it is important to observe the way in which students react to e-assessment and subsequently make changes to e-assessment tasks whenever necessary and applicable.

3.4 CONCLUSION: E-LEARNING AND E-ASSESSMENT IN HIGHER EDUCATION

In conclusion, institutions that have implemented e-learning systems should encourage their lecturers and students to effectively use e-assessment tasks in their teaching and learning. This may enable both the lecturers and their students to acquire the benefits that come with both e-learning and e-assessment (see 3.2.6, 3.3.10), and consequently improve their teaching and learning.

E-assessment is a component of e-learning. Thus, e-assessment delivery platforms relate to e-learning modes. E-assessment tasks might be delivered either online or offline as is the case with e-learning activities (see 3.2.3, 3.3.3). It was stated in section 3.2.2 that e-learning might use networked ICT to deliver teaching and learning; through this same networked ICT, e-assessment tasks can be delivered (see 3.2.2). This means that e-assessment and e-learning work hand in hand. Through e-learning platforms such as Moodle, Blackboard, etc., students might be able to perform e-assessment tasks that are in different formats (such as audio and/or video recordings) (see 3.2.2, 3.2.4.1).

Lecturers need to be trained on how to effectively use the e-learning system and how to create high-quality e-assessment tasks (3.2.9.3). If lecturers show interest in the use of the e-learning system, students will also be motivated to use the system. This motivation will enable - students to attempt their e-assessment tasks with confidence (see 3.2.10). Lecturers also need to ensure that all their e-assessment tasks (online and/or offline) should meet the principles of e-assessment (see 3.3.6).

In a nutshell, institutions that have implemented e-learning systems should ascertain whether their lecturers have acquired the technological expertise to use the system in assessing their students. This in turn will ensure that students' learning will improve, and they will also have the opportunity to take full control of their own learning (see 3.2.6.2).

CHAPTER 4

TEACHING, LEARNING, AND ASSESSMENT OF INFORMATION TECHNOLOGY TOWARDS E-ASSESSMENT IN IT

4.1 INTRODUCTION

In this section, various studies on teaching, learning, and assessment in Information Technology as a subject/discipline will be reviewed. Concepts such as the definition of IT; curriculum design in IT; principles for IT curriculum design; teaching methods in IT; challenges in the teaching of IT; students' reasons for succeeding and/or failing in the learning of IT; ways of enhancing students' creative thinking skills in the learning of IT; the role of lecturers and students in the teaching and learning of IT; assessment design in IT; and forms of assessment in IT will be looked at in this literature study.

4.2 OVERVIEW OF INFORMATION TECHNOLOGY (IT) AS A DISCIPLINE

Information Technology (IT) may be viewed as a discipline which involves all areas of "computing technology" (Lunt, Ekstrom, Gorka, Hislop, Kamali, Lawson, LeBlanc Miller & Reichgelt, 2008:9). Lunt *et al.* (2008:16) further state that IT is a discipline that prepares students to meet and address the IT needs of all sectors of industry. Students are able to meet and address the needs of industries by applying and integrating the computing technologies they have learned (Lunt *et al.,* 2008:10).

The main goal of IT as a discipline is to produce IT graduates who will have the necessary skills and knowledge to fill various positions in the IT industry, move up into higher positions and/or further their studies in the field of IT. In other words, IT courses should produce students or graduates who are competent enough to take up any position in the IT industry (Lunt *et al.,* 2008:10).

For this to happen, lecturers at HEIs have to ensure that students attain a deep knowledge and understanding of Information Technology. Thus, the teaching approach should not only be theoretical, but also practical. This means that IT courses should be created in a way that enables students to acquire both theoretical and practical knowledge in IT. If a student only possesses the practical understanding of what s/he is learning without a sound theoretical foundation, his/her practical competence will gradually become outdated. On the other hand, an IT graduate who has theoretical understanding of a specific technology but cannot apply that knowledge practically in the industry would not really be an asset to the industry (Lunt *et al.,* 2008:10).

An important skill required of IT practitioners is programming. Most higher education institutions (HEIs, including CTI) offer computer programming as a core module in their IT courses. Different HEIs refer to this course as fundamentals of programming, introduction to programming, programming for beginners, etc. (Lunt *et al.,* 2008:11). At CTI, all first-year IT students do a module on introduction to programming. This is seen as a foundation course which would enable them to progress well in their studies.

Currently, IT workers are in high demand in the industry, especially IT students with networking and e-commerce knowledge and skills. However, lecturers' teaching methods in the IT discipline are a challenge since they do not meet the demands of the IT industry and/or the needs of IT students (Minch & Tabor, 2003:52). Most IT industries are looking for graduates to occupy positions such as network administrators, web designers, security administrators, and e-commerce developers. However, many IT graduates lack the necessary skills (Ezziane, 2007:175).

It has become a challenge for higher education institutions to effectively educate their IT students to fill these positions in the IT industry (West & Bogumil, 2001:35). IT students should be able to maintain computer hardware, use Microsoft Office Suite and web browsers, create an e-mail account, and manage the operating system of a computer (Bartholomew, 2004:324; Hoffman & Vance, 2005:357).

Due to the continual and frequent changes in IT, graduates need to upgrade their skills from time and time in order to be efficient at their workplace. This means that students and/or graduates need to keep abreast of and adapt to the trend of the technology they are facing in the workplace (Ezziane, 2007:178-179). For example, if students learn and use a specific application in their studies, they have to update these frequently. If they are not aware of an available update, they will be missing some important features of that application which may affect their learning.

Many HEIs teach their IT students how to set up and network a computer; use Microsoft Office Suite (Word, PowerPoint, Excel, Visio, and Access); use the Internet and search engines to look for academic information; use programming languages such as Java to create web applications; and use simulation applications such as Cisco Packet Tracer to create a functioning network (Ezziane, 2007:179).

At CTI, IT students are also taught the content of these applications. These skills and capabilities provide students with a general idea of what is happening in the IT industry; that is, the curriculum gives students the practical knowledge of what they are studying. Through projects, students are able to engage with IT and also demonstrate all their skills.

New ways of teaching, learning, and assessment need to be developed if IT is to be applied effectively (Ezziane, 2007:179). If lecturers teaching IT courses are not properly trained, students may be disadvantaged. IT lecturers therefore need to be trained in some IT applications, observe how these applications are used by other experienced professionals, use the applications themselves, and apply their experience in their teaching (Barrette, 2000:1-2).

4.3 CURRICULUM DESIGN IN IT AS A DISCIPLINE

Due to vast and frequent changes and advancement in technology, the content and teaching of IT as a discipline are also affected; institutions therefore need to update their curriculum continually in order to keep track of technological development (Lunt *et al.,* 2008:15).

As a result of technological changes, there are some important topics that any IT discipline curriculum should cover. These include web design; networking technologies; graphic design; e-commerce applications; databases; object-oriented programming; human-computer interaction; and information systems. The instructional design of these topics should include practical exercises (Lunt *et al.,* 2008:15; Carter & Boyle, 2002:77). In IT curriculum design, lecturers should also consider students' perceptions of the content covered in the module (Grant, Malloy & Murphy, 2009:145).

CTI refers to students' rating of a module, as module evaluation. This is where students are given the opportunity to tell the institution what they liked or disliked about the module. Such evaluation enables the institution to improve and realign modules, if required. In other words, lecturers should listen to students' perceptions of the contents they are teaching as well as the way in which they teach it. IT is a broad discipline and students' input has the potential to enhance the teaching of the lecturer.

4.3.1 Principles for curriculum design in IT

When designing a curriculum for IT as an academic discipline, institutions should apply the following principles (Lunt *et al.,* 2008:58):

4.3.1.1 Reliability and nature of IT

The curriculum must reveal the reliability and nature of Information Technology as an autonomous discipline. The discipline combines theory, practical application, understanding, and abilities. This means that an IT curriculum should promote theoretical and practical/technical competence (Lunt *et al.,* 2008:58).

4.3.1.2 Frequent and rapid technological changes

An IT curriculum should continually remain up to date with technological changes, and students should follow suit. Due to the rapid changes in Information Technology, the IT curriculum should therefore be updated continually and students must be taught how to respond to such changes. Most importantly, IT graduates must keep track of current trends in the IT industry, and they should have the zeal to follow up on these technologies more often. This means that IT courses should produce graduates who are lifelong learners (Lunt *et al.,* 2008:58).

4.3.1.3 Intended learning outcomes

The IT curriculum should be directed by intended learning outcomes that students' are required to attain (see 2.7.3.1). This means that the IT curriculum should include the aims of the course and in particular, the knowledge, skills, and attributes students must have accomplished upon completion of the course. These will determine whether or not students are competent to receive an IT qualification (Lunt *et al.,* 2008:58).

4.3.1.4 Consistency

The entire IT curriculum must be reliable and make provision for innovative ideas that encourage invention, originality, and competence. Students are motivated to learn if they know what is required of them. At the beginning of the course, students must be encouraged to achieve more than the stipulated minimum requirements. The curriculum should be designed in a way that will motivate students to explore more in IT, show an interest in and take responsibility for their own learning (Lunt *et al.,* 2008:58).

4.3.1.5 Accessibility

The IT curriculum must be accessible to all students, regardless of gender, religion, culture, and race (Lunt *et al.,* 2008:58).

4.3.1.6 Experience

An important principle for an IT curriculum is that it should offer students with a “capstone experience” which enables them to apply their abilities and understanding in authentic real world (related) situations (see 2.3.3, 2.5). This can be achieved if final-year IT students undertake appropriate projects. Such a project should enable students to apply what they have learned throughout their studies in order to solve problems and perform sophisticated tasks. There are some skills in IT that cannot be demonstrated in a classroom but only through authentic projects and capstone experiences (see 2.3.3, 2.5; Lunt *et al.,* 2008:58). From the above, one can conclude that mastery of IT requires understanding, coupled with hands-on capability.

4.3.2 Conclusion: curriculum design in IT as a discipline

The high demand for IT workers has created a challenge for HEIs to produce IT-capable students who will measure up to prerequisites in the IT industry. The aim of incorporating and applying IT as necessary skill in a higher education curriculum is to render students employable and efficient at their workplace (see 2.5.4). For this aim to be achieved, lecturers and HEIs should implement strategies that will ease the integration of IT into their courses. To meet the rapid change within the Information Technology domain, HEIs need to revise and amend their curriculum from time to time. If this is not done, students may be learning concepts that are outdated and no longer required by the industry.

4.4 TEACHING INFORMATION TECHNOLOGY (IT) AS A DISCIPLINE

Literature indicates that the teaching of IT as a discipline requires using numerous simulations and practical demonstrations. These activities require active interaction between students and lecturers. Applications and multimedia such as word processing, PowerPoint slides, videos, and audio tracks may provide some form of interaction between students and lecturers. However, lecturers need to ensure that multimedia, especially audio-visual media, are used appropriately to provide high-level interaction (Ally, 2004:28; Haun, Shehane & Ali, 2010:3-4).

Lecturers may also use a learning management system (LMS) to design online IT courses. Examples of these LMSs are Moodle and Blackboard (see 3.2.4; Haun, Shehane & Ali, 2010:3). For instance, at CTI, the open source LMS, Moodle, is used. On this platform, study guides, module outlines, assignments, tutorials, and module specifications are uploaded. Lecturers provide students with reasons why they are being assessed on specific content and/or material and how it will take effect. All IT students have access to these course materials once they log in with their usernames and passwords. However, lecturers should ensure that their online course material actively engages their students since this may be the only way students interact with their lecturers (see 2.3.1, 2.4.2; Ally, 2004:28).

Lecturers could present their content either synchronously or asynchronously (see 3.2.3.1, 3.2.3.2, 3.2.3.3, 3.2.3.4). In a synchronous mode, the student and lecturer are able to interact "live," i.e., communicate with each other at the same time. A lecturer can incorporate a "live" video of a lesson or topic into Moodle to which students can have access, set up a Google hangout and video conferencing. These multimedia tools provide invaluable interaction between lecturer and student. Immediate feedback can be given in response to students' questions (Haun, Shehane & Ali, 2010:5).

Unlike a synchronous mode, an asynchronous mode is not "live." Course materials are accessed by students either on a network or online at any time that fits their programmes. If they have questions, they have to post them on a discussion forum or e-mail the lecturer and wait for a response (Haun, Shehane & Ali, 2010:5). This enables students to access the LMS as and when it fits their own programmes.

4.4.1 Teaching-learning activities (TLAs) for IT as a discipline

If lecturers encourage the practices set out below in their teaching, they may be able to engage their IT students to acquire experience in their learning of IT. These TLAs relate to both student engagement (see 2.4) and high-impact practice (see 2.5) which have been shown to improve students' learning:

- Practical demonstrations by the lecturer and students using IT-specific applications (Lunt *et al.,* 2008:29; Minch & Tabor, 2003:54).
- Computer laboratory work (Lunt *et al.,* 2008:29).
- Appropriate field trips (Lunt *et al.,* 2008:29).
- Collaborative learning and group projects (Lunt *et al.,* 2008:29; Minch & Tabor, 2003:54).
- Industry internships (Lunt *et al.,* 2008:29; Minch & Tabor, 2003:54).
- Service learning and interviews with IT professionals in industry (Lunt *et al.,* 2008:29; Minch & Tabor, 2003:54).
- Continuous encouragement for students to master the theory and fundamental concepts of the content they are studying (Lunt *et al.,* 2008:29; Minch & Tabor, 2003:54).

4.4.2 The competence of lecturers teaching IT as a discipline

Lecturers presenting IT should be competent in the discipline. This means that they need to have adequate knowledge and understanding of the content they are presenting as well as relevant practical competence. To avoid difficulties in students' learning of IT, lecturers need to be well-versed in the IT course/s they present (Bender, Hubwieser, Schaper, Margaritis, Berges, Ohrndorf, Magenheim & Schubert, 2015:520). For IT lecturers to effectively teach IT, they therefore need to be knowledgeable in the following areas:

4.4.2.1 Curriculum and discipline-related issues

The lecturer needs to know, understand, and be able to apply the content of the discipline he/she is presenting; that is, all the important topics, examples and explanations, and how to demonstrate concepts to their students. The lecturer must also know how and why the curriculum has been designed for the discipline and the standards he/she needs to follow in teaching IT (Hubwieser, Berges, Magenheim, Schaper, Broker, Margaritis & Ohrndorf, 2013:96).

It is not enough for lecturers to only teach what the curriculum covers without giving students more authentic/real-world examples (see 2.3.3). Lecturers therefore need to have an understanding beyond the discipline content they are teaching (Holmboe, McIver & George, 2001:2). Laurillard (2002a:16-17) supports this viewpoint, namely that lecturers must identify methods to ensure that their students understand the content of the discipline, identify how students misinterpret the contents, and provide criteria to measure students' understanding of the content. As experts, lecturers need to know how the students experience the IT discipline.

4.4.2.2 Teaching method and media

If a lecturer is an expert in IT as a discipline, he/she needs to make use of multimedia such as videos, audios, and animations in the teaching/learning situation. Application of such approaches indicates that the lecturer is indeed an expert in IT (Hubwieser *et al.,* 2013:96).

4.4.2.3 Professional development needs

Information Technology changes continuously, and if IT lecturers feel that they need professional development in the teaching of IT, they should inform their faculty and/or the institution that assistance is required (Hubwieser *et al.,* 2013:97; Lawless & Pellegrino, 2007:580-581).

4.4.2.4 Lecturer attitudes

It is important for IT lecturers to have a positive attitude towards the discipline they are teaching. They should not doubt their teaching skills as this may have a negative impact on their teaching and students' learning. They should be confident when delivering discipline content to their students. In other words, lecturers teaching IT should be motivated about what they teach (Bender *et al.,* 2015:4-5).

4.4.2.5 Conclusion: the competence of lecturers teaching IT as a discipline

IT lecturers need to be competent in the course that they are presenting to students. Lecturers' competence should both be theoretical and practical in order for students to attain a deep understanding of the course they are studying. Lecturers could enhance their competency through continuous professional development and a willingness to be up to date with the current/newest content of the IT courses they are teaching.

4.4.3 Challenges in the teaching of IT as a discipline

Teaching of IT courses, especially practical courses such as programming and networking, is not an easy task. It might be a challenge to teach some IT courses in distance education mode. For instance, in IT programming, students are expected to use the computer and programming software correctly to design, compile, and manipulate the output of the programme. This output must be tested to identify and correct any errors in the code. The challenge is that, since in distance learning and/or e-learning, the interaction between students and lecturers are not constant, it becomes very difficult for the lecturer to assist the student when a problem occurs in the coding. Students need to be taught the fundamental skills required for using programming software, and this is more ideal in a face-to-face classroom setup (Haun, Shehane & Ali, 2010:3; Guzdial & Soloway, 2002:17-18). If students fail to practise how to code on their own, there is very little that lecturers can do (Carter & Boyle, 2002:82).

Most IT courses involve considerable reading (Rooksby, Martin & Rouncefield, 2006:199). For example, in programming a formal language is used by students to develop, compile, and test their programming codes and it is essential for students to develop a habit of reading (Wiedenbeck & Kain, 2004:99). It is very challenging for lecturers to force students to read the fundamental theories behind the IT courses they are learning.

4.4.4 Conclusion: Teaching IT as a discipline

Due to the practicality of the IT discipline, it is not enough for students to be in a class where the lecturer only informs them about the content or tries to transmit the content of the discipline. Lecturers are expected to actively engage the students so that they can apply their theory and perform practical tasks. Students should be allowed to make mistakes and subsequently correct those mistakes. This means that students' theoretical knowledge of IT must be developed by the lecturer through demonstrations, simulations, and practical exercises.

Based on the literature reported above, I conclude that IT requires students to apply a deep-learning approach (see 2.2.4) and not just memorise concepts (which will be a surface approach) (see 2.2.3). Students will be disadvantaged if lecturers' teaching methods only require them to apply a surface learning approach (see 2.2.3).

However, I am concerned that sometimes lecturers do not have appropriate access to the necessary resources such as the computer hardware and software required for teaching. This makes it difficult to demonstrate in practice what they have taught their students in theory.

4.5 LEARNING ABOUT IT AS A DISCIPLINE

The learning of IT requires a collaborative effort of both students and lecturers. Some IT students may attribute their success and/or failure in the discipline to certain influencing factors (Berglund, Eckerdal, Pears, East, Kinnunen, Malmi, McCartney, Moström, Murphy, Ratcliffe, Schulte, Simoni, Stamouli & Thomas, 2009:330; Wilson, 2002:143).

4.5.1 Why do IT students succeed and/or fail when learning about IT?

This section discusses some of the reasons why IT students succeed and/or fail in the learning of IT. Possible reasons are as follows:

4.5.1.1 The level of difficulty of the discipline

According to the research conducted by Berglund *et al.* (2009:330), IT students fail due to the nature of the discipline. In other words, students feel that some topics covered in the discipline are too difficult to understand and they find it difficult to grasp certain concepts (Berglund, *et al.,* 2009:330; Wilson, 2002:144). For instance, in their research most IT students complained about the difficulty of certain topics covered in programming (Berglund, *et al.,* 2009:330).

4.5.1.2 Students' own intrinsic characteristics

Students' own intrinsic characteristics may influence their learning approaches (Berglund, *et al.,* 2009:330; Wilson, 2002:144). It was found that sometimes both the student and the lecturer do not have control over some of the intrinsic characteristics of the student. Some of the students in the research of Berglund *et al.* (2009:330) reported that no matter how hard they study, they still fail. They felt that intrinsic characteristics such as their innate way of thinking, culture, gender, and inherent level of capability are some of the factors that affect their learning of IT. However, there were also students who indicated that it was easy to understand most of the concepts (Berglund *et al.,* 2009:330).

4.5.1.3 Students' previous knowledge and skills

In their research, Berglund *et al.* (2009:331) and Wilson (2002:143) found that IT students with prior knowledge, experience, and understanding of IT pass the course with ease. These students usually have a good foundation in mathematics which is a critical contributing factor to learning IT successfully. However, IT students who have no or a poor background in mathematics and IT skills find it difficult to pass (Berglund *et al.,* 2009:331).

4.5.1.4 Students' assertiveness, behaviour, and prior awareness

It was found that students' success and/or failure depend on their assertiveness and behaviour. Unlike intrinsic characteristics, students can change their behaviour towards IT as a discipline. Students who take their studies seriously and put in more effort may succeed. Students may also be successful in the learning of IT if they have an effective learning style (see 2.2.4, 2.2.5), actively involve themselves in the learning task, and are self-motivated (see 2.4.8). Negative thinking concerning the discipline may cause them to fail. If students are positive about what they are learning, they should be able to succeed. Another factor is prior awareness. It was found that if students are aware of upcoming assessments or tasks, they do well (Berglund *et al.,* 2009:331; Wilson, 2002:145).

4.5.1.5 The teaching approach

Students can succeed in the learning of IT if they are able to communicate well with their lecturers and their peers. Lecturers can influence the success of students' learning in IT by adjusting and/or changing a teaching method to suit the student. For example, s/he should use images, practical exercises, frequently monitor the progress of students, and create a friendly environment. Through implementing and alternating a variety of teaching methods, lecturers can assist students who have different learning styles (Berglund *et al.,* 2009:331; Wilson, 2002:144).

4.5.1.6 Fairness

Some of the students might feel that they are not fairly treated by their lecturers when it comes to the awarding of marks. This may be demotivating (Hawi, 2010:1127).

4.5.1.7 Conclusion: Why do IT students succeed and/or fail when learning IT?

It is very important for students to have a positive mind set and attitude towards the various IT courses. The above literature indicates that students with a positive attitude tend to be successful when learning IT. Furthermore, lecturers need to create a learning environment where students can easily interact with them and their peers, an environment which is more relaxed and conducive to deep learning.

4.5.2 What measures can lecturers apply in assisting students who have difficulties with learning in IT?

This section elaborates on the measures that IT lecturers can apply in order to help students who have difficulties with learning in IT.

4.5.2.1 Reflective approach

In their research, some lecturers emphasise that when their students have problems with the course they are teaching, they have to reflect on their own teaching methods and see what they are doing wrong. However, some hardly engage with the students since they feel that the students are the ones doing something wrong. In truth, lecturers should try their utmost to modify the requirements and/or the learning environment in order to elucidate and perhaps simplify the course content in order to facilitate a positive result (Berglund *et al.,* 2009:332).

4.5.2.2 Creating a conducive learning environment

Lecturers need to create an environment conducive to learning. They should try to do as much as possible to prevent their students from struggling. Lecturers can do so by continuously motivating their students, clarifying what is expected of the students, and create opportunities to engage with the learning matter (Berglund *et al.,* 2009:332; Shi, 2008:51).

Lecturers should also help their students by clearly introducing and communicating the learning material to the students. For instance, using practical examples in their teaching, constantly reiterating what has been taught, and providing explanations for all the concepts they are teaching, will contribute to a favourable learning environment (Berglund *et al.,* 2009:332).

In their research, Berglund, *et al.* (2009:332) found that in order to identify the difficulties their students may be facing, lecturers need to engage them in appropriate and relevant questions. For example, they could ask students to do exercises to determine where their difficulties lie. They can also engage their students in challenges where they are encouraged to express their concerns. This will assist in revealing the problems faced by their students (Berglund *et al.,* 2009:332).

4.5.2.3 Monitoring students' performance and progress

Lecturers should in a pleasant and accommodating way try to understand students' problems. They need to see to it that students do not face unnecessary difficulties in their learning. They may accomplish this by monitoring students' performance and progress, asking them to do video presentations or demonstrations in class and/or, trying to identify the knowledge level of their students (Berglund *et al.,* 2009:333).

4.5.2.4 Implementing pair programming

Some literature indicates that if students are required to programme in pairs, it has a positive effect on their learning of programming (Bishop-Clark, Courte & Howard, 2006:214; Simon & Hanks, 2008:1). Pair programming is a concept through which students are divided into groups of two to design a programme (Liebenberg, Mentz & Breed, 2012:222). The significance of using pair programming in the learning of IT lies within the following five benefits for learning:

a. Teamwork

Students enjoy this practice due to the fact that they are paired with their peers to produce a functional programme. This improves their collaboration and team skills (Ho, Slaten, Williams & Berenson, 2004:4).

b. Improved self-confidence

Students are able to build confidence in their own capabilities. IT students usually feel that they do not have the necessary skills to learn IT and as a result doubt their own abilities. The practice of pair programming has already shown that students are more confident when programming in pairs (Werner, McDowell & Hanks, 2004:5).

c. Increase retention rate

Most IT students, especially female IT students, are reluctant to pursue careers in IT and/or continuing with their studies after their first year of IT studies. However, programming in pairs has been shown to increase the retention rate of female students in the IT discipline (Werner *et al*., 2004:5).

d. Higher grades

According to Werner *et al.* (2004:5), IT students who programme in pairs are able to obtain higher grades than those who programme on their own.

e. Less time and effort

When IT students programme in pairs they take less time and effort to complete a quality programme. This motivates IT students to pursue a career in the IT industry (Berenson, Slaten, Williams & Ho, 2004:3).

4.5.2.5 Creation of computer games

According to Cummings and Vandewater (2007:685), people frown upon the idea of using a computer game environment to encourage IT students, especially female students, in the learning of IT programming. The development of computer games in an IT programming course can encourage critical thinking and enhance students' problem-solving skills. IT students are motivated to develop such programmes as they feel proud of themselves after developing such games (Kelleher, Pausch & Kiesler, 2007:1456).

4.5.2.6 Conclusion: what measures can lecturers apply in assisting students who experience difficulties with learning in IT?

Lecturers play a vital role in students' learning of IT as a discipline. They need to implement strategies that will make it easier and more motivating for their students to learn IT. Lecturers need to build a cordial relationship with their students, which will enable the students to approach their lecturers for assistance with the concepts they find difficult. Lecturers must also develop teaching-learning activities (TLAs) that will engage their IT students. In conclusion, lecturers need to monitor and identify students who have difficulty in learning IT. They must then engage these students more in their teaching-learning activities and, if need be, organise additional lessons and learning activities.

4.5.3 Ways of enhancing students' creative thinking skills in the learning of IT

In IT, creativity is an important skill that students must nurture. Lecturers can improve the creative thinking skills of their IT students by implementing the following strategies (Shi, 2008:50-52):

4.5.3.1 Create a favourable learning environment

IT as a discipline is not easy to master and for that reason lecturers need to create an environment where students will feel comfortable. If IT students feel tense in the classroom, they may not perform well. Lecturers should therefore create a learning environment where the students can, within a relaxed atmosphere, clearly think and learn on their own by being allowed to make and subsequently correct their mistakes (Shi, 2008:51). Lecturers may create a discussion forum on myLMS (the e-assessment platform that is used at CTI) where students can have a discussion about a topic with their peers. Students will have the confidence to genuinely provide their views on the topic since they do not physically see their peers. The lecturer could make the myLMS environment more enjoyable and conducive to learning by providing rewards such as badges.

For instance, in networking and programming classes, lecturers may implement the question-and-answer strategy, in which students ask their peers and/or the lecturers' questions. Lecturers may also ask students to create a programme by using a programming language of their choice and give a reward to the student who proved to be the most creative. This exercise will boost the confidence of the students and improve their thinking skills (Shi, 2008:51). Lecturers may create programmes containing deliberate errors via the Moodle LMS (myLMS) for students to make the necessary corrections. Group discussions may also be created on myLMS to encourage students to share their knowledge and understanding of the errors found in the programmes.

Furthermore, in order to build the confidence of IT students, lecturers must allow students to defend the results they produce in a task (Carter & Boyle, 2002:82). For instance, as a networking lecturer, I often remove the hard drive from the computer without the knowledge of the student. I then ask the students to switch on the computer. The computer will emit a particular noise due to the absence of the hard drive. I again ask the student to tell me what he/she thinks the problem is. I believe that continuous exercises of this nature may encourage students to explore more, think critically, and in the process acquire the necessary skills. Lecturers may also create a simulation of networking exercises via the Moodle LMS where students will be able to design a network and assemble and/or disassemble a computer.

4.5.3.2 Motivate students to think critically and enhance their practical skills

For IT students to be creative in their thinking, they need to think beyond the content of the discipline. In other words, lecturers should not restrict their students' endeavours. IT students should be given the opportunity to provide a variety of answers to a specific question. Lecturers should not concentrate on the answer given by a student but rather focus on the perspective from which the student provided the answer. This also encourages students to think critically and provide different solutions to a problem (Shi, 2008:51). For example, on myLMS, lecturers could upload uniform resource identifiers (URI) links that deal with backups or computer upgrades, and then encourage students to visit those websites and discuss what they have learned on myLMS forums. On these discussion forums students may critique what they have read, and formulate different ways to backup and upgrade a computer.

4.5.3.3 Encourage students to identify and solve problems

IT as a discipline is also practical in nature and if lecturers do not ask questions that will help IT students apply what they have learned, they may not benefit from the course (Shi, 2008:51). One method a lecturer may use in an IT class is to disassemble a computer and ask students to reassemble them. This can be done through a simulation on the Moodle LMS (see 4.5.3.1). The lecturer may also write a programme and ask students to identify the errors in the code and to correct them. These exercises will improve students' creative thinking skills. When such exercises are frequently carried out, lecturers may be able to identify the problems their students' experience (Shi, 2008:51). The code can also be implemented on myLMS; students can then analyse it, and detect and correct any errors. Students can discuss the problems they identify and solve them on a discussion forum created on myLMS (see 4.5.3.1).

4.5.3.4 Conclusion: Ways of enhancing students' creative thinking skills in the learning of IT

Students' creative thinking skills can be improved if lecturers create authentic and sophisticated teaching-learning activities (TLAs) via the Moodle LMS. These TLAs will enable students to devise appropriate solutions to problems. Students can also enhance their critical thinking skills if lecturers make the IT course more practical. This will allow students to critically apply what they have learned theoretically.

4.5.4 The role of lecturers and students in the teaching and learning of IT as a discipline

Both students and lecturers play a vital role in the teaching and learning of IT (Berglund *et al.,* 2009:334; Lapidot & Hazzan, 2003:31).

4.5.4.1 Appropriate teaching approach

It is the lecturer's responsibility to effectively teach the discipline since he/she is regarded as the expert in the field. Most significantly, lecturers should make it known and clear to students what areas and/or concepts are relevant (Berglund *et al.,* 2009:334; Lapidot & Hazzan, 2003:31). Lecturers may upload relevant URI links on myLMS to provide an opportunity for students to do further research in the areas and/or concepts of importance.

4.5.4.2 Identification of students' problems and their responsibility in this regard

Lecturers should motivate their students to inform them about their academic challenges and to ask questions in and out of class about concepts they do not understand. Students can go one step further by doing research themselves about the concepts they are finding difficult to understand. This means that the responsibilities should be shared between lecturer and student. Nevertheless, a greater part of the responsibility should lie with the student. The student has to identify issues he/she is struggling with and approach the lecturer for possible solutions (Berglund *et al.,* 2009:334; Lapidot & Hazzan, 2003:31). In this regard, a discussion forum may be created on myLMS by the lecturer to engage the students on a topic. The lecturer may be able to identify and assist students who are not actively involved in the discussion and/or struggling to understand the topic being discussed.

4.5.4.3 Students' learning perspectives

Lecturers should make a concerted effort to determine the perspectives which guide their students' reasoning. This can be done by motivating their students to ask questions. It ensures active engagement and will enable the lecturer to identify problems students may encounter. Lecturers can then modify their way of teaching in order to accommodate these students (Berglund *et al.,* 2009:334-335; Lapidot & Hazzan, 2003:31). The Moodle LMS allows lecturers to create a "questions and answers (Q & A)" platform, and choose a relevant topic that has been taught in the classroom, which can subsequently be discussed on LMS forums. This "Q & A" initiative may help the lecturer identify and assist students with any problem areas they may be struggling with.

4.5.4.4 Conclusion: the role of lecturers and students in the teaching and learning of IT as a discipline

Both lecturers and students play vital roles in the teaching and learning of IT. Lecturers need to apply appropriate teaching methods that will meet students' learning needs, and actively involve them in learning matter. The teaching-learning activities designed by lecturers should therefore enable students to apply a deep learning approach (see 2.2.4), and graduate successfully.

On the other hand, students need to be ready and/or positive about the IT course they are undertaking. They need to engage with the TLAs created by their lecturers. When they encounter difficulties, they need to approach their lecturers for clarification. Students should also be motivated to take responsibility for their own learning.

Lecturers may create different teaching-learning activities, such as simulations, discussion forums, "Q & A", video recordings, etc. on the Moodle LMS to fully engage the students and also help them overcome the difficulties they face in their learning of IT.

4.5.5 Conclusion: Learning about IT as a discipline

Learning of IT requires students to think "out of the box" and lecturers to apply appropriate, engaging, and high-impact teaching-learning activities (see 2.5) and methods in order to enable their students to think laterally. Students need to identify their shortcoming in the learning process and then approach their lecturers for support. Some students feel shy about informing the lecturer in person about the problems they are facing in their learning of IT. In this case, the lecturer may create a survey on myLMS after completing every topic, and then provide an opportunity for students to write down any problems they have with that topic. This will help lecturers identify students' problems, and opt to use different teaching-learning methods to present that topic.

I believe that students who mostly apply a surface learning approach (see 2.2.3) will not be successful. In the learning of IT, students must prove that they can apply what they have learned through demonstrations and practical exercises, and this requires a deep learning approach (see 2.2.4). Lecturers may create simulations on myLMS for students to apply the theory that they have learned.

In terms of the factors that cause students to either pass or fail in their learning, I believe that students themselves play a major role. No matter how difficult students perceive the IT discipline to be, there are various ways in which they can learn. For instance, students may watch YouTube videos presented by other lecturers explaining the concepts they find difficult to understand. These videos may also be uploaded on myLMS for students to view. In programming, however, the best way is for students to practise on a regular basis; lecturers could assist in creating more programming exercises on myLMS.

Students need to take responsibility for their own learning because lecturers can only do so much in creating an environment conducive to learning. Students spend most of their time outside the classroom and need to make effective use of this time. They may excel in their learning of IT if they share their learning concerns with their lecturers and peers, ask questions in and out of the classroom, and attempt to solve more problems on their own. Instead of students spending more time in the classroom, lecturers could create different exercises on myLMS for the students to do and submit. Lecturers could then discuss the exercises with them via myLMS on forums and provide them with effective feedback (see 3.2.3.4, 3.2.4, 3.2.4.1, 3.2.6, 3.2.10.1).

In a nutshell, although lecturers play a role in students' learning of IT, the greater responsibility ultimately lies with the students themselves. Students therefore need to make the necessary effort to change their negative perceptions and also shift from applying a surface learning approach (see 2.2.3) to applying a deep learning approach (see 2.2.4). The effective use of the Moodle LMS may enable students to take responsibility for their own learning and subsequently apply a deep learning approach (see 2.2.4).

4.6 ASSESSMENT IN INFORMATION TECHNOLOGY (IT)

The following subsection provides an overview of assessment in IT and the different assessment tasks which are an integral part of IT.

4.6.1 Overview of assessment in IT

According to O'Neill and Noonan (2011:4), it is important for lecturers to consider the level of development/competence of the students for whom they are creating assessment tasks. For instance, if assessment tasks are being created for first-year students, lecturers can start off by building students' confidence by using "low-stakes" assessment tasks, and gradually intensify the level of difficulty towards "high-stakes" assessment tasks.

Lecturers should also try to optimise the assessment task workload in their IT courses in order to afford students enough time to engage with the content of the course (Sheard, Morgan, Butler, Falkner & Weerasinghe, 2015:92).

Various studies have shown that most IT students are assessed through semester examinations, tests, tutorials, assignments, and the compilation of portfolios. The most commonly used assessment tasks, however, remain semester examinations and assignments. The assignments are designed to be more practical in nature and relate to authentic/real world scenarios (Sheard, Morgan, Butler, Falkner & Weerasinghe, 2015:92). In IT, all forms of assessment, that is assessments *of/for/as* learning (see 2.9.1, 2.9.2, 2.9.3), are very important. Since IT focuses on practical skills, students may be given projects to improve their skills (Daniels, Gal-Ezer, Sanders & Teague, 1996:105).

4.6.2 Assessment tasks for IT

The subsections below explain the different assessment tasks for IT.

4.6.2.1 Examination

Examinations usually take place at the end of a semester or year course. This is referred to as assessment of learning or summative assessment (see 2.9.1). IT lecturers use examinations to confirm students' level of understanding of concepts. It assures lecturers that the work is indeed students' own work. However, some students feel that examination is not an appropriate assessment task to determine their learning because they sometimes need to memorise concepts and reproduce them in an examination, without having a proper understanding (Sheard, Morgan, Butler, Falkner & Weerasinghe, 2015:92). Usually the weighting of semester examinations in higher institutions constitutes 50% of the final mark. Examination questions commonly include true/false questions, multiple-choice questions, and scenario questions. These examination questions may be created on the Moodle LMS. On myLMS, students provide answer to these questions, all of which may be marked automatically by the system. This eases the burden of manually marking students' answers. Lecturers usually allocate fewer marks to true/false questions and multiple-choice questions, whereas scenario questions often carry a higher percentage of marks (Sheard, Morgan, Butler, Falkner & Weerasinghe, 2015:92).

4.6.2.2 Assignments

Assignments comprise both assessment of learning (summative assessment) (see 2.9.1) and assessment for learning (formative assessment) (see 2.9.2). The lecturer may decide to allocate assignments to either a group of or individual students. Assignments are summative in the sense that students are expected to submit their assignments within a specific timeframe to be marked. However, an assignment might also be formative because a lecturer at times has to test the students' progress, and provide constructive feedback on the aspects they struggle with (see 2.9.2.1.3). This, however, requires that the students are actually completing the assignment themselves. Group assignments, on the other hand, encourage peer-review and improve teamwork skills. Normally lecturers develop all assignments in advance at the beginning of the semester/year (Sheard, Morgan, Butler, Falkner & Weerasinghe, 2015:93). IT lecturers at CTI may use the Moodle LMS to create assignments, which are then completed and submitted by the students on myLMS. The added anti-plagiarism tool (Turnitin) on myLMS will enable both students and lecturers to identify areas of the assignment that have been plagiarised.

4.6.2.3 Tests

Tests are usually written upon completion of a unit, section, or chapter and are therefore mostly summative in nature (see 2.9.1.2). They are normally called semester tests, which often contribute very little towards the semester mark (e.g., at CTI, the weighting for a semester test is 10%). However, the weighting might differ from one HEI to the other. IT lecturers may use facilities available within learning management systems (LMSs) such as Moodle or Blackboard to develop and make these tests freely available. Students might, however, prefer continuous assessment through a series of exercises or class tests, rather than a one-test assessment which is allocated a higher weight (Sheard, Morgan, Butler, Falkner & Weerasinghe, 2015:95).

4.6.2.4 Tutorial assessment

Tutorial assessment is also found to be a common assessment task in IT courses. Tutorials normally take place on a weekly basis and are low-stakes assessment tasks for which the weight often ranges between 1% and 2%. This is an average weight and may differ from one

HEI to the other. Tutorials have the potential for motivating students to attend classes and working together as a team with their peers. Furthermore, through tutorials lecturers are able to identify the strengths and weaknesses of their students (Sheard, Morgan, Butler, Falkner & Weerasinghe, 2015:95). When students find it difficult to physically attend classes, tutorials could be created on a Moodle LMS to stimulate their interest. Through online tutorials, in the form of forums, lecturers can identify the strengths and weaknesses of their students. In other words, tutorials can be used effectively for the purpose of formative assessment (see 2.9.2).

4.6.2.5 Portfolios

Most IT lecturers also use portfolios as a form of assessment. These IT lecturers expect their students to create a portfolio of each unit/module that contains the work completed each week, which demonstrates how the student has met the required assessment criteria. Upon submission, students receive constructive feedback from their lecturers (assessment for learning - formative assessment) (see 2.9.2). Portfolios are often not awarded marks until the end of the semester. In many cases, a portfolio might be the only course assessment the students have to submit, which means the weighting will be 100%. Students' marks might improve with portfolio assessment if they are allowed to rework some of the portfolio tasks, based on the constructive feedback given by their lecturers (Sheard, Morgan, Butler, Falkner & Weerasinghe, 2015:95). It is important to note, however, that portfolios might also have a summative purpose, e.g., when it replaces an examination (see 2.9.1). On the Moodle LMS students are able to export their forum posts, discussions, chat sessions, database activities, and assignment submissions to their portfolios.

4.6.3 Conclusion: Assessment in IT

Assessment plays an important role in the teaching of Information Technology. If lecturers assess students incorrectly, it may have a negative effect on their learning, their progress, and their future studies. I believe that assessment tasks such as portfolios and practical simulations should be allocated a higher weight than theoretical assessments, through tests, quizzes, and examinations.

It is important that assessment tasks designed for IT students should foster deep learning (see 2.2.4), enhance teamwork (see 2.3.2), and be authentic (see 2.3.3). In other words, IT assessment tasks should also prepare students for the industry. Assignments should be authentic (real world related) and provide students with practical experience upon completion of the assignment. It is also important to make provision for assessment of learning (summative assessment), assessment for learning (formative assessment), and assessment as learning (see 2.9.1, 2.9.2, 2.9.3) in the IT discipline. For instance, portfolios and/or group assignments may involve formative and summative assessment, and provide opportunities for self- and peer assessment (assessment as learning)

At CTI, an IT assessment is divided into four parts. It allows a weight of 20% for practical assignments, 10% for continuous assessment (e.g., tutorials, presentations, and mind maps), 20% for a semester test (which is a written theory test), and 50% for the summative semester examination. These assessment tasks need to ensure that CTI IT students apply a deep learning approach (see 2.2.4) since students have to think critically while performing these assessment tasks. They should also get a feel of what to expect in the workplace.

The above assessment tasks in IT may be implemented on the Moodle LMS (see 4.6.2.1 to 4.6.2.5)

4.7 E-ASSESSMENT IN IT

The following subsection explains the overview of e-assessment in IT and the e-assessment tasks that take place in IT.

4.7.1 Overview of e-assessment in IT

The time when IT lecturers could transfer only knowledge to their IT students is no longer ideal in the teaching of IT (Deubel, 2003:63). The rapid increase in e-learning platforms and technologies has provided a different and potentially better way for IT lecturers where lecturers do not only convey knowledge and/or information to their IT students, but rather ensure that students are fully engaged in the learning process and in e-assessment tasks. E-assessment tasks enable students to improve their collaboration skills, learn independently, engage well with the tasks, improve their creative thinking skills, and apply a deep learning approach (Dafoulas, 2006:516; Deubel, 2003:64). For e-assessment tasks to be implemented successfully by IT lecturers, they should be supported by the “course content, appropriate assessment, constructive feedback, course management and effective communication between the lecturers and students” (Deubel, 2003:64).

E-assessment involves the use of ICTs to present and deliver assessment tasks, receive students’ responses, and record these responses; for this reason, IT lecturers need to be experienced in the use of these ICTs in order to create viable e-assessment tasks for their IT students. IT lecturers also need to ensure that their students have adequate knowledge of the e-assessment platform and/or tools through which they will perform their teaching-learning activities (see 3.3.3; Crisp, 2011:5; Howarth, 2015:4; Office of Qualifications and Examinations Regulation [Ofqual] [cited in Winkley, 2010:4]).

E-assessment can be delivered in two ways: synchronously or asynchronously (see 3.2.3.1, 3.2.3.2, 3.2.3.3, 3.2.3.4, 3.3.3). In a synchronous delivery mode, students use the Internet to perform their e-assessment tasks. In other words, students can engage with the e-assessment tasks “live” and get immediate feedback from either their peers or lecturers (see 3.2.3.1, 3.2.3.3, 3.3.3). On the other hand, in an asynchronous delivery mode the e-assessment tasks are downloaded onto the students’ computers or any other technical device (such as CD, DVD, memory stick) which would enable them to complete these tasks in their own time and a place of their choice (see 3.2.3.2, 3.2.3.4, 3.3.3). In IT, the asynchronous mode of delivery is usually used for high-stakes assessments such as end-of-semester examinations, where a specific venue will be equipped with computers and the e-assessment tasks downloaded onto these computers (see 3.2.3.1; 3.2.3.3, 3.3.3, 3.3.4; Naidu, 2006:1-2; Romiszowski, 2004:6; Howarth, 2015:6).

At their sole discretion, HEIs (including CTI) can decide whether to use e-assessment facilities that are already built into a learning management system (LMS), such as Moodle or Blackboard or to use a standalone assessment tool (see 3.3.3; Osuji, 2012:144; Winkley, 2010:4-5). IT lecturers must ensure that their students are familiar with the e-assessment tool and/or LMS they use for their teaching-learning and assessment activities. In other words, the e-assessment tool and/or LMS environment must be conducive to students’ learning and creative thinking.

E-assessment in IT can also be done as different forms of assessment, that is, assessment of/for/as learning (see 2.9.1, 2.9.2, 2.9.3; Earl & Katz, 2006:27; NSW, 2012:1).

4.7.2 E-assessment tasks for IT

Some IT lecturers think that e-assessment tasks should only consist of multiple-choice questions (MCQs) and/or true/false questions, and that these types of questions can only assess students’ lower-order cognitive skills. However, advancement in technology has made it possible for e-assessment tasks to also assess higher-order skills, thus helping students to apply a deep learning approach (see 3.3.4; JISC, 2006:7; DFES, 2005:75).

Due to the practical nature of IT, e-assessment tasks should be created in a way that will enhance students' learning, and maintain high expectations. E-assessment tasks in IT should be designed to be more practical and should relate to authentic/real world contexts. IT lecturers should possess the practical competence of creating appropriate and authentic e-assessment tasks (see 4.4.2). Moreover, the convenience of marking should not supersede authenticity.

E-assessment tasks should nevertheless follow principles similar to those of traditional assessment, namely being authentic, consistent, transparent, practical, accessible, timely, accurate in measuring the required outcomes; and should ensure the quality of the supporting system (see 3.3.6; Tinoca, 2012:213; JISC, 2007:8; Brink & Lautenbach, 2011:503-504).

E-assessment platforms and/or tools have the potential to provide a variety of tasks that students can perform (see 3.3.4). The Moodle platform (the LMS used by CTI), for instance, makes provision for e-assessment tasks such as calculations, calculated multi-choice questions, calculated simple questions, embedded questions (closed tests), essay questions, matching questions, multiple-choice questions, numerical questions, random short-answer matching questions, short-answer questions, true/false questions, and description questions (see 3.2.4.1). At CTI, these types of e-assessment tasks are usually utilised as continuous assessment tasks which collectively contribute 10% to the semester mark.

Moodle also allows lecturers to create e-assessment tasks. At CTI, assignments contribute 20% of the semester mark for IT students. IT students can download the assignments onto their computers and upload the completed tasks onto the system after completion. Constructive feedback is then provided by the lecturer online. Students receive an e-mail notification as soon as a lecturer is ready to provide feedback.

Some IT lecturers at CTI also use discussion forums for some of their assessment tasks (see 3.3.4). A specific topic, for example, is posted in the discussion forum for students to engage with. Students are able to comment on the topic as well as their peers' views on the topic. The lecturers then use rubrics to grade the students. Discussion forums serve to enhance students' collaboration skills and creative thinking skills.

Some lecturers also use electronic portfolios (e-portfolios) as e-assessment tasks in IT. According to Banta (2003:2), e-portfolios allow institutions and lecturers to identify what the students are learning and how they learn. Furthermore, e-portfolios ensure the effective assessment of courses and curricula (Banta, 2003:4). E-portfolios allow students to organise their semester work in electronic format; lecturers can then provide them with constructive feedback.

According to Buyarski and Landis (2014:49) all e-portfolios should contain relevant documentation and intended learning outcomes, should make it possible to monitor the progress of students' learning, and provide collaboration in the form of constructive feedback. Most of the time, e-portfolios have 100% weighting.

4.7.3 Conclusion: E-assessment in IT

In IT, e-assessment tasks should comprise practical demonstrations and simulations in order to test students' higher-order thinking skills. The practical competence of IT lecturers is also important since they are responsible for creating an effective learning environment for their students. They also need to ensure that their students are familiar with the e-assessment platforms as well as the tools they use to create e-assessment tasks.

Another important concept to apply in IT e-assessment tasks is adherence to the principles for effective e-assessment. E-assessment tasks must be accessible and fair to all IT students. IT lecturers, however, need enough time to create high-quality e-assessment tasks in order to avoid creating opportunities for students to apply a surface learning approach.

Institutions must also ensure that the necessary infrastructure is in place for lecturers and students to effectively use the e-assessment system. IT lecturers must be provided with adequate professional training in order to effectively implement e-assessment in their IT courses.

4.8 CONCLUSION: TEACHING, LEARNING AND ASSESSMENT OF IT AS A DISCIPLINE TOWARDS E-ASSESSMENT IN IT

Many IT courses have their origin in the high demands set by employers. This has changed the direction of IT as a discipline. Institutions need to ensure that their graduates are ready for the workplace. Lecturers, institutions, and curriculum developers all need to ensure the successful implementation of IT courses. Curriculum developers need to bear in mind that it is crucial to integrate practical teaching-learning activities and assessment tasks in the curriculum.

Assessment tasks and teaching-learning activities implemented by lecturers should support students in their learning and help them develop the necessary high-quality skills required by employers.

Students need to have a positive attitude towards their learning. Self-discipline, self-responsibility, confidence, and motivation are key characteristics that IT students must possess in order to succeed in IT learning.

According to Lunt *et al.* (2008:17-18), employers require IT graduates to possess quality skills and capabilities upon completion of their courses. Among others, IT graduates should therefore have the ability to:

- Apply their understanding of technology acquired from the discipline.
- Explore a technological problem and provide a solution to that problem.
- Create and assess a system or a programme that meets the needs of industry.
- Understand work ethics and be professional at the workplace.
- Communicate effectively.
- Participate in professional developments at the workplace.
- Follow the current trends in IT and easily learn how to use new technologies.
- Identify the needs of users and incorporate them in their system design.
- Create an appropriate project and/or work plan at the workplace.
- Lifelong learning in order to keep abreast of developments in IT.

Higher education institutions should regularly provide professional training for their IT lecturers on how to effectively use e-learning/e-assessment platforms and/or tools in creating opportunities for deep, engaged learning. IT students, on the other hand, need to be guided and assisted as to how the e-learning/e-assessment system works, and how they can perform their e-learning and e-assessment tasks effectively.

I believe that if lecturers create effective assessment tasks and engage their students in high-impact tasks that promote a deep learning approach, and build on their prior and innovative thinking skills, the students will indeed master the skills as outlined by Lunt *et al.* (2008:17-18).

4.9 CONCLUSION: SALIENT ELEMENTS FOR EFFECTIVE E-ASSESSMENT IN IT AS OBTAINED FROM THE LITERATURE

In this section, the salient elements of effective e-assessment in IT as obtained from the literature will be discussed.

Student learning is based on three main learning approaches (surface, deep, and strategic) (see 2.2.3, 2.2.4, 2.2.5). The approach that students use in their learning is influenced by the assessment tasks designed by the lecturer. For students to apply the deep and strategic learning approaches, assessment tasks should be aligned with the intended learning outcomes (ILOs) and should encourage student engagement (see 2.4.2). Furthermore, deep and strategic learning approaches may be achieved through active learning activities (such as exploratory writing, small-group discussions) as well as a variety of teaching-learning activities (TLAs) and methods (see 2.3.2).

The assessment tasks designed by lecturers should support the principles of assessment (fairness, validity, reliability, and practicability) (see 2.6.2.1, 2.6.2.2, 2.6.2.3, 2.6.2.4, 3.3.6.1, 3.3.6.2, 3.3.6.3, 3.3.6.4). This means that assessment tasks should have credibility:

Credibility = Fairness + Validity + Reliability + Practicability

Assessment tasks may take place in the form of diagnostic assessment, formative assessment (assessment for learning), summative assessment (assessment of learning), and self-and/peer assessment (assessment as learning) (see 2.9.1, 2.9.2, 2.9.3).

Student learning can be conducted via e-learning. The two main modes of e-learning through which learning occurs are synchronous and asynchronous modes of learning (see 3.2.3). E-learning may be facilitated through a learning management system (LMS) such as Moodle and Blackboard. E-assessment tasks may be developed on an e-learning platform (web-based) or through downloads (see 3.3.3). E-assessment tasks can test students' lower and higher order cognitive skills (see 3.3.4). E-assessment tasks in IT may include semester examinations, tests, assignments, and portfolios (see 4.6.2.1, 4.6.2.2, 4.6.2.3, 4.6.2.4, 4.6.2.5). These tasks should be in line with the principles of assessment (see 2.6.2.1, 2.6.2.2, 2.6.2.3, 2.6.2.4, 3.3.6.1, 3.3.6.2, 3.3.6.3, 3.3.6.4).

E-learning (e-assessment) provides immediate and constructive feedback to students if the feedback function in myLMS is used (see 3.2.6, 3.3.10). However, there are certain barriers to e-learning (e-assessment) that institutions and lecturers need to be aware of. These barriers include a lack of student assertiveness, website unavailability, and student isolation (see 3.2.8, 3.3.11). E-assessment can be applied in the teaching, learning, and assessment of IT in higher education. IT teaching-learning activities (TLAs) that can be implemented through e-assessment are simulations, practical demonstrations, collaborative learning, and computer laboratory work (see 4.4.1).

In conclusion, e-assessment may be successfully implemented in the teaching, learning, and assessment of IT in higher education institutions if these ensure their e-assessment systems have appropriate delivery systems, control mechanisms, system feedback facility, stability and speed, security, reporting mechanisms, and support and training for both students and lecturers (see 3.3.12.1 to 3.3.12.11).

Figure 4.1 below shows a flow diagram of the salient elements of effective e-assessment in IT, as obtained from the literature.

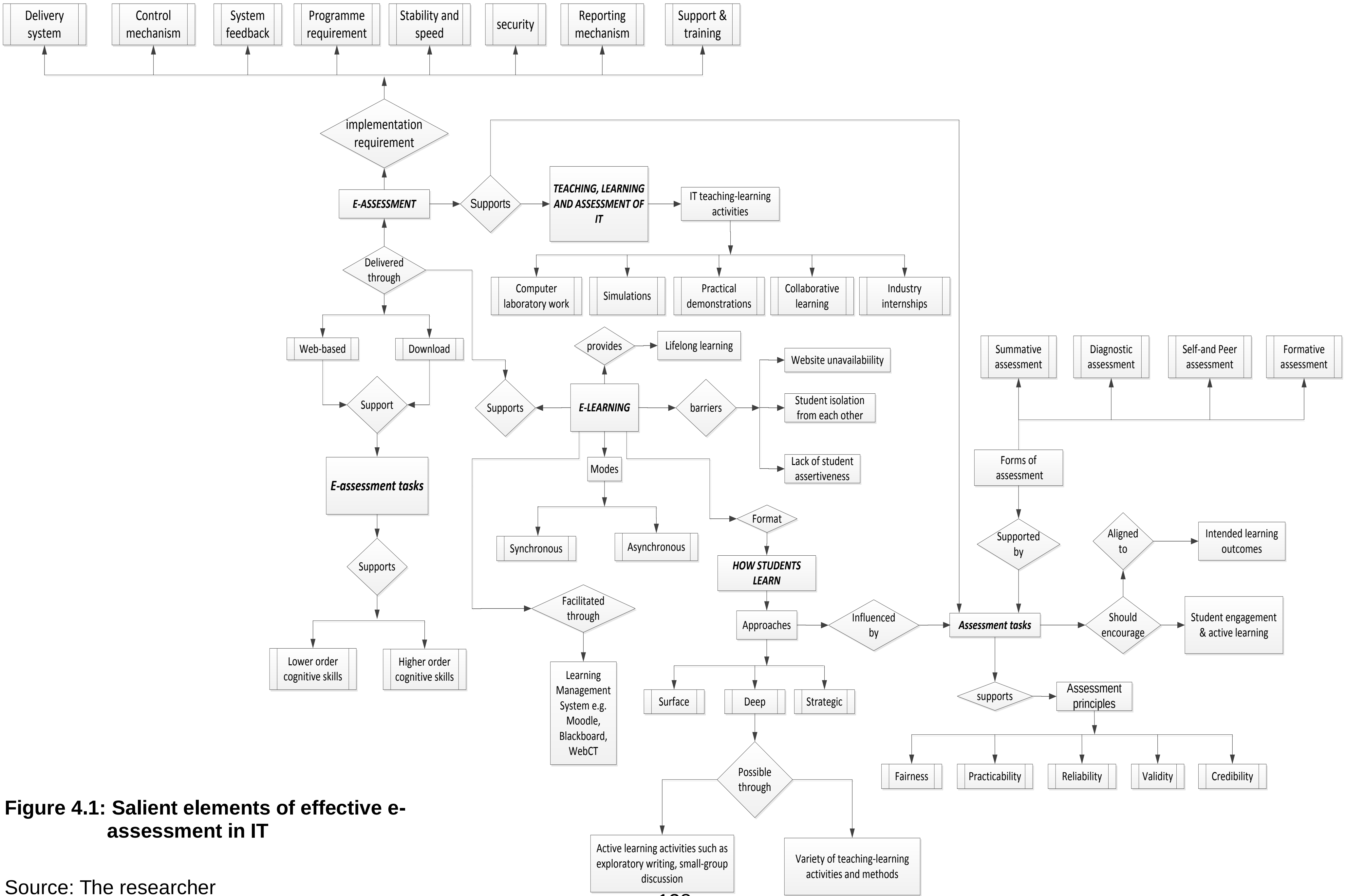

Figure 4.1: Salient elements of effective e-assessment in IT

Source: The researcher

CHAPTER 5

RESEARCH DESIGN AND METHODOLOGY

5.1 INTRODUCTION

E-learning and e-assessment became a possibility at the Computer Training Institute (CTI), which is a private higher education institution (HEI) for the first time in 2013, through the provision of access to the open-source Moodle learning management system (LMS) for lecturers and students of CTI. Since the utilisation of the LMS for the purpose of e-learning/blended learning and, in particular, e-assessment, is a relatively new development for IT lecturers at this private higher education institution (HEI), there is a need for a framework or an action plan for the lecturers' implementation of e-learning/blended learning and, in particular, implementation of e-assessment through the Moodle LMS.

This study centres on how the IT lecturers could implement e-assessment in the teaching and learning of Information Technology (IT).

In this chapter, the research design and the methodology used to answer the primary and secondary research questions will be discussed. In order for me to plan and employ the required empirical research, I had to first identify and/or understand concepts that evolved around the research project, some of which include the research paradigm (my view of research) that would underlie my research. The paradigm is important since it enabled me to establish whether I was indeed interested in other people's perceptions and/or experiences (qualitative research) or the frequency and distribution of parts of information (quantitative research). The next step was to understand and argue the background of the identified problem, which students, lecturers, and experts in the field of teaching and learning, IT as a discipline, information and communication technologies (ICTs) in education, assessment, e-assessment and e-learning in higher education would recognise and accept, and which would point to any gaps that could assist me in identifying existing research material.

It was very important for me to obtain an overall idea of the above-mentioned points (paradigm, and qualitative and/or quantitative research) in order to realise the importance and position of my own study within the already existing body of knowledge. I had to make a decision whether to opt for qualitative or quantitative research, or to collect both qualitative and quantitative data. I realised that the research problem would influence the type of research that needed to be carried out. Although researchers do have an innate desire for a particular type of research design based on their own accepted research paradigm, it was essential for me to allow the research problem to influence the research design. This assisted me to ensure that I was using a valid data-collection method (McMillan & Schumacher, 2006:10). On completion of the empirical research the data had to be examined and recommendations and/or suggestions made.

5.2 PARADIGMATIC PERSPECTIVES, ASSUMPTIONS, AND METHODOLOGICAL PREFERENCES

Based on the identified research problem (see 1.3.1), I will now deliberate on my paradigmatic research perspective, and the proposed research design and methodology that I used in resolving the research problem.

Firstly, I adopted a constructivist research paradigm because my most important purpose was to obtain an understanding of the role players' experiences of e-assessment. Despite my preference for constructivist research methods, I eventually used quantitative data to support and validate my qualitative data and findings. The methodological approaches and processes that were appropriate for this research paradigm are discussed in the section below.

5.2.1 Theoretical and paradigmatic framework

The theoretical framework for the study was informed by existing/contemporary theories and conceptions pertaining to student learning (see 2.2), assessment *of*, *for,* and *as* learning (see 2.9.1, 2.9.2, 2.9.3), e-learning/blended learning (see 3.2), and e-assessment (see 3.3) in the teaching and learning of IT in a higher education (HE) context. In this regard, theories pertaining to student learning approaches (deep, surface, and strategic approaches as well as student engagement and high impact practices in the context of constructivist learning) (see 2.2.3; 2.2.4; 2.2.5; 2.4); the relationship and difference between the three major forms of assessment (assessment *of*, *for,* and *as* student learning respectively) (see 2.9.1; 2.9.2; 2.9.3); constructive alignment in course design (see 2.7), as well as the utilisation of information and communication technology (ICT) for enhancing teaching, learning, and assessment practices in HE (see 3.2; 3.3) were of particular importance.

The study falls within the field of higher education studies and overlaps the following of Tight's (2012:9) key themes in higher education research: course design (which includes student assessment); teaching and learning; and the student experience in HE. Furthermore, I was guided by the constructivist research paradigm (which is also interpretive in nature) when interpreting the data obtained from relevant literature, as well as during the envisaged empirical research. The constructivist paradigm within which I operated is indeed attributed to my own attitude, professional practice, and my behaviour towards my own research (Hesse-Biber & Leavy, 2011:37).

I decided to work from a constructivist point of view in order to “understand, explain, explore, discover and clarify situations, feelings, perceptions, attitudes, values, beliefs and experiences of” IT lecturers and IT students at CTI (Jackson & Sorensen, 2003:257). Mertens (2005:16) states that constructivist researchers “…want to know what meaning people attribute to activities and how that is related to their behaviour. These researchers are much clearer about the fact that they are constructing the ‘reality’ on the basis of the interpretations of data with the help of the participants who provided the data in the study.” McMillan and Schumacher (2006:315) confirm that constructivist research indeed aims at the understanding of social concepts and analysing the perceptions, experiences, thoughts, and actions of the participants.

According to Creswell (2013:21); Guba and Lincoln (1994:108); and Nieuwenhuis (2007:50-56), epistemological stances offer significant information regarding the different assumptions of philosophies made by the researcher. There is the ontological view (the nature of reality) and epistemological view (the method for knowing reality).

Guba and Lincoln (1994:111) state that with regards to ontology, in the context of the constructivist paradigm, realities are not entirely true in any complete sense but simply somehow informed and/or complex. Denzin and Lincoln (2011:13) confirm that there are numerous realities. Reality is experienced differently by different individuals. For this reason I allowed the important concepts to appear as they were viewed by the participants (Mertens, 2010:18).

In terms of epistemology, there is the assumption that data, interpretations, and results are embedded in different perspectives and different people. Furthermore, the constructivist epistemological view is that knowledge is constructed by individuals themselves, based on their prior knowledge and their social interaction with others (Creswell, 2013:21; Guba & Lincoln, 1994:108; Nieuwenhuis, 2007:50-56). According to Mertens (2010:18), researchers can trace sources of data and converge (put together) these into interpretations that are ultimately known in the descriptions of the research findings. The participants in my study and I are assumed to be interactively involved, and the findings are created as the investigation continues (Guba & Lincoln 1994:11; Denzin & Lincoln 2011:13). From my point of view, it is therefore clear that my ontological and epistemological views are closely related.

Furthermore, since this research aimed to enhance my own teaching as well as that of my colleagues, it may be classified as applied research. According to McMillan and Schumacher (2010:14), applied research is research which is “conducted in a field of common practice and that is concerned with the application and developing of research based knowledge about practice." In this study the practice is the implementation of e-assessment in the teaching and learning of IT as an academic and professional discipline in higher education.

5.2.2 Qualitative research

Merriam (2009:13) indicates that studies aimed at knowing how people make sense of their world and their experiences are usually rather qualitative in nature. McMillan and Schumacher (2006:315) and Morgan (2007:49-54) support Meriam (2009:13) by stating that qualitative research indeed aims at the understanding of social concepts and analysing the perceptions, experiences, thoughts, and actions of the participants.

According to Creswell (2009:3), qualitative research is also carried out to explore and understand how individuals or different people interpret problems (both social and human problems). This definition confirms what McMillan and Schumacher (2006:315) and Merriam (2009:13) have said.

According to Mertens (2010:2), research is "a process of systematic inquiry that is designed to collect, analyse, interpret, and use data to understand, describe, predict or control an education or psychological phenomenon or to empower individuals in such contexts."

Qualitative research methods result in data and findings that are expressed in words, rather than in terms of numeric values that are manipulated for the analysis of data (Patton & Cochran, 2002:2). Parkinson and Drislane (2011:1) also confirm that qualitative research may include different designs and methods, such as case studies and participant observation in some form or another.

My interest as a mainly constructivist, qualitative researcher therefore was to identify peoples' experiences and/or perceptions and how they use/can use their experiences and/or perceptions to produce different results and to empower themselves (Mertens, 2010:2). I intended to use the qualitative research data and results in order to suggest and/or recommend how CTI IT lecturers can be empowered to use e-assessment effectively in their own teaching. I eventually did so by developing a framework that lecturers (myself included) can use in future to implement e-assessment effectively.

As a qualitative researcher, my major interest in this study was how IT lecturers at CTI could implement e-assessment in the teaching and learning of IT, which would enhance students' learning. According to Merriam (2009:14), qualitative researchers can be effective in their research if they have the requisite knowledge and an understanding of the four main aspects that are important in qualitative research, namely:

5.2.2.1 Participants' understanding of their perceptions and/or experiences

The first main aspect outlined by Merriam (2009:14) is that qualitative research involves enquiring to what extent participants understand how they feel/perceive a phenomenon, and what they experience. In other words, the researcher needs to know how people make sense of and understand their experience. This is interpreted by other authors as the natural setting of participants. The researcher needs to know exactly how the participants are feeling and the issues they are encountering (Creswell, 2013:45; Nieuwenhuis, 2007:51; Patton, 2002:39).

As a qualitative researcher, I would also like to know whether the participants' understanding of their experiences would be different if they were to encounter a similar problem at another stage. That is, do the lecturers and their students see e-assessment differently?

5.2.2.2 Researcher as a primary instrument of data collection

Merriam (2009:14) agrees with McMillan and Schumacher (2006:360) that the researcher is the primary instrument of data collection in qualitative research. McMillan and Schumacher (2006:360) indicate that as part of the data analysis process, the researcher needs to keep records of and critically reflect on the data collected. The reflection process enables the researcher to make the necessary changes to the chosen research design (the reflection process actually serves as an audit trail) (McMillan & Schumacher, 2006:327). In qualitative research, the instrument(s) created by the researcher for data collection should contain mainly open-ended questions or items (Creswell, 2013:45; McMillan & Schumacher, 2010:322; Mertens, 2010:249; Patton, 2002:64).

5.2.2.3 Inductive nature of data analysis

Merriam (2009:17) emphasises that an important aspect that qualitative researchers should be aware of is the mainly inductive nature in which they analyse data. That is, the researcher moves from "specific raw data to abstract categories and concepts." According to Merriam (2009:15), this inductiveness of data analysis occurs when a specific research study lacks the necessary theory and/or lacks *enough* theory to explain the concept being studied. As the researcher continues to work with data, new findings gradually occur (Creswell, 2013:45; McMillan & Schumacher, 2010:323). For details on how the data in this study were analysed, see section 5.3.2.

5.2.2.4 Results are interpreted in words

Merriam (2009:17) states that the most salient characteristic of qualitative research is that this method results in words (text) rather than numeric values, and that such texts are analysed in order to formulate conclusions (Patton & Cochran, 2002:2; McMillan & Schumacher, 2010:322). The research results are then compared and integrated with the reviewed literature in order to create richness in the resulting body of knowledge and to establish a means for future research (McMillan & Schumacher, 2006:315). The analysis and interpretation of qualitative data are therefore reported by making use of detailed descriptions (in text format).

5.2.3 Quantitative research

According to Creswell (2014:32), quantitative research is used to test different theories by analysing the relationship between variables. These variables can then be measured by using appropriate instruments, which in turn enable the numerical data to be analysed through statistical methods (Creswell, 2014:32; Neill, 2007:1). Quantitative research methods result in numbers rather than words (Creswell, 2014:32; Neill, 2007:1-2). Neill (2007:1) indicates that quantitative research is commonly used in the social sciences in order to generalise research findings to larger populations. However, in this study, generalisation was not the aim, although I trust that the research findings will be transferable to similar populations as well.

According to Burns and Grove (2005:23), quantitative research is used to obtain "quantifiable information about the world." In this study, the expert questionnaire reflected a significant number of the features, of the framework, which were to be rated by the participants according to three categories of importance, namely *Essential (E)*, *Useful (U),* and *Not necessary (N)* respectively [see 5.3.1.1d (iii) (vii); 5.3.2; Appendix B4.2]. I needed the expert participants to rate all the features of the preliminary e-assessment framework in order to establish which of them should be retained in my final, amended framework, and which were not necessary to retain. I only reported and interpreted the frequencies of the three rating categories, and therefore did not apply any distribution or inferential statistical measures to interpret these quantitative results.

The quantitative section in the questionnaire referred to above was, however, augmented by the inclusion at regular intervals of open-ended items in the questionnaire during which the participants were allowed to comment on groups of features/sub-features. Thus, the quantitative component was enriched with qualitative data, namely the participants' written comments and suggestions for improving the features included in the preliminary e-assessment framework.

5.3 RESEARCH DESIGN AND METHODOLOGY

In this study, a mainly qualitative intrinsic case study research design with only limited quantitative enhancement was used to answer the primary and secondary research questions.

The case study, in particular, focused on the experiences and perceptions of IT lecturers and IT students at CTI relevant to the implementation of e-assessment in the teaching and learning of IT as a subject on all CTI campuses.

The case study was therefore a system bounded by a subject (IT), an institutional context (CTI), and a focus on a particular phenomenon, namely e-assessment.

According to Van Wyk (2012:4), research design is the plan that links the "conceptual research problem to the empirical research design." That is, the design is the entire plan that outlines the processes and procedures that will be used to solve the research problem. In other words, a research design establishes the data that is required, the methods that will be used to collect, analyse, interpret and report the data, and how both the methods and data acquired will contribute to answering the research question. Creswell (2009:3) and McMillan and Schumacher (2006:9) confirm Van Wyk's (2012:4) view of the research design as the processes and procedures for solving the research problem, and that it involves the data and methods needed to answer the main research question.

Thus, the researcher is required to establish the data-collection techniques for the study beforehand, i.e., how the data will be collected, from which population the participants will be selected, and how the data will analysed and interpreted, and the findings reported.

In this section, I discuss the methods used in this particular case study.

5.3.1 Research methods

In this section, the focus is on the procedures for selecting participants, the data collection and analysis, the trustworthiness of the data and findings, and the ethical considerations that were taken in this research study.

5.3.1.1 Data collection process

According to Creswell (2013:146-176), data collection should follow a due process. I followed Creswell's cycle of data-collection activities as shown in Figure 5.1, which starts with "locating the site or individual" and then follows the different steps portrayed in a clockwise direction.

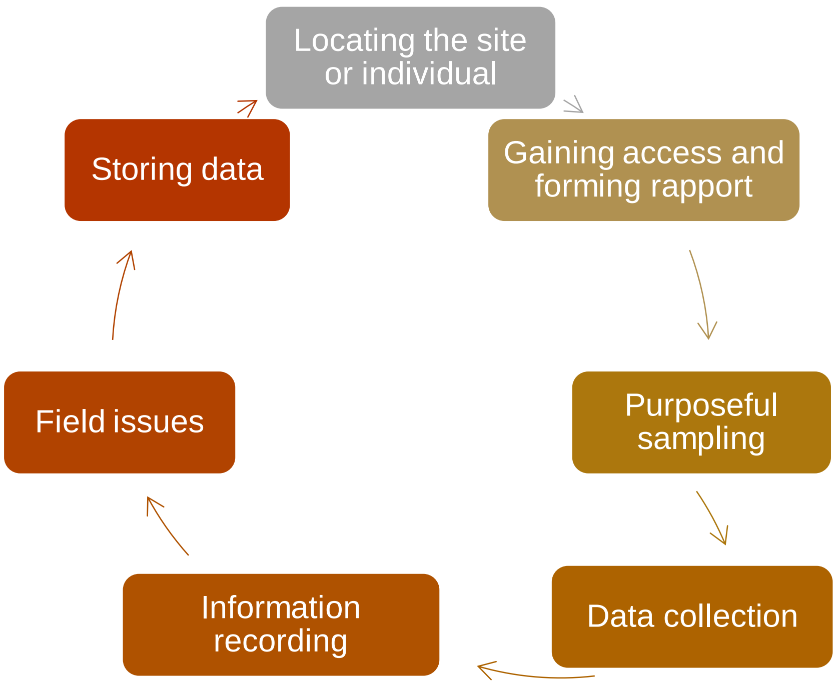

Figure 5.1: Data collection activities

Source: Adapted from Creswell (2013:146)

a. Locating the site or individual

The research participants for this research study were not situated at only one physical site. Creswell (2013:150) states that when participants are located at different physical sites, important background information needs to be provided, and themes and/or categories developed through a coding phase that takes into account the context of each site as well as the collective context.

In the first phase of this research study, the participants (IT lecturers and IT students) were situated at the 11 different campuses of the CTI Education Group in South Africa.

b. Gaining access and forming rapport

I firstly obtained approval from both the University of the Free State (the custodial institution for this research) and the CTI Education Group to do the research. The Ethics Committee of the Faculty of Education at the University of the Free State and the Ethics Committee of the CTI Education Group both approved the research (see Appendix A for the letters of approval). The ethical clearance approval from the University of the Free State was based on the submission of a research proposal, draft informed consent letters, an ethical clearance application form, and drafts of the questionnaires for the different groups of participants to be consulted. The submitted documents ensured the confidentiality of the participants' identities, the information collected as well as the voluntary participation of those participants who would be invited to take part.

Because the research involved a case study of CTI, the information regarding the choice of research site, and how data collection and reporting would occur, was provided. According to Creswell (2013:154), it is important to build a close relationship (rapport) with the selected research participants in order to easily get them to assist in the research study. This rapport was applied in the study. After obtaining ethical clearance from both institutions, I contacted and invited all the participants telephonically and via e-mail, and upon their confirmation of informed consent, they could respond to the questions provided.

c. Purposeful sampling

The participants who ultimately participated in this study were selected because they had an informed understanding and/or knowledge of the research problem (Creswell, 2013:156; McMillan & Schumacher, 2010:347).

In this study, small groups of participants were purposefully selected in order to pilot the lecturer and student questionnaires respectively. In both cases, they were selected by keeping in mind maximum variation in terms of year level, experience, and gender and/or ethnicity (as applicable) (Creswell, 2013:157; Patton, 2002:234). During the focus group interviews that followed the questionnaire survey, participants were also purposefully selected from the Vanderbijlpark Campus of CTI. Furthermore, a panel of experts in teaching and learning, IT as a discipline, ICTs in education, assessment, e-assessment and e-learning in higher education were purposefully selected and invited to evaluate and validate my preliminary framework for e-assessment through answering an online questionnaire specifically compiled for this purpose. I selected a number of such experts whom I was aware of because of their prominence in literature and the media, after which I asked these participants to direct me to other possible participants who may be viewed as experts in any of the relevant fields (Merriam, 2009:79). The initial selection of the participants therefore changed from purposive selection to snowball sampling in the expert validation survey.

According to McMillan and Schumacher (2010:347), it is important to note that the size of the group of participants selected should reach a certain point where no new important information regarding the theory would be found, after which the data collection should be terminated. Merriam (2009:80) also emphasises that there is no specific sample size for qualitative research. According to Patton (2002:246), the sample size selected should only be *enough* for the research study being undertaken.

The first round of data collection was obtained from the questionnaire surveys among students and lecturers, as well as the subsequent focus group discussions with students and lecturers. During the questionnaire surveys, the participants were selected as follows (see 6.4.1, 6.4.2 for the response rates and demographic attributes):

- Although I was allowed to invite all the IT lecturers in the Faculty of Information Technology of the CTI Education Group, only 20 provided their contact details and could therefore participate in this research. A link to the online questionnaire was e-mailed to the 20 prospective participants. However, only 14 lecturers ultimately responded to the online questionnaire.

- Sixty IT students in the Faculty of Information Technology of the CTI Education Group were invited to participate in this research. The reason why I could only invite 60 students was that the campus academic coordinators refused to provide me with their students' contact details for this research. A link to the online student questionnaire was e-mailed to the 60 participants. Forty-seven students ultimately responded to the online questionnaire.

Since the numbers of student participants (47) and lecturer participants (14) were lower than expected, I decided to do at least two follow-up focus group interviews; one with IT students, and the other with IT lecturers.

During the focus group interview sessions, the participants were divided according to their demographic characteristics (see 6.4.3).

- Five IT lecturers in the Faculty of Information Technology on the Vanderbijlpark Campus of the CTI Education Group were invited to take part in a focus group session. An e-mail invitation was sent to them, to which all responded positively and attended the focus group session.

- Seven IT students in the Faculty of Information Technology on the Vanderbijlpark Campus of the CTI Education Group were invited to participate in a focus group session. An e-mail invitation was sent to them, after which all responded positively and attended the focus group session.

After I methodically compared and linked the literature, questionnaire, and focus group data I was able to compile a preliminary e-assessment framework for the teaching and learning of IT at the CTI. I subsequently customised the framework into questionnaire format and invited a number of experts in teaching and learning, IT as a discipline, ICTs in education, assessment, e-assessment and e-learning in higher education to evaluate the preliminary framework by completing the framework questionnaire. The 26 experts that I invited to take part were:

- An expert in teaching and learning at a higher education institution in South Africa (number of invitees: 1).
- An expert in assessment and e-assessment in higher education at a higher education institution in the United Kingdom (number of invitees: 1).
- The manager of an e-learning programme in the United Kingdom (number of invitees: 1).
- Two experts in student assessment in higher education; one from each of two different higher education institutions in South Africa (number of invitees: 2).
- Five lecturers in the field of Information Technology (IT); one from each of five different higher education institutions in South Africa (number of invitees: 5).
- Two lecturers in the field of Information Technology (IT); one from each of two different higher education institutions in Namibia and Nigeria respectively (number of invitees: 2).
- The IT academic manager at a private higher education institution in South Africa (number of invitees: 1).
- Two learning management system (LMS) administrators; one from each of two different private higher education institutions in South Africa (number of invitees: 2).
- The teaching and learning manager at a private higher education institution in South Africa (number of invitees: 1).
- The national assessment manager at a private higher education institution in South Africa (number of invitees: 1).
- The Dean: IT Faculty at a private higher education institution in South Africa (number of invitees: 1).
- Two e-learning specialists at a higher education institution in South Africa (number of invitees: 2).
- The Director: Centre for E-learning and Educational Technology at a higher education institution in South Africa (number of invitees: 1).
- An educational technologist at a higher education institution in South Africa (number of invitees: 1).
- An instructional designer at a higher education institution in South Africa (number of invitees: 1).
- The Director: E-skills Strategic Alliances at a higher education institution in South Africa (number of invitees: 1).

- The manager of an online instructor care institution in South Africa (number of invitees:1).
- A researcher on e-learning and m-learning at a higher education institution in Mauritius (number of invitees: 1).

I selected the expert panel based on their own areas of expertise and their current and background knowledge of the various aspects and factors pertaining to e-assessment in higher education. Seventeen (65.4%) of the 26 invitees ultimately responded by completing the questionnaire (see 7.2.6 for the response rate).

d. Data collection and recording of information

According to Creswell (2013:159-160), there are four types of sources through which a researcher can generate qualitative data. These are observations, interviews (either closed or open ended), document analysis (private or public), and audio-visual materials (such as videos and photos). During the literature review stage of the study, I reviewed various documents such as research reports, policies, and reports from governing bodies (e.g., SAQA documents as well as books and articles from renowned authors).

The collective research method that I used in this study was survey research and the instruments used for the data collection included qualitative electronic questionnaires, qualitative focus group interview schedules, and an online questionnaire containing both closed and open-ended items (*cf.* Babbie, 2013:254).

(i) Questionnaire surveys

In the first round of empirical data collection (questionnaire survey and the focus group discussions), self-constructed, qualitative, online questionnaires with mainly open-ended questions (that therefore resemble semi-structured interviews) were used to collect data from IT lecturers and IT students on all the different campuses of CTI across the country. In addition, I constructed an online questionnaire containing both closed and open-ended questions to collect data from the experts on teaching and learning, student assessment, e-learning, and e-assessment in higher education.

An e-mail message containing the background of the proposed research was sent to the lecturer and student participants that I had invited. The e-mail contained a website link to an electronic questionnaire that comprised mainly open-ended questions aimed at collecting information, their experiences, and perceptions of e-assessment in the teaching (lecturers) and learning (students) of IT. The open-ended questionnaire survey contained questions that aligned with the primary and secondary research questions in order to gather appropriate and specific data that would address the research questions (participants were asked relevant questions).

The aim of the initial questionnaire survey was to identify how IT lecturers and IT students at CTI experienced and/or perceived the role of e-assessment in their teaching (the lecturers) and their own learning (the students) respectively.

(ii) Focus group interviews

I organised two focus group interview sessions (IT lecturers and IT students). Five IT lecturer participants and seven IT student participants took part in the two respective focus group interviews. The focus group interviews were conducted to seek confirmation that the findings of the questionnaire survey were valid. The focus groups were also used as participant review opportunities (to review the questionnaire results), which in turn strengthened the confirmability and credibility (trustworthiness) of the questionnaire data and interpretation.

Focus group interviews enable researchers to also observe the facial expressions and body language of the participants. Through focus groups researchers are able to acquire a good deal of information from the participants in a short period of time. These focus group interviews normally require of participants to leave their workplace in order to participate in the data-collection exercise; therefore, it is a method that is time effective and likely to produce rich information (McMillan & Schumacher, 2006:315). According to Merriam (2009:90), focus group interviews enable participants to hear each other's responses and this helps them to add further comments and suggestions to that which they have already given. In other words, participants are able to contribute more than their initial ideas. Nevertheless, participants in a focus group interview are not obliged to agree or disagree with other participants' responses. The main aim is to obtain rich and quality information in the social context where participants will respect each other's views.

With focus group interviews, participants usually create a social environment where they feel more comfortable since they are with their peers and are able to share their ideas (McMillan & Schumacher, 2006:360). Normally, such a social environment allows group members to highlight and share their perceptions, experiences, and ideas, which would ultimately encourage more discussions and provide rich information and findings for the qualitative research (McMillan & Schumacher, 2006:315).

Focus group interviews are in line with the constructivist research paradigm I chose since the data collected during focus group interviews are socially created through the communication between the participants within the participant groups (Merriam, 2009:93).

Interview guides were used for the two semi-structured focus group interviews (see Appendices B3.2 and B3.3).The questions asked during the focus group interviews were based on the online survey questionnaire data that had been gathered and provisionally analysed (*cf.* McMillan & Schumacher, 2006:366; Mertens, 2005:16).

(iii) An expert questionnaire survey

The aim of the data collection in the second round (the survey among experts) was to acquire feedback with regard to the preliminary framework that I compiled in order to ultimately guide the implementation of e-assessment in the teaching and learning of IT at CTI. The panel evaluated and validated my proposed framework through answering a self-constructed online questionnaire specifically compiled for this purpose (*cf.* Yin, 2009:198-199).

An e-mail message containing the background to the initial research and the preliminary framework was sent to the expert panel members. The purpose of this e-mail was to enable the panel to consider the feasibility of the proposed framework in their own time and space. This e-mail contained a website link to an electronic questionnaire that comprised both closed categorical rating items and open-ended questions based on the features that had been rated. This questionnaire was completed by the panel upon reviewing the framework, and the responses were sent back to me (see Appendix B4.2). The questionnaire items included all the feature and sub-features of the preliminary framework.

(iv) Distribution of questionnaires

Because the participants were situated at different sites, I distributed the questionnaires via e-mail. This method of data collection was cost-effective, and participants were able to respond to the questions in their own time without any pressure. According to Babbie (2013:282-283) and Creswell (2013:159), online data collection enables participants to truthfully/honestly and comfortably answer the questionnaires since they are not intimated by any person. Gibbs (2007:20) supports online data collection by stating that it reduces the possibility of mistakes during data transcription. However, when designing open-ended questionnaires, researchers should consider the language proficiency and writing skills of their participants (Babbie, 2013:257).

All the questionnaires were created in Microsoft Word and then converted to Google Forms. The participants (students, lecturers, and experts) were sent an e-mail invitation containing a website link to the relevant questionnaire. The e-mail invitation to participate in the research as well as the first page of the two initial questionnaires and the expert questionnaire contained information regarding the purpose of the research and the approximate amount of time it would take a participant to respond to the questions (see Appendix B).

Participants who had Internet problems could request hard copies of the questionnaires. Copies of the invitation sent to participants as well as the questionnaires used in the study can be found in Appendix B.

In the next section, I will discuss the design of the questionnaire, its content, and type of questions used in the study.

(v) Designing the questionnaires

In this study, all the questionnaires were first piloted. During the pilot of the first two surveys, one questionnaire was designed and distributed to lecturers and the other questionnaire to students. Furthermore, the expert questionnaire and the interview schedules were piloted by my promoter and a number of my colleagues, requesting them to provide me with feedback. Based on their feedback, a number of changes were made and additional questions were added. For examples of the changes that were made to the interview schedule and the expert questionnaire, see section 5.3.1.1d (viii).The number of questions in each questionnaire is shown in Table 5.1.

During the two initial questionnaire surveys, the two questionnaires were distributed among the lecturers and the students respectively. One questionnaire on the preliminary framework was also distributed to the expert panel. The number of questions in each questionnaire is shown in Table 5.1.

Table 5.1: Number of questions per questionnaire

Questionnaire surveys among:	Number of forced choice multiple-choice questions (demographic and other)	Number of open-ended and mixed questions	Total number of questions
IT lecturers	3	22	25
IT students	6	30	36

Questionnaire for the expert survey	Number of open-ended questions (demographic and other)	Number of rating questions (Essential, Useful, Not necessary)	Number of open-ended questions about framework components	Total number of questions
Validation questionnaire for panel	5	228	36	269

(vi) Content of questions

The two initial survey questionnaires were informed by the findings of the literature review in Chapters 2, 3, and 4, and that related to my first secondary research question, namely:

- How does the literature portray, in general, the implementation of e-assessment in the teaching and learning of IT as a subject/discipline in the context of higher education?

The main sections of the two respective questionnaires in the first round of data collection (the first surveys), therefore were:

- Demographic information.
- General experiences of conventional and e-assessments of student learning in IT.
- Experiences and/or feelings about the different forms of assessment in IT.
- The different types of e-assessment tasks in IT.
- The different types of feedback provided on e-assessment.
- The principles of good e-assessment.

Although in the first round of data collection (first two questionnaire surveys) most of the main sections in the two questionnaires were the same, the questions for each section were differently formulated for the two groups of participants, especially as far as the language and terminology used were concerned (See Appendices B2.2, B2.3 for examples of the questionnaires).

The main sections of the questionnaire for the evaluation and validation by experts of the features of the preliminary proposed framework for implementing e-assessment in the teaching and learning of IT at CTI were as follows:

- Demographic information.
- Characteristics and/or requirements for the successful implementation of e-assessment.
- IT lecturers' prior experience and knowledge of e-assessment of student learning.
- Using IT students' e-assessment results for different teaching and learning purposes.
- Setting deadline dates for the completion/submission of e-assessment tasks.
- Setting duration limits (limiting the allowed duration) for the completion of e-assessment tasks.
- Relationship between IT students' e-assessment marks and how and what they have learned.
- IT students' knowledge regarding *what* (content) they will be assessed on.
- IT students' knowledge regarding *how* they will be assessed (what the e-assessment criteria will be).
- Feedback to IT students about their performance in e-assessment tasks.
- Forms of e-assessment in higher education.
- Types of assessment tasks that may be used in e-assessment.
- Principles of good e-assessment.

(See Appendix B4.2 for a copy of this questionnaires)

The format in which the questions were presented is shown in Tables 5.2 to 5.4 respectively. These tables show the topics addressed in each questionnaire and their relation to topics investigated in the literature review.

Table 5.2: Questionnaire for IT lecturers

Section/Topic	**Questions related to lecturers' perceptions regarding the section/theme**	**Type of question**	**Related topics in Chapters 2, 3, and 4**
Demographic information	• Gender	• Multiple choice (one answer)	Used to report on the characteristics of participants, and to create a background understanding in reporting the data

Section/Topic	Questions related to lecturers' perceptions regarding the section/theme	Type of question	Related topics in Chapters 2, 3, and 4
Paper-based and/or e-assessment tasks	• How often lecturers assess their IT students through paper-based assessment tasks. • How often lecturers assess their IT students through e-assessment tasks.	• Mixed questions	Chapter 2 – See 2.9.1; 2.9.2; 2.9.3. Chapter 3 – See 3.2.4.1; 3.3.3; 3.3.4 Chapter 4 – See 4.6.1; 4.6.2; 4.7.2
Value of e-assessment	• The experience and perception pertaining to the value of e-assessment for the teaching and learning of IT as a discipline. • How and why e-assessment enhances (or does not enhance) lecturers teaching.	• Open ended	Chapter 3 – See 3.2.4; 3.2.6; 3.2.6.1; 3.3.10
Experience in the teaching and learning of IT	• How long and at what levels lecturers have been teaching IT. • How has lecturers' way of assessing their IT students changed and/or improved over the years?	• Open ended	Chapter 4 – See 4.4.2; 4.4.2.1; 4.4.2.2; 4.4.2.3; 4.4.2.4
Forms of assessment	• The forms of assessment lecturers use to assess their IT students (diagnostic, formative, summative, peer, baseline, and self-assessment).	• Mixed questions	Chapter 2 – See 2.9; 2.9.1; 2.9.2; 2.9.3 Chapter 3 – See 3.2.9.10; 3.2.9.11 Chapter 4 – See 4.6.2
Assessment tasks	• Assessment tasks lecturers use to assess students; why they use them, and how often they let students do these tasks. • What lecturers like and/or dislike about using myLMS in assessing IT students.	• Open ended	Chapter 2 – See 2.9.1.2; 2.9.2.4; 2.9.3.2 Chapter 3 – See 3.2.4.1; 3.2.7; 3.2.8; 3.2.10.1; 3.3.3; 3.3.4; 3.3.10; 3.3.11; 3.3.12 Chapter 4 – See 4.6.1; 4.6.2; 4.7.2
Setting deadlines and time limits for assessments	• Lecturers' opinions of and/or experiences in setting deadlines for the submission of assessment tasks in IT. • Lecturers' opinions of and/or experiences in setting time limits for the completion of assessment tasks in IT.	• Open ended	Chapter 2 – See 2.2.3.1; 2.2.3.2; 2.4.7 Chapter 3 – See 3.2.10.2; 3.3.9; 3.3.12.2; 3.3.12.8 Chapter 4 – See 4.6.1; 4.6.2.2
Relation between	• Lecturers' opinion of and/or experiences in the relation	• Open ended	Chapter 2 – See 2.2.3;

Section/Topic	Questions related to lecturers' perceptions regarding the section/theme	Type of question	Related topics in Chapters 2, 3, and 4
student marks and their learning	between their IT students' marks and how and what the students have learned.		2.2.4; 2.2.5.1; 2.2.6.2; 2.4.7; 2.4.10.2; 2.9.1; 2.9.1.4; 2.10.2 Chapter 4 – See 4.9
Content of assessment	• Lecturers' opinion of and/or experiences in informing IT students in advance of the content that they will be assessed on.	• Open ended	Chapter 2 – See 2.6.2.2; 2.7.3.3 Chapter 3 – See 3.2.10.2
Assessment criteria	• Lecturers' opinions of and/or experiences in informing IT students in advance of the assessment criteria according to which they will be assessed.	• Open ended	Chapter 2 – See 2.6.2.2; 2.6.2.3; 2.9.1.3; 2.9.2.3 Chapter 3 – See 3.3.6.3
Assessment feedback	• Lecturers' opinions of and/or experiences in providing feedback to their IT students about assessment tasks they have performed. • Lecturers' opinion of and/or experiences in the possible effects that feedback they provide might have (or not have) on their IT students' performance in their assessment tasks.	• Open ended	Chapter 2 – See 2.9.1.4; 2.9.2; 2.9.2.1.3; 2.9.3.1 Chapter 3 – See 3.2.3.4; 3.2.9.10; 3.3.7; 3.3.12.3 Chapter 4 – See 4.7.2
Principles of good assessment (e-assessment)	• To what extent are the e-assessment tasks that lecturers let their IT students do fair, practicable/feasible, reliable, and valid?	• Open ended	Chapter 2 – See 2.6.2; 2.6.2.1; 2.6.2.2; 2.6.2.3; 2.6.2.4; 2.6.2.5 Chapter 3 – See 3.3.6; 3.3.6.1; 3.3.6.2; 3.3.6.3; 3.3.6.4 Chapter 4 – See 4.7.2
Assessment results (purposes of e-assessment)	• What do lecturers use their IT students' assessment results for?	• Open ended	Chapter 2 – See 2.6.1
Quality assessment	• How do lecturers describe quality assessment?	• Open ended	Chapter 2 – See 2.6.2; 2.6.2.1; 2.6.2.2; 2.6.2.3; 2.6.2.4; 2.6.2.5 Chapter 3 – See 3.3.6; 3.3.6.1; 3.3.6.2; 3.3.6.4

Section/Topic	Questions related to lecturers' perceptions regarding the section/theme	Type of question	Related topics in Chapters 2, 3, and 4
			Chapter 4 – See 4.7.2
Prior experience and knowledge	• To what extent do lecturers think that it is necessary for them to have prior experience and knowledge of student assessment before they try to implement e-assessment in their own teaching of IT?	• Open ended	Chapter 2 – See 2.6 Chapter 3 – See 3.3.4 Chapter 4 – See 4.4.2.2; 4.4.2.3; 4.7.1
Suggestions/Recommendations	• The suggestions and recommendations lecturers could give to other lecturers pertaining to how they can assess their students using computing/network technology (through e-assessment/myLMS). • To what extent would the lecturers recommend (or not recommend) e-assessment in the teaching and learning of IT?	• Open ended	Used to obtain the general perceptions and/or experiences of the participants pertaining to the use of e-assessment

Table 5.3: Questionnaire for IT students

Section/Topic	Questions related to students' perceptions with regard to the section/theme	Type of question	Related topics in Chapters 2, 3, and 4
Demographic information	• Gender • Home language • Age	• Multiple choice (one answer)	Used to report on the characteristics of participants and to create a contextual understanding in reporting the data
General experiences of assessment in IT	• Why students think their IT lecturers need to assess them. • When, how, and how often students are assessed. • To what extent will students think that knowing what they will be assessed on influence their own learning and performance (or not)? • To what extent will students think that knowing how they will be assessed influence their own learning and performance (or not)?	• Open ended	Chapter 2 – See 2.2.6.2; 2.6; 2.6.1; 2.6.2.2; 2.6.2.3; 2.7.3.3; 2.9.1.3; 2.9.2.3 Chapter 3 – 3.2.10.2; 3.3.6.3 Chapter 4 – 4.4

Section/Topic	**Questions related to students' perceptions with regard to the section/theme**	**Type of question**	**Related topics in Chapters 2, 3, and 4**
Forms of assessment	• Students' experiences and/or perceptions of assessment tasks that carry marks (e.g., tests, assignment, exams etc.). • Their experiences and/or perceptions of assessment tasks that do not carry any marks. • Their experiences and/or perceptions of peer assessment tasks. • Their experiences and/or perceptions of self-assessment tasks. • Their experiences and/or perceptions of baseline assessment tasks. • Their preferred form of assessment.	• Open ended	Chapter 2 – See 2.9; 2.9.1; 2.9.2; 2.9.3 Chapter 3 – See 3.2.9.10; 3.2.9.11 Chapter 4 – See 4.6.2
Types of assessment tasks	• Types of assessment tasks that students should do, and their experiences and/or perceptions of these. • The format in which assessment tasks instructions are provided to students. • The extent to which these types of assessment tasks test students' knowledge as well as their skills in IT.	• Open ended	Chapter 2 – See 2.9.1.2; 2.9.2.4; 2.9.3.2 Chapter 3 – See 3.2.4.1; 3.2.7; 3.2.8; 3.2.10.1; 3.3.3; 3.3.4; 3.3.10; 3.3.11; 3.3.12 Chapter 4 – See 4.6.1; 4.6.2; 4.7.2
Types of questions in assessment tasks	• Their experiences and/or perceptions of short-answer questions. • The extent to which short-answer questions test their level of understanding of what they learn in the IT modules.	• Open ended	Chapter 3 – See 3.2.4.1; 3.3.4; Chapter 4 - 4.6.2; 4.7.2
Prior knowledge of assessment content	• The extent to which their IT lecturers inform them in advance about the content they will be assessed on. • The extent to which their IT lecturers inform them in	• Open ended	Chapter 2 – See 2.2.6.2; 2.6.2.2; 2.6.2.3; 2.7.3.3; 2.9.1.3; 2.9.2.3 Chapter 3 – See 3.2.10.2; 3.3.6.3

Section/Topic	Questions related to students' perceptions with regard to the section/theme	Type of question	Related topics in Chapters 2, 3, and 4
	advance about how they will be assessed (types of questions and criteria).		
Assessment feedback	• To what extent students get feedback from their IT lecturers and/or via the myLMS system on their performance in assessment tasks. • The type feedback they get on their performance from their IT lecturers and/or via the myLMS system, and how the feedback is given. • How the feedback they receive from their IT lecturers and/or via the myLMS system influence how they learn afterwards.	• Open ended	Chapter 2 – See 2.9.1.4; 2.9.2; 2.9.2.1.3; 2.9.3.1 Chapter 3 – See 3.2.3.4; 3.2.9.10; 3.3.7; 3.3.12.3 Chapter 4 – See 4.7.2
Principles of good assessment (e-assessment)	• To what extent the e-assessment tasks that students do in IT modules are fair. • If the e-assessment tasks that are fair/not fair, why, or why not? • To what extent do the e-assessment tasks that students do test the content that has been covered in the relevant IT modules	• Open ended	Chapter 2 – See 2.6.2; 2.6.2.1; 2.6.2.2; 2.6.2.3; 2.6.2.4; 2.6.2.5 Chapter 3 – See 3.3.6; 3.3.6.1; 3.3.6.2; 3.3.6.4 Chapter 4 – See 4.7.2
E-assessment tasks and conventional paper-based assessment tasks	• How the marks that students obtain for the various e-assessment tasks compare with one another. • How do the marks that students obtain for the various e-assessment tasks they should do, compare with the marks they obtain for conventional paper-based assessment tasks? • Students were requested to provide examples of the e-assessment tasks and paper-based	• Open ended	Chapter 2 – See 2.2.3; 2.2.4; 2.2.5.1; 2.2.6.2; 2.4.7; 2.4.10.2; 2.9.1.2; 2.9.2.4; 2.9.3.2; 2.10.2 Chapter 3 – See 3.2.4.1; 3.3.4 Chapter 4 – See 4.6.2; 4.7.2

Section/Topic	Questions related to students' perceptions with regard to the section/theme	Type of question	Related topics in Chapters 2, 3, and 4
	assessment tasks that they are required to do in IT modules.		
E-assessment problems	• To what extent do students experience problems with the e-assessment tasks?	• Open ended	Chapter 3 – See 3.2.7; 3.2.8; 3.3.11
Value of e-assessment tasks	• To what extent do e-assessment tasks add value (or not add value) to students' own learning?	• Open ended	Chapter 3 – See 3.2.4; 3.2.6; 3.2.6.1; 3.3.10
Assessment tasks that improve students' learning	• What types of assessment tasks do students think can help them most in improving their own learning?	• Open ended	Chapter 2 – See 2.9.1.2; 2.9.2.4; 2.9.3.2 Chapter 3 – See 3.2.4.1; 3.2.8; 3.2.10.1; 3.3.3; 3.3.4; 3.3.10; 3.3.11; 3.3.12 Chapter 4 – See 4.6.1; 4.6.2; 4.7.2
Suggestions/recommendations	• To what extent do students think e-assessments should be used (or not used) in the teaching and learning of IT?	• Open ended	Used to obtain the general perceptions and/or experiences of the participants pertaining to the use of e-assessment.

Table 5.4: Questionnaire for expert panel

Section/Topic	Questions related to students' perceptions with regard to the section/theme	Type of question	Related topics in Chapters 2, 3, 4, and 6
Demographic information	• Gender. • Years of experience in the field of teaching, learning, and assessment in higher education. • Years of experience in the teaching, learning, and assessment of IT. • Years of experience in e-learning and/or e-assessment.	• Mixed questions	Used to report on the characteristics of participants, and to create a contextual understanding in reporting the data.
Characteristics and/or requirements for the successful	• Evaluation of the characteristics and/or requirements considered important for the successful implementation of e-	• Categorical rating questions. • Open-ended questions for comments and	Chapter 3 – See 3.3.12.1 to 3.3.12.11 Chapter 6 – See 6.5.1.3;

Section/Topic	Questions related to students' perceptions with regard to the section/theme	Type of question	Related topics in Chapters 2, 3, 4, and 6
implementation of e-assessment.	assessment.	suggestions.	6.5.1.8; 6.5.2.22; 6.5.2.23
Lecturers' prior experience and knowledge of student e-assessment.	• Evaluation of features related to the need for lecturers to have prior experience and knowledge of student e-assessment before implementing e-assessment.	• Categorical rating questions. • Open-ended questions for comments and suggestions.	Chapter 2 – See 2.6; 2.9.2.5 Chapter 3 – See 3.3.4; 3.2.3.4 Chapter 4 – See 4.7.1 Chapter 6 – See 6.5.1.19
Using IT students' e-assessment results for different teaching and learning purposes.	• Evaluation of features related to how lecturers may use their IT students' e-assessment results (the purposes of e-assessment).	• Categorical rating questions. • Open-ended questions for comments and suggestions.	Chapter 2 – See 2.6; 2.6.1 Chapter 6 – See 6.5.1.17
Setting deadline dates for the completion/submission of e-assessment tasks.	• Evaluation of features related to the importance of setting deadline dates for the completion/submission of e-assessment tasks.	• Categorical rating questions. • Open-ended questions for comments and suggestions.	Chapter 2 – See 2.2.3.1; 2.2.3.2; 2.4.7 Chapter 3 – See 3.2.10.2; 3.3.9; 3.3.12.2; 3.3.12.8 Chapter 4 – See 4.6.1; 4.6.2.2 Chapter 6 – See 6.5.1.9
Setting duration limits (limiting the allowed duration) for the completion of e-assessment tasks.	• Evaluation of features related to the importance of setting duration limits (limiting the allowed duration) for the completion of e-assessment tasks.	• Categorical rating questions. • Open-ended questions for comments and suggestions.	Chapter 2 – See 2.2.3.1; 2.2.3.2; 2.4.7 Chapter 3 – See 3.2.10.2; 3.3.9; 3.3.12.2; 3.3.12.8 Chapter 4 – See 4.6.1; 4.6.2.2 Chapter 6 – See 6.5.1.10
Relationship between IT students' e-assessment marks and how and what they have learned.	• Evaluation of features related to the relationship between IT students' e-assessment marks and how and what they have learned.	• Categorical rating questions. • Open-ended questions for comments and suggestions.	Chapter 2 – See 2.2.3; 2.2.4; 2.2.5.1; 2.2.6.2; 2.4.7; 2.4.10.2; 2.9.1; 2.9.1.4; 2.10.2 Chapter 4 – See 4.9 Chapter 6 – See 6.5.1.11
Students' knowledge	• Evaluation of features	• Categorical rating	Chapter 2 – See 2.6.2.2;

Section/Topic	Questions related to students' perceptions with regard to the section/theme	Type of question	Related topics in Chapters 2, 3, 4, and 6
regarding what (content) they will be assessed on.	related to the importance for IT students' to be informed in advance regarding what (content) they will be assessed on.	questions. • Open-ended questions for comments and suggestions.	2.7.3.3 Chapter 3 – See 3.2.10.2 Chapter 6 – See 6.5.1.12
Students' knowledge regarding how they will be assessed (what the e-assessment criteria will be).	• Evaluation of features related to the importance for IT students to be informed in advance regarding how they will be assessed (what the e-assessment criteria will be).	• Categorical rating questions. • Open-ended questions for comments and suggestions.	Chapter 2 – See 2.6.2.2.; 2.6.2.3; 2.9.1.3; 2.9.2.3 Chapter 3 – See 3.3.6.3 Chapter 6 – See 6.5.1.13
Feedback to IT students about their performance in e-assessment tasks.	• Evaluation of features related to the importance and/or effect of providing e-feedback and/or IT lecturers' feedback about IT students' e-assessment tasks.	• Categorical rating questions. • Open-ended questions for comments and suggestions.	Chapter 2 – See 2.9.1.4; 2.9.2; 2.9.2.1.3; 2.9.3.1 Chapter 3 – See 3.2.3.4; 3.2.9.10; 3.3.7; 3.3.12.3 Chapter 4 – See 4.7.2 Chapter 6 – See 6.5.1.14; 6.5.1.15; 6.5.2.15; 6.5.2.16
Forms of e-assessment in higher education.	• Evaluation of features related to the forms of e-assessment (formative, summative, peer, self- and diagnostic e-assessments) that should be provided to IT students.	• Categorical rating questions. • Open-ended questions for comments and suggestions.	Chapter 2 – See 2.9; 2.9.1; 2.9.2; 2.9.3 Chapter 3 – See 3.2.9.10; 3.2.9.11 Chapter 4 – See 4.6.2 Chapter 6 – See 6.5.1.6; 6.5.2.4; 6.5.2.5; 6.5.2.6; 6.5.2.7; 6.5.2.8
Types of assessment tasks that may be used in e-assessment.	• Evaluation of the features of the types of assessment tasks that may be used in e-assessment (e.g., e-presentations, e-short-answer questions, e-tests, e-examinations, e-assignments, e-group projects, e-case studies). • Evaluation of types of assessment tasks considered important for improving IT students' learning in e-assessment.	• Categorical rating questions. • Open-ended questions for comments and suggestions.	Chapter 2 – See 2.9.1; 2.9.2; 2.9.3 Chapter 3 – See 3.2.4.1; 3.3.3; 3.3.4 Chapter 4 – See 4.6.1; 4.6.2; 4.7.2 Chapter 6 – See 6.5.1.7; 6.5.2.10
Principles of good e-	• Evaluation of features	• Categorical rating	Chapter 2 – See 2.6.2;

Section/Topic	Questions related to students' perceptions with regard to the section/theme	Type of question	Related topics in Chapters 2, 3, 4, and 6
assessment.	related to importance of applying the good principles of e-assessment (fairness, practicability/ feasibility, reliability and validity) in e-assessment tasks.	questions. • Open-ended questions for comments and suggestions.	2.6.2.1; 2.6.2.2; 2.6.2.3; 2.6.2.4; 2.6.2.5 Chapter 3 – See 3.3.6; 3.3.6.1; 3.3.6.2; 3.3.6.3; 3.3.6.4 Chapter 4 – See 4.7.2 Chapter 6 – See 6.5.1.16; 6.5.2.17; 6.5.2.18; 6.5.2.19; 6.5.2.20

(vii) Types of questions used in the initial questionnaires

According to McMillan and Schumacher (2010:197-198), the type of questions (closed or open-ended questions) to be used in a study solely depends on the researcher and the type of data he/she wants to collect in the study. McMillan and Schumacher (2010:197-198) further state that demographic data are best collected using closed questions since they can easily be categorised. On the other hand, they emphasise that in an open-ended question participants are expected to provide their own answers and that the problem with it is that participants might provide answers that are not important to the study. Nevertheless, Babbie (2013:255) confirms that detailed qualitative research mostly depends on open-ended questions.

During the first round of data collection (the initial questionnaire surveys among lecturers and students) mainly open-ended questions were used to gather information from participants. However, closed questions were used to collect participants' demographic information. Participants could choose the "other" option if the applicable response category was not listed in the closed question, and could then provide their answers in the appropriate space provided.

Babbie (2013:256,262) and Patton (2002:353-354) state that good questions should be unbiased, singular, and unambiguous in order to allow participants to express themselves well in any way they deem fit when answering the questions. In this research study, I focused on prompting such individual perceptions to explore the different backgrounds and viewpoints pertaining to the various themes addressed in the research study (see Tables 5.2 to 5.4).

During the second stage of data collection (the framework validation survey among the experts), open-ended questions were used to gather participants' demographic information. All the features/sub-features of the preliminary framework that I compiled were listed and had to be rated as either “essential,” “useful,” or “not necessary.” These items provided me with the opportunity to fuse measurement of the features with opinion, quantity, and quality (Cohen, Manion & Morrison, 2007:327). Open-ended questions followed groups of rating items. The open-ended items allowed the expert participants to make comments and suggestions regarding the specific group of features that they had rated, as well as the framework as a whole (see Appendix B4.2).

In all three questionnaires, there was a section where participants could provide further suggestions and/or comments that they felt would be important for consideration.

(viii) General aspects related to the design of the questionnaires

I ensured that all the spelling and grammar were correct before the questionnaires were distributed by having everything language edited and proofread. Other considerations included the font size and the line spacing used. The instructions were clear and easy to read and understand.

I included a glossary of terms used in the questions/items in all three questionnaires that the participants could consult in case of uncertainty in each questionnaire. The glossary of terms was made navigable in that participants could go back and forth to read the terms while answering the questions.

My promoter, who has experience and knowledge of qualitative research, was asked to scrutinise the questions before I distributed them for the pilot surveys. Furthermore, my promoter and a language editor were consulted to provide feedback on the questions in terms of language used, formulation, understanding of questions, the length of questions, and the feasibility of the questions to prompt informative answers. The questionnaires were then e-mailed to five IT lecturers and five IT students on the Bloemfontein Campus of CTI for the pilot surveys, and by requesting their feedback and recommendations pertaining to the respective questionnaires.

Following the piloting of the expert questionnaire, a new question referring to the number of years of experience that the experts have pertaining to e-learning and/or e-assessment, was added. Also the keyword *ability* which was initially used to begin every feature was removed. I was also able to identify only the salient parts of each feature as I had initially provided features that were similar.

With regards to the interview questions, the phrase *“please explain your answers (where applicable)”* was added to each question. Another important statement that I included in the interview schedule, based on the feedback I received during the pilot, was the following: "*Question 1 was an overarching open question that I will ask first to the focus group, and that I will provide ample time for all group members to respond to, in the hope that they will touch upon many of the issues I have identified as important for this study.*"

These pilot processes were followed and considered, as advised by McMillan and Schumacher (2010:202-205).

e. Field issues

Field issues may arise during interviews and observations and may include ethical issues. Researchers need to know the relationships they have with the participants and address all issues accordingly. They should consider the issue of power division during their research. In qualitative research, the researcher may encounter various ethical issues during the data collection, analysis, and report writing phases (Creswell, 2013:171-175). A detailed discussion of the ethical considerations regarding this study can found in section 5.6.

f. Storing data

In qualitative research storage and protection of data are important, especially electronic databases. The researcher should backup data files regularly. The researcher should also assign letters of the alphabet or numbers to participants' names, or use pseudonyms instead of their actual names in the data and reports in order to protect their identities. Creswell (2013:176-177) advises that a system (such as MsExcel or MsAccess) should be in place for easy storage and retrieval of data. I complied with these requirements by exporting the questionnaire data collected to MsExcel, and saving the data on two different external hard drives. These hard drives were kept in a safe box that needed a code to open. Thus, I made a backup copy of the data, kept it safe, and protected the data from being accessed by unauthorised people.

5.3.2 Data analysis

According to Mertens (2005:424), the analysis of qualitative data critically depends on how the researcher views and interprets the data and what relationships, differences, and meanings between the different data can be found.

The analysis and interpretation of qualitative research data is an iterative process, is more synergetic than consecutive, and becomes more challenging as the research progresses (McMillan & Schumacher, 2006:17). The iterative nature of data gathering and analysis in qualitative research enables a researcher to identify the problems and gaps in the data collected and in turn, find an opportunity to close those gaps. It also enables the researcher to find possible solutions to the problems identified. This means that the researcher needs to use an innate and flexible method when analysing qualitative data (McMillan & Schumacher, 2006:17).

In qualitative research, the researcher should furthermore be prepared for any outcome of the data and follow what the data exposes. Merriam (2009:14) indicates that "findings are inductively derived from data in the form of categories, typologies, concepts, tentative hypotheses, theory about a particular aspect of the practice". I, however, designed the two initial survey questionnaires and the focus group schedules according to predetermined categories that were based on the literature findings. First of all, data from the case study were combined in order to confirm Merriam's (2009:2003) statement that data needs to be easily retrieved.

In order for me to obtain a workable method of data analysis, I had to repeatedly go through the heaps of data gathered from the different participants as well as the literature review. The literature review and ensuing conceptual and theoretical framework were significant sources of comparison and analysis. I focused on different categories of concepts or theories and how they prolonged, excelled, or challenged prevailing ideas in the field by comparing my own ideas with those of other scholars. This comparison was done to ensure the accuracy and consistency of the findings (Gibbs, 2007:46, 96; Merriam, 2009:175-176; Miles & Huberman, 1994:254). The data-analysis process therefore included both inductive and deductive reasoning. Through the coding process, themes and subthemes were eventually either confirmed or created. Ultimately, the framework and guidelines were created using the categories, themes, and patterns that were developed from the initial data analysis (Merriam, 2009:177-192). The focus group interview sessions were also used to address weaknesses and gaps identified in the analysis of the initial survey questionnaire data. Furthermore, they were used to deeply analyse the issues that appeared in the survey analysis, or which I innately felt should be deliberated upon based on my reflections on the analysis of the survey data to date. The focus group interviews were therefore used to confirm themes, disprove them, or find new ones.

In the analysis process, I gathered and analysed thoroughly until no new information, perceptions and/or meanings were forthcoming (Merriam, 2009:83). According to Miles and Huberman (1994:261), this process is described as "moving up from the empirical trenches to a more conceptual overview of the landscape."

QSRNvivo, which is software for analysing qualitative data, was used during the data management and analysis process of this research study. The software was chosen because it provided security by storing the database and files together in a single file; it allowed me to easily code, categorise, and search for data. The software also has the capability of displaying codes and categories graphically (*cf.* Babbie, 2013:404-405; Creswell, 2013:204; Gibbs, 2007:107). Figure 5.2 shows the process used in the data analysis of the research study

Figure 5.2: Data-analysis process used in the research study

Source: Adapted from Creswell (2013:191, 199; 2014:197-198); Gibbs (2007:50, 86-87); Merriam (2009:202-204); Mertens (2010:424-425)

In a nutshell, the qualitative data obtained from the open-ended questions in all the questionnaire and focus group surveys were analysed by means of coding; identifying predetermined sections to be included in the questionnaires and interview schedules; identifying patterns; and categorising data into appropriate themes and subthemes.

With regards to the analysis of the quantitative data obtained from the closed questions in the expert questionnaire, I only applied very basic statistics. I reported the frequencies of the three rating categories (*"Essential," "Useful,"* or *"Not necessary"*) for every feature/sub-feature, and allowed these frequencies to guide me in deciding whether a feature should be retained in the framework or whether it should be discarded.

5.4 STATUS AND ROLE OF THE RESEARCHER

I am currently an Information Technology (IT) lecturer at the Vaal University of Technology. From 2013 to 2015, however, I was an IT lecturer at the Bloemfontein Campus of the Computer Training Institute (CTI) Education Group, a private higher education institution in South Africa. The related experience gave me insight into the background and terms used in the study as well as the context of the teaching and learning of IT as a subject at CTI in general.

Throughout the research study, I tried to be honest by interpreting and reporting all positive and negative responses as objectively by all means possible. I therefore applied disciplined subjectivity and reflexivity throughout the process (McMillan & Schumacher, 2010:332). Furthermore, I identified and reported the limitations in the research study in the last chapter of this thesis (see 8.6).

McMillan and Schumacher (2010:322) and Merriam (2009:14) confirm that an important aspect of qualitative research is indeed the researcher's role since the researcher is the main instrument for data collection. As the researcher, I acted as a participant observer. Due to my great involvement in the research focus, context, and in the data collection and analysis process my underlying values, opinions, and perceptions could have influenced my interpretation of the data. Given this intimate involvement, these should all be visible in the data collection and analysis phases (Mertens, 2005:49). For this reason, subjectivity was unavoidable and the question to be deliberated on is whether and how I provided adequate descriptions without conceding the science behind the research being done.

In quantitative research, the assumption is that the researcher is absent from the participants and can therefore be more objective than in the case of qualitative research (Neill, 2007). For this reason, it might therefore be assumed that I have been objective during the expert survey since it includes a relatively significant quantitative component. However, since my underlying paradigm has been constructivist, and my major focus in this study has been to obtain an *understanding* of how participants *experienced and/or perceived* e-assessment in the IT context, I could not really remain objective even in this last survey. I therefore continued to employ reflexivity/disciplined subjectivity when analysing the expert survey data (McMillan & Schumacher, 2006:327-328).

Subjectivity, however, was minimised (disciplined) in this study by my participation in various activities, which included the triangulation of data collected, documenting the challenges that I faced during the data-collection process, and how it was overcome. As the researcher, I always reflected on the data collection and analysis process, which in turn enabled me to remain aware of my own responses and how my responses might have impacted the data I collected and analysed.

5.5 TRUSTWORTHINESS AND DATA-VALIDATION STRATEGIES

The trustworthiness of the research data and findings was enhanced by applying appropriate strategies that strengthened their credibility, dependability, confirmability, and relative transferability as criteria for ensuring trustworthiness (De Vos, Strydom, Fouché & Delport, 2002:351; Nieuwenhuis, 2007:105-115; Polit & Beck, 2009:492; Winter, 2000:58). The limited quantitative data were summarised and analysed by making use of basic descriptive statistics (e.g., reporting and interpreting frequencies), which was used to enrich and confirm the qualitative data.

According to Guba and Lincoln (1989:236-243), trustworthiness of a research study refers to its true value. These authors initially provided the four pillars or criteria against which researchers can measure the true value of their qualitative research: dependability, credibility, transferability, and confirmability. These criteria are also acknowledged by different other researchers (De Vos, Strydom, Fouché & Delport, 2002:351; Nieuwenhuis, 2007:105-115; Polit & Beck, 2009:492; Winter, 2000:58).

5.5.1 Credibility

According to Merriam (2009:213) and Mertens (2010:388), credibility should ensure that the research findings correspond to reality. In other words, the research findings should be verified to see if they confirm the relationship between the actual perceptions of the research participants and the manner in which the researcher describes the viewpoints. Credibility in qualitative research is similar to the criterion of internal validity in the context of quantitative research (De Vos, Strydom, Fouché & Delport, 2002:351; Denzin & Lincoln, 2011:13; Guba & Lincoln, 1989:236-243).

During the design of a survey questionnaire or interview, it is critical for the researcher to evaluate the extent to which the questions and responses received depict what is agreed to be meant by the terms (Babbie, 2013:407-408).

It is advisable to use many and different sources, methods, and investigators as these increase the credibility of findings. Using different sources, methods, and/or investigators is referred to as triangulation (Cohen *et al.,* 2007:141-142; Creswell, 2013:251; Gibbs, 2007:94; Merriam, 2009:229, 234; Patton, 2002:247; Yin, 2009:118-119). In this research, I employed a range of sources and methods, for example, a comprehensive literature study, two questionnaires, and two focus group interviews to investigate the experiences of students and lecturers, as well as a third and final questionnaire survey among relevant experts. These experts were knowledgeable in the fields of teaching and learning of IT, assessment, student learning, e-learning, and/or e-assessment in higher education. Collectively, the variety of participant sources and research methods ensured the credibility of the findings.

Supervisor, expert, and peer reviews also ensure that an external check on the research process has been made. In other words, a supervisor, peers, and experts review the honesty of the researcher, ask prompting and difficult questions about the approaches, meanings, and clarifications, and allow the researcher to ask questions and raise his/her concerns (Creswell, 2013:251; Merriam, 2009:229, 234; Mertens, 2010:257). In my case, my promoter played this role as supervisor of my research study. However, involving purposively selected IT lecturers in the initial data collection, as well as experts pertaining to the research focus in the evaluation and validation of the preliminary framework which I designed, are also special types of peer and expert review.

Participant review was also applied in this study. It allowed the initial lecturer and student participants to evaluate the credibility of the findings and the interpretations of the views they provided during the initial questionnaire surveys. This process therefore ensured that I had correctly interpreted the views of the questionnaire survey (McMillan & Schumacher, 2010:33; Gibbs, 2007:95; Merriam, 2009:229). According to Charmaz (2006:19), a good relationship with research participants is critical in order for the review to be successful. The participant review that I used was the follow-up focus group interviews with a group IT lecturers and a group of IT students respectively. This made it possible to compare and verify the data obtained from the questionnaire and interview surveys.

Gibbs (2007:97) and McMillan and Schumacher (2010:330,335) emphasise that the use of participants' exact language and/or verbatim expressions improve the authenticity and credibility of the data and the interpretation thereof by the researcher. Citations and quotations must be important, precise, and appropriate for the study. I therefore reported the research findings by using verbatim quotations of participants' responses in order to improve the authenticity and credibility of the finding. Nevertheless, I was continually cautious not to reveal the identity of the participants.

In a nutshell, the cautious selection of research participants, consistent checking of the research findings between different sets of data and with appropriate individuals, and the in-depth data analysis and data reporting all improved the credibility of this research study.

5.5.2 Transferability

Guba and Lincoln (1989:236-237) and Merriam (2009:223) state that transferability means that the research findings are applicable in other contexts and/or areas. As such it is similar to the criterion of external validity in quantitative research (Denzin & Lincoln, 2011:13; De Vos, Strydom, Fouché & Delport, 2002:351; Guba & Lincoln, 1989:236-237; Polit & Beck, 2009:492; Nieuwenhuis, 2007:105-115; Winter, 2000:58). The readers should be able to relate the research findings to other similar, related environments and/or contexts by looking at the thorough explanations and/or descriptions and the title under study (Creswell, 2013:252; Mertens, 2005:256). I therefore tried to provide thorough descriptions in the literature study, the research findings, and the proposed framework which ensued from the research study. The aim of the thorough description and/or explanation was not only to simplify the research findings, but to demonstrate to and enlighten readers with regard to related contextual conditions (McMillan & Schumacher, 2010:335; Merriam, 2009:229,234). To encourage the extension of the research findings, I acknowledged the findings of already existing research in order to show the possibility of a relationship and/or inconsistencies. This was also done to ensure that the reader would be able to relate the findings to similar contextual conditions. However, it is also important to emphasise that transferability is not a major purpose in the context of qualitative research. For this reason, it is safer to allow the reader of a research report to judge the transferability of the research findings in this study.

5.5.3 Dependability

In social sciences research, the idea of reliability (as a criterion in quantitative research) (De Vos, Strydom, Fouché & Delport, 2002:351; Guba & Lincoln, 1989:236-243; Nieuwenhuis, 2007:105-115; Polit & Beck, 2009:492; Winter, 2000:58) is somewhat indefinable because what is investigated may change frequently; the process of measuring may be different; and the same process of measuring (such as asking a question) may also have an effect on the participant being studied (Babbie, 2013:408). According to Merriam (2009:220), dependability in qualitative research refers to how consistent the research findings are and whether the same findings can be obtained if the research is repeated with similar sample(s) of participants in similar contextual conditions.

An audit trail containing the initial audio recordings, transcriptions, field notes, and detailed descriptions and/or explanations of how I arrived at the research findings will be kept for a period of five years. According to Merriam (2009:222, 234) and Babbie (2013:326), providing an audit trail which contains thorough descriptions of the research study and findings improves the dependability of the data. A research study that is focused on rich, extensive, and important data improves the dependability of the study. Furthermore, triangulation, internal verification and/or validation, and peer and participant review can also improve the dependability of the research findings. It should therefore be clear that the research findings in this study can be viewed as dependable.

5.5.4 Confirmability

Confirmability means that the research findings should be based on the participants' true responses and not on the researcher's possibly biased judgement, interest, or motivation (Guba & Lincoln, 1989:236-243). It is an alternative criterion (specifically for qualitative research) to the criterion of objectivity in quantitative research (De Vos, Strydom, Fouché & Delport, 2002:351; Denzin & Lincoln, 2011:13; Guba & Lincoln, 1989:236-243).

I deliberately attempted to explain my own biases with regards to previous experiences, preconceptions, and ideas since these had the possibility of impacting on my interpretations of the research findings and the research approach. I therefore had to apply reflexivity in order to ensure that I could discipline my own subjectivity. Reflexivity is the process where the researcher continuously reflects and scrutinises him-/herself throughout the entire research process by means of continuous self-scrutiny and by not rejecting human subjectivity, but considering one's own subjectivity throughout the entire research process (disciplined subjectivity). Peer and expert review, ethical considerations, participant reviews, audio recording, and leaving a trail for external auditing are all methods that can improve reflexivity (Creswell, 2013:251; Gibbs, 2007:91; McMillan & Schumacher, 2010:334-335).

Data triangulation also enabled me to confirm the research findings and/or identify any inconsistencies in my research findings. The aim was to obtain an understanding of different perceptions and to identify gaps or bias in the interpretive analysis of the data. Patton (2002:467) states that a research finding is of confirmatory significance if it supports other people's works and if it is also supported by other people. Data triangulation (through a literature study, questionnaire surveys, and focus group interviews) was used for this research study due to the reasons provided above. According to Creswell (2013:253), qualitative researchers implement at least two of the above quality assurance approaches in their studies.

5.6 ETHICAL CONSIDERATIONS

Throughout the research process, there are occurrences of ethical issues. The researcher must therefore be mindful of the needs of the participants.

5.6.1 Consent and voluntary participation

According to McMillan and Schumacher (2010:339), researchers should gain the consent of research participants by also assuring them that their responses will be handled confidentially and anonymously; by providing a clear description of how the data will be collected, and how it will be used. For research participants to voluntarily participate in a research study, they should indeed have an in-depth understanding and knowledge of the aim of the research, what the data collected would be used for, possible risks involved in their participation, the level of confidentiality, and know that they may withdraw from the research at any time (Babbie, 2013:64; Gibbs, 2007:8,101; Patton, 2002:408).

I included all the above-mentioned information in the invitation letter sent to the participants. Their informed consent had to be provided in the online questionnaires by clicking on the appropriate icon to confirm their informed consent to participate. Participants who did not click on the confirmation button were taken directly to the end of the questionnaire and thanked (see Appendix B). During the focus group interviews the participants were required to complete and sign a typed informed consent form before the interview started.

5.6.2 Anonymity and confidentiality

McMillan and Schumacher (2010:339) and Gibbs (2007:8,101) state that the researcher should ensure participants' anonymity by coding their names and places of origin/residence. It is indeed the responsibility of the researcher to ensure participants' confidence in him/her and to protect the participants from the reading society. Due to the in-depth nature of qualitative data, there is indeed a high probability of breaching confidentiality which is, however, less probable in the case of quantitative data. For this reason, great care should be taken to protect participants (Gibbs, 2007:104). Babbie (2013:66) states that confidentiality is ensured when the researcher identifies participants' responses, but promises that those responses will not be made available to the public, by rather making use of pseudonyms/codes instead of original names.

For the purpose of further data validation and clarification of responses, I identified the participants by making use of codes in order to ensure anonymity in all reports emanating from the research. Furthermore, in order to ensure confidentiality, unauthorised people were not allowed to have access to the data. I personally typed all the transcripts collected from the focus group interview sessions and also kept copies of captured notes and sound recordings from the focus group interview sessions to ensure confidentiality. Merriam (2009:161) advises that during the data reporting stage, a researcher should also ensure that participants are not identified by the description of their messages. I consistently considered this during the reporting of data. In addition, all hard copies of the data and field notes were kept in a locked cabinet, while all electronic copies thereof were password protected.

5.6.3 Caring and fairness

In qualitative research, physical harm to participants seldom occurs. However, some participants may feel humiliated and lose their trust in the research process. According to McMillan and Schumacher (2010:339), a researcher should care about his/her participants through his/her thinking, actions, and personal morality. Researchers should be aware of any harm and risks that may befall their participants (Gibbs, 2007:8). Creswell (2013:57) further states that participants' religion, culture, and gender differences should be respected at all times.

I was conscious of any harm or risks that might occur during the collection, analysis, and reporting of the data and findings. I assured the participants that they would not encounter any risks in the research study and that they were free to withdraw from the research at any time. This information was communicated to the participants in the invitation message requesting them to participate in this research study.

5.6.4 Permission obtained

Babbie (2013:69) and Creswell (2013:57) confirm that before a study is conducted, a researcher needs to acquire approval from the institution of the participants to collect the data from their employees or students.

This research study was approved by the Ethics Committee (Ethical clearance number: UFS-EDU-2015-001) and the Title Registration Committee and Faculty Board of the Faculty of Education at the University of the Free State. I also obtained permission from the Computer Training Institute's (CTI) Ethics Committee (Ethical clearance number: 2/2016 MA) to conduct the study by involving their students and lecturers. In all these cases, the institutions or their committees were fully informed pertaining to the purpose and nature of the research and the data that would be collected. The members of the expert panel were requested to only base their responses on their own views and experiences and not that of their respective institutions. This research study is therefore in accordance with the necessary requirements.

5.6.5 Reduce possible misinterpretation of research results

During the stage of results analysis, a researcher should not be biased in his/her interpretations of findings (he/she should report both positive and negative findings), and should not disclose any private information relating to the participants. When reporting the results, the researcher should provide authentic results and use appropriate and/or clear language in his/her communication. Furthermore, the researcher should identify the limitations of the study (if applicable) and make it known (Babbie, 2013:65, 69; Creswell, 2013:58-59; Gibbs, 2007:104; Miles & Huberman, 1994:263; Yin, 2009:4,168). In this study the limitations are acknowledged in the last chapter of this thesis (see 8.6).

5.7 CONCLUSION

In this chapter, the research design and methodology used in this research study was discussed. The research design was discussed according to the research strategies, philosophical underpinning, and research methods applied.

The table below summarises the research design and methodology discussed in this chapter:

Table 5.5: Summary of the research design and methodology

Function and purpose of the research
• Applied research.
Research categories in the field of higher education studies (Tight 2012)
• Course design. • Teaching and learning. • Student experiences.
Research approach
• Qualitative research with only limited quantitative enhancement (frequencies).
Research design
• Intrinsic case study.
Research paradigm (philosophical view)

• Constructivist.
Data-collection methods
• Focus group interviews (semi-structured, open-ended interview questions) as a participant review exercise for both the IT lecturer and IT student participants. • Self-constructed, open-ended online questionnaires for both the IT lecturers and IT student participants. • Self-constructed questionnaire with both closed and open-ended questions for experts to evaluate and validate the preliminary framework.
Data analysis
• Coding. • Categorisation of data into themes and subthemes. • Identification of patterns and predetermined sections in questionnaires and interview schedules. • Complete interpretation of findings. • Triangulation of sources and methods. • Comparing and converging all data.
Trustworthiness of the study
Credibility: • Verbatim quotation of participants. • Peer and expert review. • Triangulation of sources and methods. • Participant review through focus group interviews. • Acceptance of subjectivity (reflexivity/disciplined subjectivity). **Transferability:** • Rich and thorough descriptions in order to demonstrate and enlighten readers with regards to related contextual conditions. • Acknowledgement and citation of already existing research. **Dependability:** • Audit trail. • Triangulation of sources and methods. • Rich, extensive descriptions of the research data. • Peer review. **Confirmability:** • Triangulation of sources and methods. • Audit trail. • Continuous and improved reflexivity through audit trail, ethical considerations, peer and expert reviews, participant reviews, audio recordings, verbatim quotations.
Ethical considerations
• Informed consent by participants. • Voluntary participation.

- Anonymity and confidentiality: names of participants were coded and the data were protected from being accessed by unauthorised people.
- Caring and fairness: care was taken to respect participants' views, not put them at risk, and to gain their trust.
- Permission obtained from the University of the Free State and CTI Education Group.
- Reduce possible misinterpretation of research results: avoid being biased in the interpretation of the results, disclose both positive and negative results; reflexivity.
- Clear, consistent, and honest reporting of results.
- Identifying the limitations of the study.

During the discussion, the researcher also emphasised the methodology used to address the following research questions:

- *How do IT lecturers at CTI experience and/or perceive the role of e-assessment in their teaching?*
- *How do IT students at CTI experience and/or perceive the role of e-assessment in their own learning?*

I will respond to the above-mentioned research questions in Chapter 6 by analysing, interpreting, and reporting the relevant research data and findings.

CHAPTER 6

DATA ANALYSIS AND INTERPRETATION

6.1 INTRODUCTION

In chapter 5, the research design and methodology used in this research study was discussed. Chapter 6 subsequently builds on Chapter 5 and aims to answer the following two secondary research questions (see 1.3.2.2):

- How do IT lecturers at CTI experience and/or perceive the role of e-assessment in their teaching?
- How do IT students at CTI experience and/or perceive the role of e-assessment in their own learning?

The aim of this research study was, first, to investigate how CTI IT lecturers could implement e-assessment in the teaching and learning of IT, and then ultimately devise a framework as a means to implement e-assessment in the teaching and learning of IT in the Faculty of Information Technology at CTI.

During the pilot survey, lecturer and student participants were conveniently selected to respond to their relevant questionnaires and to provide feedback, which was then used to amend and improve the questionnaires.

In the first round of the data-collection process (the first questionnaire survey and focus group interviews among CTI IT lecturers and students), the research participants were asked numerous questions, which covered their general experiences of paper-based assessment and e-assessment that were used in IT; the different forms of paper-based assessment and e-assessment that were used in IT; types of feedback to students and if and how it improved their learning; the value of paper-based and e-assessment; and the principles of good paper-based and e-assessment.

The analysis of the research findings emanating from the questionnaire surveys and focus group interviews was done in three parts. The first part reports the relevant participants' demographic characteristics. The second part reports the findings from the qualitative questionnaire survey and focus group discussions. The final part reports the integration and discussion of the findings.

The steps followed in reporting and discussing the empirical findings for each of the initial data collection process in this chapter, are shown in Figure 6.1.

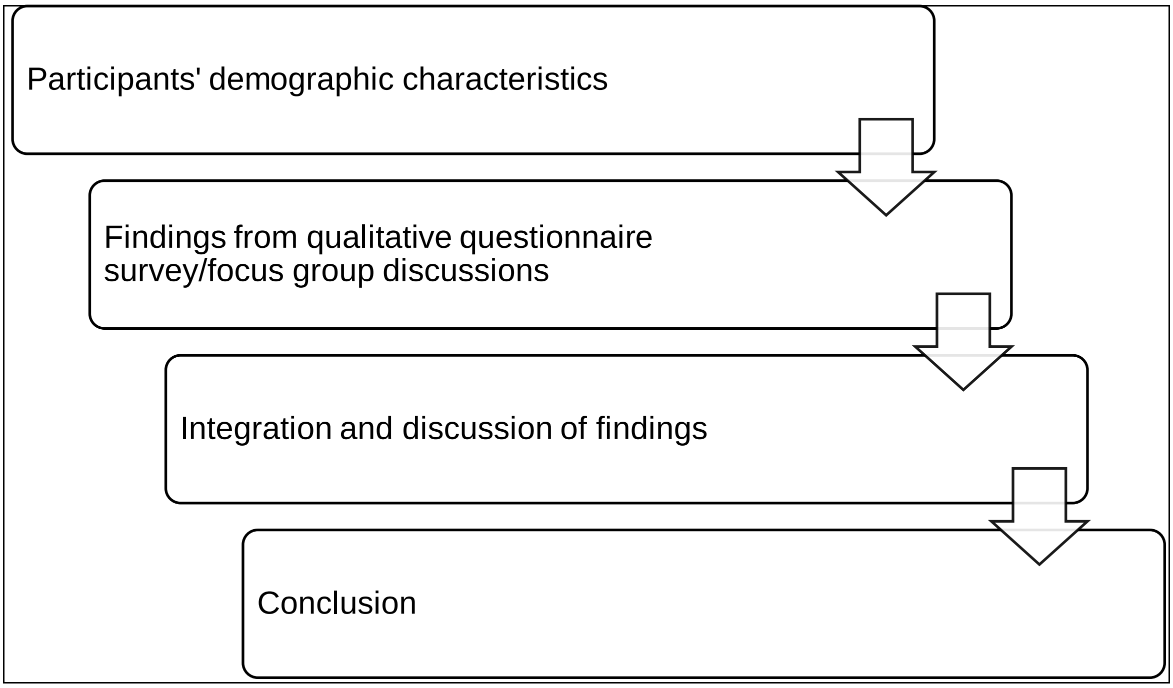

Figure 6.1: Steps used in the discussion of the empirical findings

6.2 PILOT SURVEY - PARTICIPANTS' DEMOGRAPHIC CHARACTERISTICS

This section discusses the lecturer and student participants' demographic characteristics that were gathered during the pilot survey. For the purpose of this study, gender was the only demographic characteristic collected from the lecturer participants. However, as to the student participants, the demographic characteristics collected were based on gender, home language, and age.

At this stage it is important to note that in the context of this chapter, the term '"majority" implies the highest number of selections made by the research participants for specific categories/types/concepts, and does not necessarily refer to a frequency of 50% or more.

6.2.1 Response rates in the pilot survey

All student *(n=7)* and lecturer *(n=5)* participants who were invited to take part in the pilot survey agreed to participate, and none needed to be disqualified.

6.2.2 Demographic characteristics of the pilot survey participants

During the pilot survey, seven IT students and five IT lecturers from the Faculty of Information Technology at CTI completed the proposed questionnaire and subsequently also provided feedback pertaining to the questions contained in the questionnaire. The participants were from the Bloemfontein Campus where I was teaching at that time, and the sampling of participants may therefore be typified as convenient sampling.

6.2.2.1 *Gender*

The majority [85.7%, (6)] of the pilot student participant group (*n=7*) were male. Similarly, the majority [60%, (3)] of lecturer participants (*n=5*) were also male. Although the males were predominant in both participant groups, the aim of the pilot study was not to distinguish between the findings with regards to gender but rather the ability of the pilot participants to provide rich information that would be significant to the research study, as well as whether amendments had to be made to the two questionnaires.

6.2.2.2 *Home language of the pilot student participants*

Table 6.1 indicates the home language distribution of the student participants. The majority of the student participants claimed Sotho as their home language [71.4%, (5)]. This was followed by Afrikaans [14.2%, (1)] and English [14.2%, (1)] as home languages.

Table 6.1: Home language distribution of student participants *(N=7)*

Language(s)	**Number of participants**	**Percentage (%)**
Afrikaans	1	14.2%
English	1	14.2%
Sotho	5	71.4%

6.2.2.3 *Age*

All the student participants who took part in the pilot survey were between the ages of 18 to 23 [100%, (7)]. This distribution was as a result of the condition that the student participants should be 18 years old or older.

6.3 DISCUSSION OF THE PILOT QUALITATIVE SURVEY DATA AND FINDINGS

For the sake of brevity, I will only provide a summary of the responses of both the lecturer and student participants. A detailed discussion of the responses of the participants to every question in the pilot survey questionnaires can be found in Appendix C. The purpose of the pilot survey was to provide a small sample of the lecturer and student participants the opportunity to inform me concerning the questions they might not have understood, as well as to provide general comments regarding the questions in the questionnaires. The participants' feedback was indeed used to amend and then finalise the questionnaire. The questions in the pilot survey questionnaires were based on the themes/topics that emanated from the literature review. The findings are reported here according to the questions in the respective questionnaires.

6.3.1 Lecturers' responses to their pilot questionnaire

This section provides a summary of how the lecturer participants answered the different questions in their pilot questionnaire, and how the questions were eventually amended.

In general, the lecturers' responses to the pilot questionnaire were somewhat disappointing compared to those of the students. Based on the responses of the lecturers, my promoter and I decided that I should change the wording of some of the questions. Furthermore, keywords in the questions were subsequently capitalised to draw the attention of the participants to the key issues involved. Baseline assessment was added as a form of assessment in the final survey questionnaires because one of the lecturer participants mentioned this in his/her response. Unfortunately, most of the pilot lecturer participants did not comment on the formulation of the questions in the pilot survey, even though they were asked to do so. Only one participant indicated that the question pertaining to the r*elation between students' marks and how and what they have learned* was not clear (see Appendix C2.1.9).

6.3.2 Student participants' responses to their pilot questionnaire

This section provides a summary of how the student participants answered the different questions in their pilot questionnaire, and how the questions were subsequently amended.

Although the responses of the student participants to the questions in the pilot questionnaire were generally satisfactory, there were some questions where the participants' responses were somewhat disappointing. My promoter and I therefore decided that I should change the wording of some of these questions in order to invite more relevant answers. Furthermore, some of the keywords, phrases, and headings in the pilot questionnaire were eventually capitalised to ensure that the participants focused on these key issues in their answers. None of the pilot student participants, however, specifically commented on the formulation of the questions in the pilot survey (see Appendix C2.2).

6.4 RESPONSE RATES AND DEMOGRAPHIC CHARACTERISTICS OF THE FINAL QUESTIONNAIRE SURVEY AND THE FOCUS GROUP INTERVIEWS

This section reports the response rates and demographic information of all the participants who participated in the first round of the data-collection process (questionnaire surveys).

6.4.1 Response rates for the final questionnaire surveys

Twenty (*n=20*) IT lecturers and 60 (*n=60*) IT students were invited to take part in the final questionnaire survey.

Four lecturer participants were disqualified because they did not provide any information on any of the questions in the questionnaires. Three student participants were also disqualified because they were younger than 18 years. Table 6.2 indicates the response rates.

Table 6.2: Participants' response rates

Participant groups	Number invited	Total number of participants	Participants who took part but had to be disqualified	Total number of qualified participants	Used response rate (%)
IT lecturers	20	14	4	10	50%
IT students	60	47	3	44	73.3%

Unfortunately, a low response rate is one of the disadvantages of online questionnaires (Phellas, Bloch & Seale, 2012:187). According to McMillan and Schumacher (2010:240-241), researchers are to establish personal contact with their research participants before the questionnaires are sent to them to complete, and that it might be necessary to send them frequent follow-up reminders to complete the questionnaire. I indeed made personal contact with all the research participants (through electronic mail) and sent frequent reminder e-mails via the online-based Google Forms website (see 5.3.1.1[iv]).

It is important to emphasise that the aim of this qualitative research study was not to generalise the findings but rather to acquire an in-depth understanding of the different experiences and perceptions of the purposefully selected participants of the concept under study (see 5.2.2.1; 5.2.2.2; 5.2.2.3; 5.2.2.4; 5.3.1.1[c]). Even though I could identify saturation in the data at some point, I chose to analyse all the questionnaires for the purpose of carefulness.

Please note that the review/expert panels' demographic characteristics and response rates are only discussed in Chapter 7, and not in this chapter.

6.4.2 Demographic information of the participants in the final questionnaire surveys

In this round of the data-collection process (the questionnaire survey), the research participants (those who completed questionnaires with mainly qualitative open-ended questions), were IT students and IT lecturers from the Faculty of Information Technology at CTI.

6.4.2.1 Gender

The majority of the student participants who qualified (*n=44*) were males (63.6%) (see Figure 6.2). On the other hand, Figure 6.3 depicts that the majority of lecturer participants who qualified (*n=10*) were females (60%). Proportionately, the balance pertaining to gender in both participant groups is acceptable since the aim of this research study was not to focus on gender differences but rather the willingness and ability of the participants to provide rich information that would be significant to the research study.

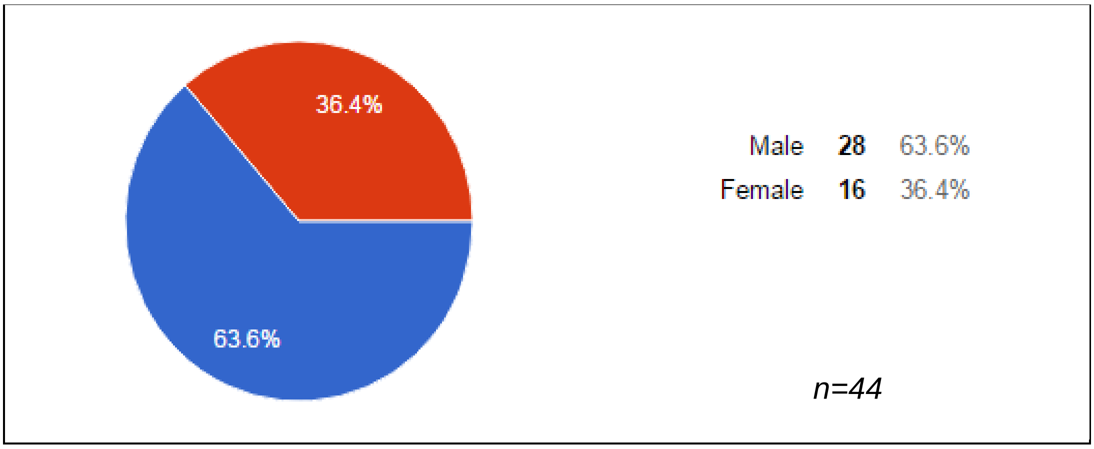

Figure 6.2: Gender distribution of student participants who qualified to take part

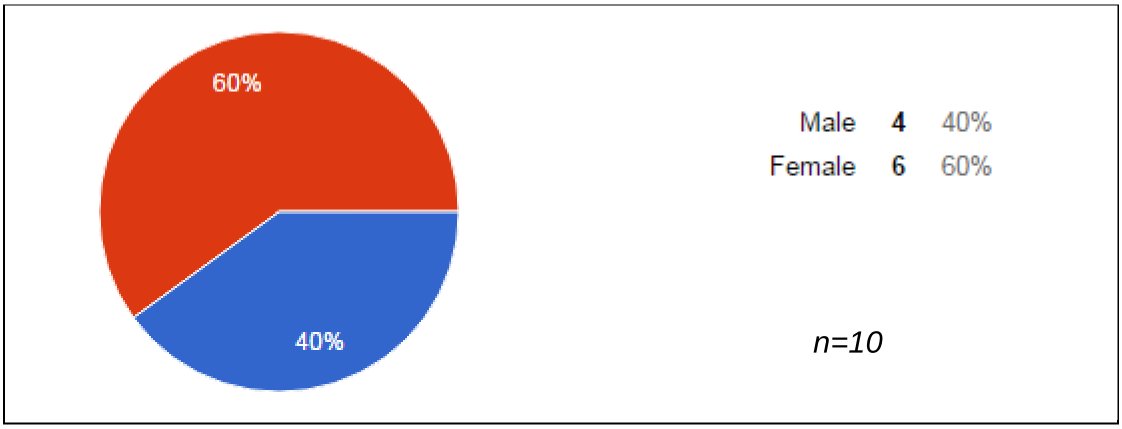

Figure 6.3: Gender distribution of lecturer participants who qualified to take part

6.4.2.2 Home language of the student participants in the final survey

Figure 6.4 shows the home language distribution of the student participants. The majority of the student participants indicated Sotho as their home language [25%, (11)].

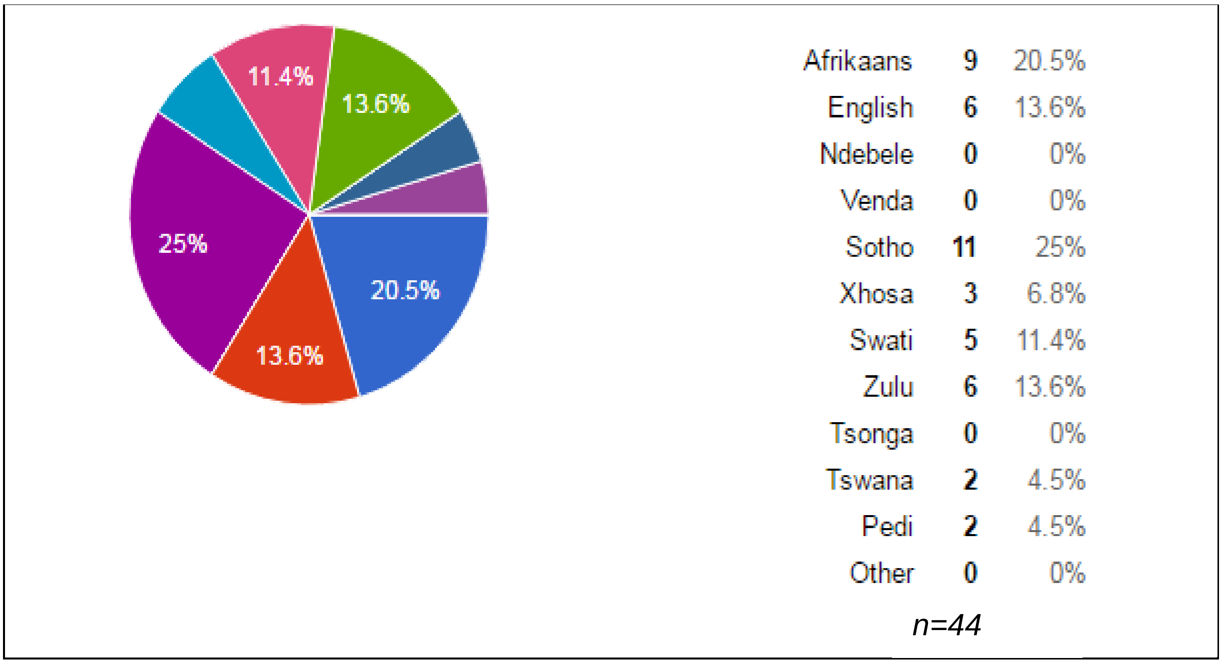

Figure 6.4: Home language distribution of student participants

6.4.2.3 Age

Figure 6.5 indicates that the majority of student participants who took part in the research study were between the ages of 18 to 23 (88.6% [39]). The second highest age range was from 24 to 29 years of age (11.4% [5]). This distribution was as a result of the stipulation that the student participants should be 18 years or older. The three student participants who were disqualified were younger than 18.

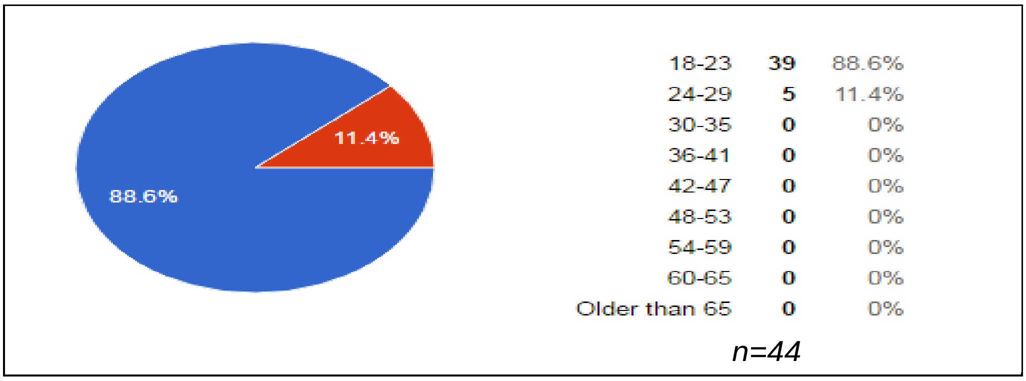

Figure 6.5: Age distribution of student participants

6.4.3 Demographic characteristics of the focus group interview participants

During the focus group interviews, seven (n=7) IT students and five (n=5) IT lecturers from the Faculty of Information Technology at CTI were engaged in the interview discussions. The participants were from the Vanderbijlpark campus. The majority [85.7%, (6)] of the focus group student participants were male. On the other hand, the majority [80%, (4)] of lecturer participants were female. Although males were predominant in the student participant group and females predominant in the lecturer group, the aim of this research study was not to distinguish between the findings with regards to gender, but to seek confirmation of the findings of the questionnaire surveys by using the focus group interviews as participant review sessions.

6.5 FINAL QUALITATIVE SURVEY AND FOCUS GROUP INTERVIEWS DATA AND FINDINGS

The discussion of the findings collected from the first round of data collection (questionnaire survey and the focus group interviews) is based on the themes/topics discussed in the literature review, and that informed the questions in the individual questionnaires for the participant groups. Cross-references to related information reported in the literature review of this research study are made in this discussion in order to either confirm or refute some of the data and findings.

Data collected from the focus group interviews were transcribed and analysed thoroughly in order to identify the details of what the participants said. The focus group interview data/results were compared with the questionnaire survey results. I summarised the interview results and questionnaire results in table format (see Appendix E). Both groups of results were juxtaposed in the same table. I then highlighted and explained the major differences between the two sets of data in my discussion. This comparison was done in order to identify both new information and confirmation of information found by means of the questionnaires. All the data/results from both focus group interviews are also discussed below. The aim of this is to provide an overall view of all the data/results that emerged from the focus group interviews.

Note:

The term “majority” used in this discussion refers to the preponderance of views/opinions provided by the research participants, and does not necessarily represent a frequency of 50% or more.

Illustrative verbatim comments are provided in the discussions as proof that my reporting and interpretations are true reflections of what the participants wrote in their answers. Because these are verbatim comments, they may still include spelling and grammatical mistakes that were made by the research participants (see 5.5.1). All the questions in the questionnaire also clearly required the participants to motivate/explain their answers clearly.

6.5.1 Lecturers participants' responses to their final questionnaire and the focus group interview questions

This section reports on how the lecturer participants answered the different questions in their final questionnaire as well as the focus group interview questions. Fourteen IT lecturers completed the questions in the final questionnaire, while only 10 participants' responses were analysed because four of the lecturer participants did not provide any information on any of the questions in the questionnaires (see 6.4.1). Five IT lecturers took part in the focus group interview. The questions asked during the focus group interviews were determined after the online survey. Upon explaining the instructions for the focus group interview, I first asked a broad and open question during both focus group interviews.

I hoped that the focus group members, in their answers to this broad and open question, and the discussion that followed, would touch upon most of the issues relating to the research foci that I had already identified as important for this study. I therefore subsequently only asked a selection of 11 open, but more specific, questions to the IT lecturer participants, if their answers to the first broad and open question did not cover everything. The questions selected therefore related to issues not covered in the group discussion of the first broad and open question (for the specific interview questions, see Appendices B3.2 and B3.3).

For the sake of brevity and to avoid repetition of findings, I will only discuss (accompanied by verbatim comments) the questions for which new findings emerged and add to what has already been found during the first round of data collection (the questionnaire surveys). For detailed information about the findings that were gathered during this focus group interview, please refer to Appendix D.

6.5.1.1 Frequency of students' assessment through paper-based tasks

The lecturer participants were asked to report on and supply reasons for the number of times that they assess their IT students through paper-based assessment tasks.

Table 6.3: Summarised responses of the lecturer participants on the frequency of students' assessment through paper-based tasks

Responses **(Number of times that assessment is done through paper-based tasks)**	**Frequency (%)**	**Number of participants who responded to this question**
Every month	40 *(n=4)*	*n = 10* (100%)
Every two months	20 *(n=2)*	
Often	20 *(n=2)*	
Twice a semester	10 *(n=1)*	
Every two weeks	10 *(n=1)*	

The majority of the lecturer participants indicated that they assessed their IT students through paper-based tasks on a monthly basis. The most frequent reasons provided were that they tested their students' knowledge and level of understanding (see 2.6, 2.6.1).

L P7: "…in order to test their knowledge."

L P8: "…to ascertain my students' knowledge level and understanding."

L P9: "…to test their knowledge."

Another reason postulated was that students were not comfortable with the assessment technology (see 3.2.9.6; 3.3.8, 3.3.11). Furthermore, paper-based assessment was used because of technological infrastructure constraints such as slow Internet and the lack of access to tablets or computers for online assessments (see 3.3.11).

L P1: "…since my students are not yet comfortable with assessment technology."

L P4 "…infrastructure constraints e.g. internet too slow, classes don't have computers, not all students have tablets."

Two of the lecturer participants assessed their students often and reported that when students wrote down their answers, they were able to remember what they had learned, which enabled them to show the steps they followed to arrive at an answer.

L P5 "…students need to write down the steps they followed in order to arrive at an answer."

L P6 "…it allows students to write down their responses and as such they will not forget what they would have learned."

One lecturer participant assessed the students every two weeks, and reported that there was seldom enough time to set up electronic assessment tasks (see 3.2.7.1, 3.3.4, 3.3.11).

L P3 "…my time is limited with regards to setting up electronic evaluations."

Unfortunately, the participant who assessed the IT students twice a semester (during a semester test and final exam) did not provide any reasons for her/his choice.

During the lecturers' focus group interview, some of the reasons provided through the questionnaire survey were confirmed. However, new reasons also emerged. Reasons provided why they assessed their students' through paper-based assessments included that it was quicker to use since they did not have to deal with any technical problems; that they were not trained on how to develop assessment tasks on myLMS; and that it was faster to mark long questions on paper since myLMS (the online learning management system) was not programmed to automatically mark students' responses, and lecturers had to mark them on the system, which was time consuming.

L P1: "With me most of the time I use paper based tasks - it's like I said in terms of assessing using myLMS we just lack training or knowledge of how to use myLMS."

L P3: "I also use paper based tasks - much quicker and I don't have to worry about any technical problems like internet or computers not working and students not able to login."

L P5: "Paper based is what I use because it saves my time when marking long questions."

The majority of the views expressed by the lecturer participants also reflected current perceptions from the literature. It is clear that the lecturer participants predominantly assessed their IT students through paper-based assessments, and their reasons for this phenomenon need more attention.

Some of the lecturer participants stated that they assessed their IT students through paper-based tasks in order to test their students' knowledge and level of understanding. Regarding this, I am of the opinion that e-assessment tasks have the potential to equally test students' knowledge and level of understanding (see 2.6, 2.6.1). Unlike the paper-based tasks, e-assessment tasks have the capability of testing students' abilities and skills/competencies (see 3.2.5, 3.3.1, 3.3.4, 3.3.10).

Other lecturer participants indicated that students were assessed through paper-based tasks as these students were seemingly not comfortable with the assessment technology and because of infrastructure constraints. The literature confirms these factors as some of the challenges faced by e-assessment users (see 3.2.8, 3.2.9.6, 3.3.8, 3.3.11). For successful implementation of e-assessment, there should be appropriate software, network infrastructure, and access to computers (see 3.3.12). Furthermore, students need to be trained and supported on how to fully make use of e-assessment technologies (see 3.2.8.12, 3.2.9, 3.2.12, 3.3.12.9, 3.3.12.12). The indication by students that they are not comfortable with assessment technology is an important issue as it underlines one of the main principles of the implementation of e-assessment, namely to assess the way you teach. Lecturers should know that e-assessment is not an add-on but an integral part of the teaching and learning process. Therefore, if technologies are used in everyday teaching, learning and assessment, in this case IT, it will not pose a barrier when it comes to the implementation of e-assessment.

One participant pointed out that they used paper-based tasks because students tended to recall what they have learned more easily when they put pen to paper (see L P6), while others reported a lack of sufficient time to set electronic assessment tasks (see L P3) or indicated that the students needed to write down the steps they followed in order to arrive at an answer (see L P5).

Comments made by L P5 and L P6 might reflect a lack of training and support regarding e-assessment tasks (see 3.2.12, 3.3.4, 3.3.10, 3.3.11, 3.3.12.9). The literature confirms that e-assessment enables the assessment of students through different formats of technology such as videos, simulations, and audio (see 3.2.7, 3.3.1, 3.3.4). The e-assessment system should have technical support (see 3.2.9, 3.3.12.9). Also, proper and adequate training (see 3.2.8.11, 3.2.9.3, 3.3.12.9) should be provided to lecturers to enable them to use and benefit fully from the implementation of e-assessment. I am of the opinion that long questions can be marked electronically (see 3.2.4.1, 3.3.3, 3.3.4) on an e-assessment, and therefore lecturers should be trained to utilise this option as this would have a positive effect on time management. E-assessments also allow students to reflect on what they have learned and the assessment tasks they have done (see 3.3.10). In addition, students can also be allowed to type the steps of calculations in e-assessment tasks on the e-assessment platform (see 3.2.4.1, 3.3.3).

The literature also confirms the response of L P3 relating to the limited time available for setting assessment tasks (see 3.3.4, 3.3.6.4, 3.3.11). This lack of enough time is apparently a direct result of the excessive workload of these lecturers. Institutions therefore need to look into this and reduce lecturers' workload and/or reward lecturers for the additional effort required for implementing e-assessment (see 3.2.8.11).

6.5.1.2 Frequency of students' assessment through e-assessment tasks

The lecturer participants were asked to report on and provide reasons as to how often they assess their IT students through e-assessment tasks (assessment tasks on myLMS)

Table 6.4: Summarised responses for the lecturer participants on the frequency of students' assessment through e-assessment tasks

Responses (Number of times that assessment is done through e-assessment tasks)	**Frequency (%)**	**Number of participants who responded to this question**
Once every month	20 *(n=2)*	*n=10* (100%)
Rarely	20 *(n=2)*	
Never	20 *(n=2)*	
Six times per semester	10 *(n=1)*	
Every three months	10 *(n=1)*	
Every two months	10 *(n=1)*	
Often	10 *(n=1)*	

Although the lecturer participants differed regarding how often they assessed their IT students through e-assessment tasks, they mentioned common reasons. Some of the reasons provided were that they assessed their IT students through e-assessment tasks in order to test their students' knowledge and level of understanding [(20%, (2)] (see 3.2.6, 3.3.10), to minimise the marking load [20%, (2)] (see 3.2.6, 3.3.1, 3.3.4, 3.3.10), and to determine how competent their students are with technology [10%, (1)] (see 3.2.8.8, 3.2.9, 3.2.9.6, 3.2.9.14, 3.3.8).

L P1: "…to save marking time."

L P8: "…to test their knowledge."

L P9 "…in order to reduce the marking load and how well my students are with technology."

L P10 "…also to test their knowledge and understanding."

However, one participant [10%, (1)] felt that e-assessment did not work well with the Maths module he/she taught in IT and that the format of the Maths symbols did not always reflect correctly (see 3.2.7.1, 3.2.12, 3.3.8, 3.3.11). Another participant [10%, (1)] found them to be time consuming and he/she did not have time to create e-assessment tasks (see 3.2.7.1, 3.3.4, 3.3.11).

> L P4: "…I do not have the time to set up e-assessments because it is time consuming."
>
> L P6: "…the Maths symbols in questions do not always come out correctly. Can't rely that it will always be what I intended the format of the symbols to be."

Some participants stated that they used the myLMS platform for continuous assessment [10%, (1)] (see 3.2.9.10, 3.3.10) and assignments [10%, (1)] (see 3.2.4, 3.2.8.4, 4.4, 4.6.2.2).

> L P1: "…we also have assignments on myLMS."
>
> L P2: "…for continuous assessment."

However, one participant [10%, (1)] indicated that he/she rarely used e-assessment tasks because the students did not like the e-assessment platform (myLMS) due to usability and reliability issues (see 3.2.7.1, 3.2.8.3, 3.2.8.5, 3.3.5, 3.3.11).

> L P5 "…students hate using myLMS (usability and reliability issues)."

During the focus group interviews all the participants [100%, (5)] stated that although they rarely did e-assessment tasks using myLMS, they sometimes assessed their students using another commercial e-assessment platform, notably Socrative, as it was easier to create e-assessment tasks on Socrative rather than on myLMS.

> L P1: "I sometimes use Socrative because it easy to use."
>
> L P2: "I use Socrative - it is easy to manage, easy to use, and sometimes now even, especially when it is multiple choice questions you can use Socrative."
>
> L P3: "However I sometimes use Socrative for multiple choice because it is easier to use than myLMS."
>
> L P4: "Then for theory based what I normally use is Socrative – that is more of true/false and multiple choice questions."
>
> L P5: "…even if I conduct e-assessment tasks, like true/false questions, I use Socrative and not myLMS."

I can confirm that many of the lecturer participants who implemented e-assessment tasks apparently did so in order to test the knowledge and understanding of their students (see 3.3.4, 3.3.10), minimise their own marking load (see 3.2.6, 3.3.8, 3.3.10), determine their students' knowledge level of the use of technology (see 3.2.8.8, 3.2.9, 3.2.9.6), and to do continuous assessment and/or assignments (see 3.2.4, 3.2.8.4, 3.2.9.10, 3.3.1, 4.4, 4.6.2.2).

Some participants emphasised that they rarely assessed their students through e-assessment tasks because of issues such as compatibility (see 3.3.9), format (see 3.3.9), reliability (see 3.2.8.3), usability (see 3.3.5), and insufficient time (see 3.2.7.1, 3.3.11). These problems point to a need for institutions to provide e-assessment platforms that ensure flexibility (see 3.3.8), compatibility (see 3.3.9) and adherence to the requirements for successful e-assessment (see 3.3.12). The issue of insufficient time experienced by lecturers should be addressed by institutions. For example, they can either reward lecturers for the effort and/or reduce their workload (see 3.2.8.11). I would also entreat the CTI IT Faculty that since myLMS is based on Moodle (which is an open-source tool), the institution can customise it to fit lecturers' and students' needs (see 3.3.12.10); and the institution's needs, policies, procedures, and regulations (see 3.3.3). For lecturers to use myLMS, the institution should have the necessary requirements in place (see 3.3.12). Guidelines, procedures, and policies on the use of the e-assessment platform (myLMS) should be shared among the lecturers in order for them to become familiar with how the system works (see 3.3.12). I believe that lecturers will be interested in using myLMS for e-assessment tasks (and not Socrative) if the institution creates an easy-to-use interface (see 3.2.8.4).

6.5.1.3 The value of e-assessment for the teaching and learning of IT

The lecturer participants were asked to report on their experiences and/or perceptions pertaining to the value of e-assessment and whether they would recommend (or not) e-assessment in the teaching and learning of IT,

The majority of lecturer participants [90%, (9)] conceded the value of e-assessment. Reasons provided were that assessment was fair; it provided immediate evaluation of assessment tasks and prompt feedback; was flexible (anywhere and anytime assessment); reduced marking time; and that it enabled diverse assessments.

L P2: "…as some of the student responses can be evaluated instantly and therefore providing prompt feedback to the students. Making it flexible."

L P3: "Highly recommend. They reduce marking and ease mark analysis."

L P4: "…the immediate feedback was useful."

L P5: "…they reduce marking and ease mark analysis."

L P8: "…minimizes my marking workload, makes content available to my students anywhere, anytime which makes it easier for them to learn at their own convenient time."

L P9: "…ability to provide my students with diverse assessments."

Other reasons included that it secured tests and results; it saved time due to the ability to re-use questions in the question bank, and was the most effective way to assess students.

L P1: "Recommend highly. It is very effective in assessing students."

L P9: "…it increases the quality and effectiveness of my teaching. I am able to implement secure tests and results, ability to re-use my question bank which saves me time and I am not restricted to specific times and places to assess my students; ability to provide my students with diverse assessments."

L P10: "…saves my time."

However, one of the participants [10%, (1)] reported issues with e-assessment in the teaching and learning of the Maths module in IT.

L P6: "Students in Maths subjects do a paper-based rough work and then submit an answer. The incorrect thinking behind wrong answers is lost when they choose multiple choice answers."

One participant [10%, (1)] also referred to some lecturers' inability to implement the practical aspect of IT, and another participant emphasised on the infrastructure constraints.

L P5: "…infrastructure and additional constraints make it difficult to implement."

L P7: "IT is highly practical and therefore it requires that students do tasks rather than write about how to do a task."

The focus group interviews for the most part conceded the value of e-assessment. However, new information emerged. Two participants [40%, (2)] reported that the e-assessment platform provides security because students were not able to remove and/or edit materials that had been uploaded or that lecturers could conceal and/or disclose the e-assessment tasks that students had to do (the lecturers had control over what students could see on the e-assessment platform) (see 3.3.12.7).

L P1: "…with myLMS what comes in is basically once you upload your stuff a student cannot remove that stuff if it is materials and or other resources unlike you using other platform like drop box if you upload something a student deletes that information you might not be aware of that. So, I think it is a good platform it is being lets me say it's useful as an e-learning tool."

L P3: "you can personalize it, so you can already set up from the first day. They can just put everything and what you don't want student to see you can unhide or hide it".

One of the focus group participants [20%, (1)] reported that e-assessment enabled lecturers to develop diverse assessments (such as simulations), which in turn helped students to apply their knowledge of what they had learned and improve their problem-solving skills (authentic learning). This confirmed that a variety of assessment tasks could be created on e-assessment platforms (see 3.3.4, 4.7.2) and these assessment tasks could also assess students' higher order thinking (see 3.3.4, 4.7.2). Two participants [40%, (2)] mentioned that e-assessment exposed students to technology. With e-assessment, students are indeed able to acquire and/or improve their computer skills (see 3.3.8) and to keep abreast of the newest technology (see 4.2, 4.4.8).

L P1: "With e-assessment you are testing application of knowledge and that is one thing – you are testing problem solving. You are not testing only knowledge based questions and that is what we need. That is what we call the authentic learning which prepares the students for the career field that they want to work in. It helps students to be used to technology and career options will be via IT such as communication, collaboration." L P3: "I think any exposure they get through myLMS helps them to broaden their horizon because myLMS is a technology."

The support provided by the majority of the lecturer participants as to the value of e-assessment for the teaching and learning of IT, corresponds with the literature (see 3.2.6, 3.2.6.1, 3.2.6.2, 3.3.3, 3.3.4, 3.3.8, 3.3.10, 4.6.2, 4.7.1, 4.7.2). These views indicate and/or confirm the importance and benefits that come with the implementation of e-assessment in higher education institutions. The majority of the participants maintained that they would recommend e-assessment in the teaching and learning of IT due to the benefits that come with it. However, some of the participants also raised concerns regarding e-assessment, and this is also in line with the literature (see 3.2.8, 3.3.11). Institutions need to have adequate infrastructure and resources in place before implementing e-assessment tasks (see 3.2.9). Lecturers need to be trained in the technology used for implementing e-assessment tasks (see 3.2.8.11, 3.2.9.3, 3.3.1, 3.3.12.9) as well as the different formats in which they can design their assessment tasks (see 3.2.7.1, 3.3.2). The new information that lecturers gleaned as to what students are allowed/not allowed to see on myLMS was a good addition to the value of e-assessment, because now institutions will be motivated to use the system without the fear of their e-assessment tasks being leaked as this usually happens in the case of traditional assessment tasks (see 3.3.1). Due to the high security and control on e-assessment platforms, lecturers can conduct high-stake assessment tasks on the platform (see 3.3.1, 4.7.1).

6.5.1.4 Lecturers' experience in the teaching and learning of IT

The lecturer participants were asked to report on the number of years and the levels that they have been teaching IT.

Table 6.5: Summarised responses for the lecturer participants on their years and level of teaching IT

Responses (Years and level of teaching IT)	**Frequency (%)**	**Number of participants who responded to this question**
1 to 5 years (higher certificate and Levels 1 – 3)	50 *(n=5)*	*n*= 10 (100%)
6 to 10 years (higher certificate and Levels 1 – 3)	20 *(n=2)*	
11 to 15 years (higher certificate and Levels 1 – 2)	20 *(n=2)*	
Level 2	10 *(n=1)*	

It was therefore clear that the majority of the lecturer participants had less than 11 years' experience. Half the participants had less than six years' experience.

L P1: It has been 5 years."

L P2: "5 years' experience."

L P8: "I have been teaching IT for four years."

L P9: "About 4 years."

L P10: "3 years."

The majority of participants also taught at higher certificate level and year levels 1 to 3.

L P1: "…I have been teaching higher certificates, first and second years."

L P2: "…At undergraduate level."

L P3: "level 2."

L P4: "I have been teaching IT modules for eight years and at all levels. Higher certificate level 1, 2 & 3."

L P5: "…pre-degree, e.g., higher certificate & Bsc IT degree years 1 and 2."

L P7: "…tertiary levels up to degree level."

L P8: "Levels 1, 2 and 3."

L P10: "Levels 2 and higher certificate."

Only two participants had more than ten (10) years' experience.

L P5: "±10 years."

L P7: "I have been teaching over ten years."

The lecturer participants had relatively rich experience in the teaching of IT. This was valuable to my study because of the rich information they provided to the questions. It also assured me that the data collected would have credibility. This confirmed the literature's emphasis on the competencies and experiences of IT lecturers (see 4.4.2).

6.5.1.5 How has the lecturers' way of assessing IT students improved and/or changed?

The lecturer participants were asked to report on how their way of assessing IT students had changed and/or improved over the years.

The majority of the lecturer participants [90%, (9)] indicated that they had moved from paper-based assessment to online/computer-based assessment tasks (e-assessment) over the years. Reasons mentioned included familiarity with the assessment tools; the ability to assess practically based tasks; the ability to develop quality assessment tasks; credible and timely tasks; and the easy accessibility of student results anywhere and in any place.

L P1: "…in the beginning, I relied on the paper based assessment, but now I do more e-assessment because as lecturer I am now more familiar with the available assessment tools."

L P2: "…the advent of e-assessment it is more practical based."

L P7: "I now make use of online or computer assessment and this was something I used not to do. This has improved my assessment skills since I am now able to develop assessments that are credible"

L P8: "I now use technology in my assessment (e-assessment) more often unlike previously where I only used paper-based. This method of assessment has enabled me to design timely and appropriate assessment tasks for my students."

L P9: "…it has improved since I have now been using technology more in my assessment. I have also learned to develop quality assessment tasks with the use of Bloom's taxonomy verbs."

Furthermore, one participant [10%, (1)] mentioned that he/she used the e-assessment platform for formative assessment, and another participant [10%, (1)] reported that he/she used it as a communication tool with students, which saved printing costs. It therefore seems that many of the participants engaged their students actively by providing them with online activities and assessment tasks.

L P4: "I have used my LMS and e-active to communicate assessments to students in order to save printing costs."

L P10: "I use myLMS for continuous assessment."

However, one of the participants (L P3) [10%, (1)] indicated that even though he/she had initially moved to computer-based assessment, he/she now reverted to paper based because of his/her current workload.

L P3: "I started out with paper based assessments, moved to computer based assessments, but changed back to paper based assessment. Mainly because of increased workload."

Most of the participants stated that they now frequently make use of e-assessment and/or that it changed and/or improved their teaching/learning of IT. Literature confirms the reasons they provided for deciding to change to e-assessment tasks (see 2.3.1, 2.3.2, 2.4.12, 3.2.6.1, 3.2.7, 3.3.1, 3.3.4). These IT lecturers' confirmation of the potential to improve teaching/learning by adapting to e-assessment, should motivate the CTI IT Faculty and all lecturers to change their way of assessing from paper-based to e-assessment. With regards to L P3's issue of workload, the CTI IT Faculty should investigate how it could reduce lecturers' workload and/or reward these lecturers for their additional effort (see 3.2.8.11).

6.5.1.6 Forms of assessment used in assessing IT students

The lecturer participants were asked to report on the forms of assessment they used to assess their IT students as well as when and why they use it.

Table 6.6: Lecturer participants' responses on the forms of assessment

Responses (Forms of assessment)	**Frequency (%) *(n=10)***	**When they used the particular form of assessment**
Diagnostic assessment	70 *(n=7)*	• The beginning of the semester • Often • At the start of each unit
Baseline assessment	90 *(n=9)*	• Rarely • At the beginning of each semester • Never
Formative assessment	100 *(n=10)*	• Throughout the semester • Often • At the end of each unit
Summative assessment	100 *(n=10)*	• At the end of the semester • Once a semester • Rarely • Only when necessary • At the end of a chapter/unit
Peer assessment	70 *(n=7)*	• Throughout the semester • Often • Sometimes • Almost every day • Once a month
Self-assessment	60 *(n=6)*	• Throughout the semester • At the end of each unit • Rarely

All the participants confirmed that they used formative assessment. Reasons for using formative assessment included to determine the concepts that students had mastered [20%, (2)]; to monitor student learning and provide ongoing feedback [40%, (3)]; to help evaluate students' understanding of what has been done [30%, (3)]; to provide a "great" opportunity for learning [10%, (1)], and to determine students' performance and progress [10%, (1)] (see 2.9.2, 2.9.2.4).

L P1: "…throughout the semester."

L P2: "…yes…throughout the semester to gauge how much students have grasped concepts."

L P3: "Small class exercises and quizzes help me evaluate if the students understood the worked explained in class."

L P4: "…this is done to monitor student learning to provide ongoing feedback."

L P6: "Yes. Very often. These assessments have maximum opportunity for learning."

L P10: "…it is used throughout the semester to check my students' progress and performance and how to assist them."

The new information that emerged from the lecturers' focus group interviews was that formative assessment was used throughout the academic year in order to encourage students to learn more. One participant [20%, (1)] reported that formative assessment forced students to revise what had been completed in class.

L P1: "Formative assessments or continuous assessment I definitely use throughout the year to make students to learn."

L P3: "I do this to so that my students will be forced to learn what we have done in class."

L P5: "…continuous or formative assessment to check if my students are learning throughout the year."

The participants indicated that they used summative assessment to provide formal grades for their students [40%, (4)]; to evaluate students' learning [10%, (1)]; to determine whether students could progress to the next level of their studies [20%, (2)]; to determine students' attained knowledge and skills and whether or not they had met the learning outcomes [20%, (2)]; and to determine if students had met the assessment criteria [10%, (1)]. The summative assessment tasks they mentioned included class tests, assignments, and examinations. These are supported by the literature (see 2.9.1, 2.9.1.2).

L P1: "…at the end of the semester."

L P2: "…Once a semester as an exam. To give final grading."

L P3: "…this is done to evaluate student learning at the end of some modules."

L P9: "…I use it at the end of a chapter and at the end of the semester to determine the students who will make it to the next level of their academic. I also use it to determine students' knowledge and skills and whether or not they have met the module's learning outcomes."

L P10: "…it is used at end of every unit that I cover and also at the end of the semester to determine if students' met the module's criteria and their ability as well as skills."

The new information that emerged from the lecturers' focus group interviews regarding summative assessment included determining the students' predicate at the end of the semester (dual performance).

L P1: "…Summative assessments like test and exams, as well as informal semester test that I scheduled that will count for their DP marks."

L P2: "…Summative assessments are the tests, exams and assignment to determine their predicate."

L P4: "…Summative assessments such as exams and semester test are compulsory and are used to determine students' DP."

The seven (70%) participants who confirmed their use of peer assessment mentioned that they used it to help students to learn better from each other [20%, (2)]; to enforce team work and sharing of ideas, which improved students' learning [10%, (1)]; to reveal the students' knowledge and to elicit creative questioning of topics [10%, (1)]; and to enable students to identify their own mistakes in a softer context [10%, (1)] (see 2.9.3, 2.9.3.2).

L P1: "Throughout semester. Students learn from each other."

L P2: "…this is done to enforce team work and sharing of ideas."

L P5: "Yes. I use opportunities for assessments to be marked by peers as this shows up their own mistakes in a softer context."

L P7: "I do not use this because I feel students will award marks to peers based on friendship and I feel it is not fair."

L P8: "It is used during presentations. At least once a month. It helps my students to share knowledge by asking each other questions and learn from each other in order to improve their learning.

One of the participants [10%, (1)] said that he/she mainly used peer assessment for assessment tasks where the answers required did not need to be interpreted; for example, true or false questions.

L P3: "I use it only for short answer questions like true/false because students will not have to understand the answers when marking."

However, another participant [10%, (1)] claimed that he/she did not use peer assessment because students tended to assess their friends based on the nature of the friendship they had with them, which was not fair.

L P7: "I do not use this because I feel students will award marks to peers based on friendship and I feel it is not fair."

During the focus group interviews, some lecturer participants reported that they used peer assessment at the end of every semester where students had to deliver their final presentations for their software development projects [60%, (3)] and when they had to present their final networking assignments [40%, (2)]. A reason provided for using peer assessment was that it helped students to obtain valuable feedback from their peers [20%, (1)].

L P1: "Peer-assessments I sometimes - so once at the end of the year or twice a year I make use of that to validate especially with the software projects or something nice they can enjoy and learn from each other - I mean they are able to provide valuable feedback for each other."

L P2: "Peer assessment – I do them once a year for their networking final project."

L P3: "I am not a huge fun of peer assessment but we do it with our Software development project at the end of the year."

L P4: "I only use peer assessment when conducting networking presentations at the end of the year."

L P5: "Peer assessment is used for my software development students when they complete the module."

Most of the seven (70%) lecturer participants who confirmed using diagnostic assessment emphasised that they used it to identify students' weaknesses and strengths in order to plan their lecturing accordingly [30%, (3)]; to evaluate students' understanding of the work done in class [20%, (2)], and to determine areas that needed to be focused upon in revision classes [10%, (1)].

L P1: "In the beginning of the semester to identify students' weakness and strengths and planning my lecturing accordingly."

L P3: "…small class exercises and quizzes help me to evaluate if the students understood the worked explained in class."

L P4: "…often – once units of work have been covered, prior to tests – to determine focus areas for revision classes."

L P6: "…at the start of each unit in the guide to assess what the students know."

One of the participants [10%, (1)] stated that he/she used class exercises for diagnostic purposes (see 2.9.3, 2.9.3.2).

L P3: "…small class exercises and quizzes help me to evaluate if the students understood the worked explained in class."

With regards to baseline assessment, the participants used it to identify the weaker students through observation [20%, (2)]; to determine students' strengths and weaknesses [50%, (5)]; and to test students' level of understanding [20%, (2)].

L P1: "…this is given in a small class test format on the first day of the semester."

L P2: "…rarely – done without a formal assessment – picked up through observation etc."

L P6: "…I use this to determine my students' strengths and weaknesses at the beginning of the semester."

L P7: "It is used at the beginning of every semester to test students' level of understanding of the modules they will be doing."

One participant [10%, (1)] said he/she did not use baseline assessment because it was not an appropriate way to determine students' strengths and weaknesses.

L P3: "…no. I don't like to give students an experience of "deficit pedagogy."

During the focus group interviews, all the lecturer participants [100%, (5)] reported that baseline assessment and diagnostic assessment worked the same at CTI. However, I suspect that the lecturers were confused about the difference in the purpose of diagnostic assessment and baseline assessment. The CTI IT lecturers should be aware that diagnostic assessment is used to identify the strengths and weaknesses of students, whereas baseline assessment is used to determine students' knowledge level and competence of the IT module, before teaching takes place.

L P1: "It is the same as diagnostic."

L P2: "Yah, is like a baseline assessment or diagnostic at the beginning of a semester."

L P3: "I think we can combine the diagnostic assessment with the baseline assessment."

I suspect that the reason why only six (60%) of the lecturer participants used self-assessment could be linked to a lack of appropriate assessment training for lecturers as to the use and management of self-assessment tasks. Those who confirmed that they did use self-assessment indicated that they used it so that students could assess themselves during self-study [30%, (3)] and also evaluate their own level of understanding [20%, (2)]. One participant [10%, (1)] reported that he/she provided assessment tasks in a database (or test bank) at the end of every unit (see 2.9.3, 2.9.3.2).

L P1: "Throughout semester, a database or test bank is made available for students to test themselves during self-study."

L P2: "…this is done to evaluate level of assessment."

L P3: "Test your knowledge questions at the end of each unit in the study guide serves as self-assessment."

L P5: "…students need to know how assess their learning."

L P8: "…self-assessment will help them to determine if they understand what they learn."

L P10: "For students to assess themselves so that they can improve."

Some lecturer participants indicated that they did not use this form of assessment because they felt that students were not motivated to do self-assessment [20%, (2)]; and that students tended to think they know everything if they do well in self-assessment [10%, (1)] (see 2.9.3.2.1). Students' lack of satisfaction also hindered their performance.

L P5: "Seldom. Students are often not sufficiently intrinsically motivated to do this well."

L P6: "I have not used this method of assessment. Students tend not to want to assess themselves."

L P7: "I do not use this because students tend to assess themselves more than they ought to and they begin to think they know their work whiles they do not."

No new information emerged from the focus group interviews regarding self-assessment.

The lecturer participants' views pertaining to the forms of assessment clearly showed that the majority of them made use of the different forms of assessment. However, they reported that the use of these forms of assessment differed; the reasons (or benefits) they provided for using a particular form of assessment could be confirmed from the literature (see 2.9.1, 2.9.1.2, 2.9.2, 2.9.2.4, 2.9.3, 2.9.3.2). This confirmed that the CTI IT Faculty needs to consider these forms of assessment and train their lecturers on how to effectively assess students through all these forms of assessment.

This will ultimately enhance the lecturers' teaching and the IT students' learning. Formative assessment comes with constructive feedback (see 2.9.2) and if it is done throughout the year, as mentioned in the focus group interviews, it will help students to be up to date with their studies, which would subsequently help them to monitor their progress in the learning process (see 2.9.2.4, 3.2.9.10). I also want to encourage the IT lecturers to use a variety of assessment tasks, as confirmed by literature (see 2.9.2.4), in order to enhance their students' learning. The assessment task (e.g., a presentation) used for peer assessment is confirmed by literature (see 2.9.3.2). However, my advice is that lecturers should do this often and not only at the end of the semester so that students could learn more from each other, and engender a sense of belonging in being part of the assessment process (see 2.9.3.2). Furthermore, although students obtain valuable feedback from their peers, it is the responsibility of the lecturer to ensure that these students act on this feedback. Lecturers need to understand that since their decisions in summative assessment may affect the students' future, they need to ensure that predicates awarded to students are valid, fair, and reliable (see 2.9.1).

Allegations were made that students were disinterested and reluctant to do self-assessment, and that they tended to neglect their studies due to their dissatisfaction with self-assessment and the perceived unfair assessment by their peers. The literature confirms that these challenges do exist (see 2.9.3.2.1); however, lecturers need to play a role by developing appropriate self-/peer assessment tasks and opportunities that will be motivating and fair (see 2.9.3.1). I observed that some of the participants clearly confused the purpose of diagnostic assessment and baseline assessment. It should be noted that diagnostic assessment is used to identify the strengths and weaknesses of students whereas baseline assessment is used to determine students' knowledge level and competence of the IT module, before teaching occurs.

6.5.1.7 Assessment tasks used in assessing IT students

The lecturer participants were asked to report on the assessment tasks they use to assess their students, why they use them, and how often they let their students do these tasks.

Table 6.7: Summarised responses pertaining to the assessment tasks used by the lecturer participants

Responses (Assessment tasks)	**Frequency (%)**	**Number of participants who responded to this question**
Presentations	• 50 *(n=5)* • Once a month *(n=2)*	*n*=10 (100%)
Written examinations	• 100 *(n=10)*	
Quizzes	• 100 *(n=10)*	
Multiple-choice questions	• 100 *(n=10)* • Every month *(n=4)*	
Assignments	• 100 *(n=10)* • Once a semester *(n=10)*	
Tests	• 100 *(n=10)* • Thrice per semester *(n=2)*	

Responses (Assessment tasks)	Frequency (%)	Number of participants who responded to this question
Case studies	• 20 *(n=2)*	
Short-answer questions	• 20 *(n=2)* • Every month *(n=1)*	
True/false questions	• 100 *(n=10)* • Every month *(n=2)*	
Group projects	• 20 *(n=2)*	

Table 6.7 above summarises the lecturers' responses to the above question. Please note that many of the participants confirmed using more than one type of assessment task in their teaching of IT. Also, note that in cases of written examinations, quizzes, case studies, and group projects none of the participants mentioned the number of times they used these assessment tasks.

Among the five (50%) lecturer participants who confirmed using presentations as an assessment task, some indicated that it improved students' communication skills [20%, (2)]; allowed students to learn from each other [10%, (1)]; and allowed students to become involved in the assessment task since they could ask the student presenters some questions for obtaining clarity [20%, (2)].

L P1: "Presentation improves students' communication skills and allows other students who are not presenting to participate since they can ask questions for more clarifications or they can also help to clarify or add to what has been presented."

L P2: "I think the presentations help the students to learn from each other."

L P5: "…presenting findings through presentations. It improves students' communication, can ask each other questions and share ideas or learn from each other."

The use of examinations was confirmed by all the participants [100%, (10)]. Some claimed that examinations tested their students' level of knowledge and understanding of what they had learned. There was no clear indication of the frequency of examinations in their IT modules.

L P3: "Exams test students' knowledge and understanding."

L P5: "The exams will enable me to know how much my students know about what I taught."

L P10: “Written examinations are used at the end of the semester to test students’ knowledge and understanding of the module.”

Furthermore, all the participants [100%, (10)] confirmed that they used quizzes, true/false questions, multiple-choice questions, and tests. One reason mentioned was that these tasks could be automatically assessed by myLMS. One of the two participants who confirmed using short-answer questions also indicated that these improved the students’ level of understanding which ultimately enhanced their learning, while another indicated that short-answer questions, multiple-choice, and true/false questions eased the marking process and that he/she used them every month.

L P1: “…include quizzes and multiple choice qns. These are automatically evaluated by the LMS.”

L P2: “…the short answer questions test helped my students to understand the module.”

L P8: “I usually use short answer questions, multiple choice questions and true/false questions. These assessment tasks are used because it eases my marking. I use them on a monthly basis.”

One of the two participants who confirmed using case studies mentioned that case studies allowed lecturers to determine if the students could apply what they had learned, and should be IT related.

L P4: “Case studies must be applicable to the IT course. I make use of case studies, in order to see if the students can apply what they have learned.”

All the lecturer participants [100%, (10)] confirmed using assignments as assessment tasks. One of these lecturers reported that assignments improved his/her students’ skills in IT and enabled them to be well prepared for the world of work due to its practical content.

L P9: “I use assignments and tests. I feel these types of tasks enable students to be well prepared for the working world and it improves their skills.”

Two of the participants [20%, (2)] confirmed using group projects. One indicated that group projects allowed students to learn from each other and share ideas.

L P5: “…from group projects. It improves students’ communication, can ask each other questions and share ideas or learn from each other.”

L P10: “I also do group projects.”

Two of the focus group interviewees confirmed that they used practical programming, practical exercises [20%, (1)], and case studies [20%, (1)]. A participant [20%, (1)] reported that in his/her programming class, practical exercises (coding) are provided for the students to facilitate hands-on experience. Another participant [20%, (1)] mentioned that he/she often used case studies in class, which enabled students to think critically and come up with solutions to real-world problems.

L P1: "I think it all depends on the module – with my programming class I give them practical exercise like coding for them to have the required experience."

L P4: "I only use a lot of case studies for practical which they need to interpret that as well – it helps students to think critically and obtain solutions to real-world problems."

The lecturer participants' views on the assessment tasks they used and the reasons for using them (see 6.5.1.7) showed that the majority of the assessment tasks that were found in the literature (see 3.2.4.1, 3.3.3, 3.3.4, 4.6.2.1, 4.6.2.2, 4.6.2.3, 4.7.2) were also used by the CTI IT lecturers. The CTI IT Faculty can incorporate most of these assessment tasks in their curriculum to enable IT students to broaden their knowledge of the module that they are doing (see 4.3.1.1, 4.3.1.6). However, none of the participants indicated simulations (see 4.2, 4.4.4, 4.5.4.4), practical demonstrations (see 4.4.1), portfolios (see 4.6.2.5), and tutorials (see 4.6.2.4) as assessment tasks used in their teaching of the IT modules. Portfolios enable students to receive constructive feedback from the lecturers, and tutorials enable students to work with their peers in groups which ultimately enhance student learning (4.6.2.4, 4.6.2.5). Because IT is more practical, assessment should involve simulations and practical demonstrations (see 4.5.4.4) that will assess the students' higher order thinking and provide them with the necessary skills (see 4.7.3). The IT Faculty should encourage e-assessment tasks that are based on authentic learning (see 2.3.3).

6.5.1.8 Lecturers opinions about myLMS

The lecturer participants were asked to report on their experiences and/or views of what they like and/or dislike about using myLMS in assessing IT students.

The majority of the lecturer participants [60%, (6)] clearly confirmed "liking" myLMS assessment. The reasons mentioned include automatic and authentic marking (marking that is not falsified and/or manipulated); prompt feedback to learners; "anytime, anywhere" accessibility; easy upload and setting questions; its ability to randomise questions; its ability to secure the assessment tasks; and since it allowed the re-use of questions.

L P1: "…it's fast to do the marking."

L P2: "I like the idea of quick, prompt feedback to the learners."

L P4: "…student can access it 24/7."

L P7: "I like the ease of the system (i.e. easy to navigate, upload and set questions). I also like the instant feedback students receive once they are done with their assessment tasks."

L P8: "I like myLMS because it is secure to do assessment tasks on the system, questions can be randomized making it difficult for students to copy each other and students receive immediate feedback and marks due to the authentic marking."

L P9: "Reduced time due to no marking, security, re-use of questions, anywhere anytime development of questions."

These reasons also correspond with the benefits of e-assessment mentioned in the literature (see 3.2.6, 3.2.6.1, 3.2.6.2, 3.3.3, 3.3.4, 3.3.8, 3.3.10, 4.6.2, 4.7.1, 4.7.2). The literature also confirms lecturers' views on the value of e-assessment (see 6.5.1.3). For this reason, I believe that the CTI IT Faculty should encourage their lecturers to make use of myLMS because of its many benefits, as reported in literature, as well as by the lecturer participants.

The other four participants [40%, (4)] however, reported that they did "not like" to assess their IT students on myLMS. The reasons provided included time constraints pertaining to setting up the assessments; that its use was not practical (too administrative rather than educative); the restricted modes of questioning made it difficult in the Maths module; some students did not really know how to use the system; and that it had usability and efficiency problems (login issues).

L P3: "…myLMS is more administrative than for educational purposes. So many things are happening there. I don't use it."

L P5: "Don't use it – too many student complaints about its usability, relevance, efficiency (e.g. login issues)."

L P6: "I don't like it as it restricts the modes of questioning for Maths. Students don't know the software to type Maths symbols readily."

L P10: "I don't' like the fact that it takes so much time to set up a test on myLMS."

During the focus group interviews one participant [20%, (1)] indicated that the user interface of the myLMS platform still had some bugs.

L P2: "…myLMS – the user interface still at this stage have some bugs – it needs some cleaning up from the IT perspective."

The concerns they raised are all supported in the literature (see 3.2.8, 3.3.11) and do not actually refute the lecturers' views as to the value of e-assessment (see 6.5.1.3). I believe that CTI needs to ensure that all necessary infrastructure and resources are in place before allowing lecturers to use myLMS for assessing their students (see 3.2.9). Lecturers and students also all need to be appropriately trained on how to use the myLMS system for assessment purposes. Lecturers in particular need to be made aware of and empowered with knowledge of the different formats in which they can design assessment tasks on myLMS (see 3.2.7, 3.3.1, 3.3.4). The CTI IT Faculty needs to ensure that before an e-assessment platform goes "live" it is tested and all errors corrected for the effective use of the system (see 3.3.12.10). The institution needs to ensure that they have qualified technical staff to assist lecturers and students with the errors that they encounter with the system (see 3.2.9, 3.3.12.9).

6.5.1.9 Setting deadlines for the submission of assessment tasks in IT

The lecturer participants were asked to report on their experiences and/or views of setting deadlines for the submission of assessment tasks in IT.

All the lecturer participants [100%, (10)] confirmed the importance of setting deadlines for the submission of assessment tasks. Reasons provided included that deadlines prevented students from coming up with invalid excuses for not submitting a task or submitting a task late; it taught students good time management; it ensured that students take responsibility for their own learning; and it ensured fairness since all the students had the same time span to submit a task.

L P1: "It is necessary to set deadlines. Students need to be trained to meet deadlines since they will need this at work."

L P3: "Students comes with a lot less excuses when they submit hardcopy but when they know it is an online assessment they submit on time, as they know that the system will not accept the assignment after the due date."

L P6: "Deadlines are good for time management and it is fair because students have the same deadline. That is teaching them the principle of employability."

L P7: "I believe it is necessary since it will ensure that students take responsibility. If deadlines are not set for assessment tasks, students will have the tendency of submitting work late/not submitting at all"

Although all the participants [100%, (10)] agreed with the setting of deadlines, some also advised that deadlines should be reasonable in order to allow the students enough time to achieve the intended results, since there could be unforeseen circumstances such as the server being down, resulting in a student not being able to upload his/her assessment task before the deadline.

L P2: "Deadlines should be reasonable otherwise the assessment will not achieve the intended results."

L P4: "Technology sometimes fail or are too slow to load, which can have an influence on the students' experience."

During the focus group interviews, the information regarding deadlines for assessment tasks was confirmed; there was no new information.

One of the reasons given by lecturer participants who agreed to the setting of deadlines for the submission of assessment tasks was that deadlines allowed students to manage their time well and therefore assist with the development of the necessary skill of time management in the working environment. I believe that the timely submission of assessment tasks by students is one of the principles that improve students' learning because they would be forced to manage and/or use their time well and take responsibility for their own learning. For this reason, lecturers should therefore adhere to the setting of deadlines (see 2.4.7). Assessment tasks that are delivered through the myLMS platform would indeed ensure and improve time management (see 3.2.6). When an e-assessment platform is used students do not have a choice other than to adhere to the deadlines because these can be set on the platform in order to reject late submissions. However, the CTI Faculty needs to ensure that their e-assessment platform has the necessary stability and speed (see 3.3.12.6), continuous and reliable Internet connection, and a server that is up and running (see 3.3.12.1).

6.5.1.10 Setting time limits for the completion of assessment tasks in IT

The lecturer participants were asked to report on their experiences and/or views of setting time limits for the completion of assessment tasks in IT.

All the lecturer participants [100%, (10)] confirmed the need for setting such time limits. Reasons mentioned included that time limits for the completion of assessment tasks ensured fair assessment; helped students to prepare themselves for the working environment; forced students to think and set targets on the achievement of their tasks; and that it enabled students to take responsibility for their own learning.

L P1: "…every test whether is paper based or e-assessment, there is always time limit."

L P2: "This is so, as to adhere to the principles of Fair assessment."

L P5: "Time limits are important to help students prepare for work environment."

L P7: "Time limits force students to think and therefore set targets on the achievement of their tasks."

L P8: "Time limits are important for control. It will enable students to be mindful of their time and also take responsibility of their own learning."

However, some of the participants provided important advice about setting time limits, namely to consider factors such as the complexity of the assessment, the types of questions being asked, and possible technical problems such as slow Internet and unreliable computers. These factors also need to be considered.

L P2: "You have to consider the amount of content that the student has to give and provide for such adequately."

L P3: "…duration of the assessment is determined by types of questions and complexity of the assessment."

L P4: "Technology sometimes fail or are too slow to load, which can have an influence on the students' experience."

L P5: "However, due to technical issues like internet and bad computer, one should be able to adjust times or enforce this properly"

During the focus group interviews the information regarding time limits for assessment tasks was confirmed; there was no new information.

Although all the lecturer participants were in support of setting time limits for the completion of assessment tasks (see 6.5.1.10), I agree with those participants who warned that the time limits should be set based on the type and/or content of the questions. In my opinion, providing too little time will cause students to take a surface approach to learning (see 2.2.3, 2.2.3.2). The e-assessment platform (myLMS) should nevertheless allow time limits to be set for assessment tasks (see 3.3.9, 3.3.12.1). Providing enough time for the completion of assessment tasks contributes to the practicability/feasibility of student assessment (see 2.6.2.4). Lastly, it is important that lecturers discuss different ways of managing time with their students since this may assist to motivate them as well.

6.5.1.11 Relations between IT students' marks and how and what they have learned

The lecturer participants were asked to report on their experiences and/or views of the relation between their IT students' marks, and how and what they had learned.

The majority of participants [90%, (9)] confirmed that there was a relation between their IT students' marks and how and what they had learned. One participant reported that his/her students who take their studies seriously learn well (by using a deep-learning approach) (see 2.2.4), and always get good marks compared to those who merely memorised concepts (a surface learning approach) (see 2.2.3).

> L P10: "My students who learn effectively using deep learning approach always get good marks as compared to those who just memorise concepts (surface approach)"

However, another participant [10%, (1)] believed that marks were not important in IT as a subject/discipline, because IT required practical demonstrations (see 4.7.2) and as such, marks did not always reflect what students had studied.

> L P7: "Marks in IT do not mean anything. Achieving an objective matters most. IT is a field of doers and marks simply do not reflect the study."

Some lecturer participants indicated that the relationship of their IT students' marks and how and what they had learned depended on the lecturer's teaching methods [30%, (3)]; the type of tests [30%, (3)] and/or the nature of the IT modules [20%, (2)] (see 2.2.3.1, 2.2.3.2, 2.2.4.1, 2.2.4.2).

> L P2: "It depends on the effectiveness of the teaching methods used."
>
> L P3: "I think it depends on how the lecturer teaches."
>
> L P4: "When the tests are fair my students do well. So it depends on what they are writing."
>
> L P5: "Differs from test to test and module to module. Some are a good indication whilst others are not."
>
> L P6: "The teaching approach is a factor."
>
> L P8: "The marks depend on the types of questions."
>
> L P9: "My networking students do well than my programming students so it depends on the module."

During the focus group interviews one participant [20%, (1)] warned that lecturers should use the verbs linked to the different levels of Bloom's Taxonomy appropriately when developing assessment tasks in order for their students to obtain better marks.

L P4: "I think also if students can pass well, the type of question you ask should be appropriately based on the verbs in the Bloom's taxonomy. That types of question you should also see if the student understands or the way that you asked the question."

CTI IT lecturers should ensure that their assessment tasks and teaching methods are appropriate in order for students to learn accordingly. If lecturers want their IT students to obtain better marks they need to actively engage their students in assessment tasks that are meaningful and problem based; teach in a way that clearly outlines the details of the topic; and implement teaching methods that have been proven to actively engage students (high-impact practices) (see 2.2.4.1, 2.2.4.2, 2.5, 2.5.2).

Although the view of the participant who stated that marks were irrelevant in IT since the marks obtained in IT do not reflect what a student has studied, might be based on his/her experience and therefore may be reasonable, I believe marks remain important in IT since it at least serves as an indicator of a student's level of understanding of the module. I believe that the participant might have meant to say that IT should involve sufficient practical demonstrations (see LP 7), as also confirmed in the literature (see 4.2, 4.3, 4.4.1). However, in my opinion, students might not be able to undertake practical exercises if they have no theoretical background. Therefore, students should demonstrate both theoretical and practical competence (see 4.3.1, 4.4.1, 4.4.4). Awarding marks for both competencies can reflect what the student has learned and whether or not he/she has achieved all the intended learning outcomes (ILOs).

Regarding the verbs linked to the different levels of Bloom's Taxonomy, lecturers need to be adequately trained on how to develop student assessment tasks, and are encouraged to use active verbs (such as explain, argue, justify, examine, apply, reflect, and evaluate) in their assessment tasks (see 2.2.6.3, 2.7.3.1). When such verbs are used in assessment tasks, students are able to apply a deep learning approach, which will enable them to achieve better marks (see 2.2.4.1, 2.2.4.2, 2.2.6.3).

6.5.1.12 Informing IT students in advance of the content that they will be assessed on

The lecturer participants were asked to report on their experiences and/or opinions of informing IT students in advance of the content that they will be assessed on.

Most of the participants [60%, (6)] agreed that it was good for the students to be informed in advance of the content that they would be assessed on. Motivations for this argument included that it helped them to focus on the important concepts, and that it enabled them to prepare adequately (they could then take control of what they would be assessed on).

L P1: "I do not think it is not necessary because students need to understand and dominate all the content in the scope of the module."

L P4: "Students will learn very well when they know the content."

L P8: "Students' knowledge about the content will enable him/her to focus on the most important aspect of what they will be assessed on."

L P9: "Students need to know the content they will be assessed on in order to prepare adequately and focus on most important concepts."

On the other hand, other participants wrote that when students were aware in advance of the content they would be assessed on, they tended to become lazy [10%, (1)]; did not attend classes since they received the "scope" of the content [10%, (1)]; and that students seldom study on their own [20%, (2)].

L P3: "…it affects other students because they would not always attend classes."

L P7: "They simply never study on their own and become lazy."

L P10: "Students don't take responsibility of their learning."

The new information that emerged from the focus group interviews was that for any assessment task, students should be aware of its breakdown (mark allocation) [20%, (1)]; the type of questions (short questions or long questions) [40%, (2)]; and the chapters the assessment tasks will cover [20%, (1)]. One participant [20%, (1)] advised that the information provided to students should not be the exact questions in the assessment tasks.

L P1: "I feel that students should know exactly what they should study and also what type of questions they should study because they study differently for different types of questions."

L P3: "…you know we can just say the assessment is from chapter 5-9, multiple choices 10 marks and so on."

L P4: "The problem I have with this is that some lecturers give the same questions they will ask in the assessment which I feel it is not right."

Some of the opinions expressed by lecturer participants show that although they agreed with informing students in advance of the content they will be assessed on, some lecturers exhibited some resentment (see 6.5.1.12). It is therefore important for the CTI IT lecturers to ensure that their assessments are fair (see 2.6.2.1) and valid (see 2.6.2.2), and that students are to be made aware of the content they will be assessed on. This is confirmed by the literature (see 2.7.3.2, 2.7.3.3, 3.2.10.2, 4.4, 4.4.2.1). Some lecturer participants mentioned that students tended to be lazy and skip classes when they were informed in advance of the content they would be assessed on. I suspect this happens when lecturers omit some important aspects of the content (if they provide a limited “scope”). That is why constructive alignment is so important (see 2.7.1, 2.7.2, 2.7.3). I also support the advice provided by one participant during the focus group interviews, namely that students should not be given the exact questions in the assessment tasks because they tend to replace in-depth understanding of concepts with memorisation, which is a surface learning approach (see 2.2.3, 2.2.3.1), and such a practice should be frowned upon.

6.5.1.13 Informing IT students in advance of the assessment criteria according to which they will be assessed

The lecturer participants were asked to report on their own experiences and/or opinions of informing IT students in advance of the assessment criteria according to which they would be assessed.

The majority of the participants [70%, (7)] confirmed that students needed to be aware of the assessment criteria they would be assessed *against*. The reasons provided included that it narrowed down what they would study (they would then focus only on the relevant areas); rendered the assessment fair; and ensured alignment between teaching, learning, and assessment.

L P2: “To satisfy principle of fair assessment so that they know what the important aspects of the assessment are.”

L P3: “Students need to be aware of the criteria. There should be the alignment between teaching, learning and assessment.”

L P9: “Assessment criteria should be known to the students in order for them to know the focus areas and also study relevant content.”

However, one participant [10%, (1)] was of the view that students would then tend to rely only on the assessment criteria and would not really learn on their own.

L P7: “They simply never study on their own.”

During the focus group interviews the lecturer participants provided the same information discussed in 6.5.1.12.

CTI IT lecturers also need to be cognisant of the fact that for assessment to be both reliable (see 2.6.2.3) and valid (see 2.6.2.2), students need to be made aware in advance of the assessment criteria according to which they will be assessed (see 2.9.1.3, 2.9.2.3, 3.3.6.3, 4.4.2.1). Lecturers need to understand that students' knowledge of the assessment criteria according to which they will be assessed in advance, will enable them to focus on the required competencies.

6.5.1.14 Feedback to IT students about their performance in assessment tasks

The lecturer participants were asked to report on their experiences and/or opinions of providing feedback to their IT students about assessment tasks they had performed.

Most of the participants [80%, (8)] clearly confirmed the importance of providing feedback to IT students about their performance in the assessment tasks they had to perform. Reasons provided for the importance of such feedback in assessment tasks included that it enabled students to improve their work by learning from their mistakes [20%, (2)]; ensured positive enforcement of their performance among the students [10%, (1)]; enabled the students to take note of their own strengths and weaknesses [40%, (4)]; and that it assisted in enhancing their students' learning curve [10%, (1)].

L P1: "It is very crucial for students to know where they did wrong or right so that they can improve."

L P2: "It is critical. Feedback motivates change in attitude and effort as well as positive reinforcement"

L P3: "It gives them clarity and helps them prepare for big assessments and also take responsibility of their work."

L P10: "…feedback is critical since it improves students' learning curve."

However, one lecturer participant [10%, (1)] was of the opinion that there was no time available to provide students with proper feedback, and that the students failed to attend one-on-one sessions for obtaining feedback.

L P5: "No time allocation in semester plan for proper feedback. Students are reluctant to schedule one-on-one sessions to get feedback, especially the weaker students."

Another participant [10%, (1)] mentioned that students did not reflect on the feedback since their only interest was always in the marks they scored.

> L P7: "They do not reflect on the work they have done. They are more concerned about the marks obtained."

During the focus group interviews some of the information was confirmed. However, some participants reported that they provided feedback to students in class by going through class activities, assignments, and tests with them.

> L P1: "I usually discuss the exercises I have done with them in class for correction purposes."
>
> L P2: "We discuss every class exercise, assignments and test in class."
>
> L P3: "My feedback on activities is normally done in class."

One participant [20%, (1)] mentioned that the memoranda of assignments and class exercises were uploaded on the campus server for students to access. However, the participant observed that the students rarely went through the memoranda because they evidently felt that they had already obtained the marks which could not be changed.

> L P5: "Sometimes I also share the memorandum with them on the network. Some students do make use of that; other students do not bother to go through because they know that the marks cannot change. Assignments, semester tests when they get it back we sort of go through and explain the answers to them in class."

The literature confirms that when lecturers provide their students with constructive feedback on the assessment tasks that they have done, their learning will be enhanced (see 2.9.2.1.3), and they will be empowered to monitor their own learning and progress and improve on these (see 3.2.9.10, 3.3.7). Some of the participants had concerns that students were only interested in the marks and not the feedback. The fact that some learners ignore feedback is also confirmed by the literature (see 2.9.1.4). Nevertheless, I suggest that lecturers should not stop providing feedback. Students should still be empowered to determine whether or not they have been successful in their learning by reflecting on both their marks and the feedback provided by their lecturers. It is important, however, that the students should be coached on how they could use the feedback they get. I feel that not all the students will pay attention when the solutions are being discussed in class or will have access to the memoranda on the server. Again, since these types of feedback are not continuous and personal, the lecturers will not be able to determine if a student understands clearly what he/she needs to improve on (see 2.9.2.1.3).

6.5.1.15 Possible effect of feedback on IT students' performance in their assessment tasks

The lecturer participants were asked to report on their experiences and perceptions of the possible effect that the feedback they provided to their students might have (or not have) on their IT students' performance in assessment tasks.

All the participants [100%, (10)] confirmed that the feedback they provided to their IT students in their assessment tasks had a positive effect on their learning and/or performance. Two of them [20%, (2)] reported that the feedback had a "positive" effect on the learners' learning curve; two [20%, (2)] indicated that their feedback created learning opportunities for the students; three [30%, (3)] reported that it enabled students to identify their own competency levels; one [10%, (1)] reported that it enabled students to obtain high marks which in turn encouraged them to work harder; and two participants [20%, (2)] reported that feedback enabled the students to take responsibility for their own learning when they went through the feedback, made the necessary corrections, and learned from their mistakes.

L P1: "the feedback allows students to improve."

L P2: "It has a positive effect on the learners' learning curve."

L P3: "It gives them clarity and helps them prepare for big assessments and also take responsibility of their work."

L P4: "I believe this have an effect, as this is a learning opportunity for them."

L P8: "Students learn through feedback."

L P9: "Feedback has positive effect on my students. With the feedback, I have realised that my students' knowledge of my module has improved and they have attained better grades based on my feedback."

L P10: "The possible effect of feedback is improved learning because students work on the mistakes they have done and do better in other assessment tasks."

During the focus group interviews one lecturer participant warned that feedback should be timely in order to have a positive impact on students' performance. I believe this is good advice because students tend to ignore feedback that is provided long after an assessment task (see 2.9.2.1.3).

L P2: "…the timeliness of feedback is important. Feedback provided on time will be effective and improve the performance of the students."

The reasons provided by the lecturer participants for the positive effect of feedback on student performance, corresponded with the student participants' opinions in this regard (see

6.5.2.16). According to the literature, if the CTI IT lecturers continue to provide constructive feedback to their IT students, these students' learning as well as their grades will improve (see 2.9.2.1.3, 3.2.9.10, 3.3.7). Not only will they learn better and achieve better grades but the feedback will help them in preparing for the world of work since effective feedback would engender taking responsibility for their own learning and teach them to learn from their mistakes. Thus, feedback is an authentic adjunct to personal development.

6.5.1.16 Application of the principles of e-assessment in e-assessment tasks

The lecturer participants were asked to report on their experiences and/or opinions of the extent to which the e-assessment tasks done by their students were fair, practicable/feasible, reliable, and valid.

In this section the views of the participants as to their application of the principles of e-assessment will be discussed in the following order: fairness, practicability/feasibility, reliability, and validity.

Table 6.8: Summarised responses of lecturers' application of the principles of e-assessment

Responses: E-assessment tasks	**Frequency (%)**	**Number of participants who responded to this question (response rate)**
Fair	90 *(n=9)*	*n=10* (100%)
Not fair	10 *(n=1)*	
Practicable/feasible	80 *(n=8)*	*n= 10* (100%)
Not practicable/feasible	20 *(n=2)*	
Reliable	100 *(n=10)*	*n=10* (100%)
Valid	100 *(n=10)*	*n=10* (100%)

The majority of the lecturer participants [90%, (9)] confirmed that the e-assessment tasks that students had to do were fair. Reasons they provided were that the content and assessment criteria were made known to the students [10%, (1)]; the content that was assessed was within the scope of the module [40%, (4)]; and the e-assessment tasks were not biased (it did not favour any of the students) [30%, (3)].

L P2: "They are fair; I always assess the content within the scope of the module."

L P8: "They are fair because all students get equal opportunity in terms of the content and assessment criteria it will cover."

L P6: "They are fair because my e-assessment tasks are not biased. Every student is given equal opportunity to do them."

One participant [10%, (1)] stated that because of the assessment training he/she had received provided him/her with the necessary experience and knowledge to design fair and reliable e-assessment tasks.

L P1: "To a huge extent because I have been adequately trained in the development of assessments."

However, one of the participants [10%, (1)] felt that the e-assessment tasks were not fair in the module that he/she taught (Maths in IT) because the e-assessment platform (myLMS) did not award marks for the steps that students follow in order to arrive at the final answer. For this reason, he/she was forced to create lower level questions.

L P6: "I don't think they are fair in Maths as no marks can be awarded for steps of the thought process towards solution finding. …Too many lower level questions end up being asked."

During the focus group interviews, one lecturer participant also reported that the e-assessment tasks that students had to do was unfair, because some students were more knowledgeable and experienced with the use of technology than others, and as a result most of the students were not able to complete their tasks on time.

L P5: "I think e-assessment can be unfair and favour some students – let's say you have students who are not familiar with information technology and struggles to use computer or any other device, it might be of a disadvantage to that student because now they have to study for the work and cope with working with the computer or the device. – they don't finish on time."

With regards to the practicability/feasibility of e-assessment tasks, eight of the lecturer participants [80%, (8)] indicated that their e-assessment tasks were practicable and/or feasible. Reasons provided included that they ensured that the necessary infrastructure (such as Internet access and computers) was in place; that resources (physical, human, and financial) were readily available to students; and that the environment in which their students had to do their e-assessment tasks was always devoid of unnecessary pressure.

L P2: "Where they write their test is conducive and same condition."

L P7: "They are practicable/feasible because…I ensure that all the necessary infrastructure such as the internet connection as well as computers are available for the students to use."

L P8: "They are practicable/feasible because I ensure that students have access to all resources required to do the test (i.e. physical, financial and human resources) like internet availability, invigilators etc."

L P9: "Yes because my students always have the necessary requirements that will ensure smooth running of the test, such as conducive environment, good infrastructure, good computers, good internet connectivity etc."

One participant [10%, (1)] reported that he/she was appropriately trained in assessment and could therefore ensure the feasibility/practicability of the e-assessment tasks he/she completed.

L P1: "To a huge extent because I have been adequately trained in the development of assessments."

Nevertheless, one participant [10%, (1)] and another [10%, (1)] mentioned that assessing programming and Maths appropriately was not feasible and/or practicable in e-assessment because of their restrictions.

L P4: "Depends on the module. Programming is not feasible."

L P6: "I don't think they are fair in Maths as no marks can be awarded for steps of the thought process towards solution finding. …Too many lower level questions end up being asked."

During the lecturers' focus group interviews, the majority of the lecturer participants [80%, (4)] confirmed that the e-assessment tasks that their students had to do were not practicable and/or feasible, and that this refuted what the participants reported in the questionnaire survey. Reasons provided included a lack of infrastructure [40%, (2)]. One participant [20%, (1)] mentioned that although e-assessment tasks were available to students at all times, not all students had enough mobile network data to do the assessment tasks when they were off campus.

L P1: "Lack of infrastructure such as the internet and computers make it difficult to do e-assessment."

L P4: "I think it is true that the tasks are available all the time and practicable, some students do not have data to download the materials and do the tasks at their homes."

L P5: “The current infrastructure we have makes it very difficult for online assessment.”

In terms of reliability, all the lecturer participants confirmed that they developed reliable e-assessment tasks [100%, (10)]. Reasons provided were that their students did the same assessment tasks under similar conditions [50%, (5)]; their students’ results or the outcome of their e-assessment tasks were consistent [20%, (2)]; marking in e-assessment was more consistent [20%, (2)].

L P2: “Where they write their test is conducive and same condition.”

L P4: “Tests are done in the same condition.”

L P7: “They are reliable because all my student groups doing the same module do the same assessment tasks under the same situation/environment and consistent results are produced.”

L P8: “The marking on myLMS is more consistent.”

L P9: “Yes because all my groups get similar/consistent results/outcome when they write the same tasks under same condition.”

One of them [10%, (1)] claimed that he/she was appropriately trained in the development of e-assessments.

L P1: “To a huge extent because I have been adequately trained in the development of assessments.”

During the lecturer participant focus group interviews no new information emerged from this question, but confirmed what the lecturer participants said in the questionnaire survey.

Reasons that six of the lecturer participants [60%, (6)] provided for believing that the e-assessment tasks were well-designed and valid included that they ensured that their e-assessment tasks were set according to the requirements of the module, and that it only covered the content of the module.

L P1: “…Yes, the assessments are always within the scope.”

L P4: “They valid because the content are covered which was covered with the students.”

L P7: “They valid because it is within the requirements of their modules.”

L P9: “Yes because it covers only the content that I teach them.”

Furthermore, four of the participants [40%, (4)] hinted that their students had shown signs of improvement in their grades/marks after completing their e-assessment tasks.

L P1: “…my students do well.”

L P4: "…and their marks are better."

L P5: "…their marks have improved."

L P10: "When my tests are within the requirements, students pass."

During the focus group interviews the majority of the lecturer participants [80%, (4)] confirmed that students' e-assessment tasks were not always valid. This refuted what the participants reported in the questionnaire survey. The reason provided was that they wanted their IT students to learn beyond the IT module requirements.

L P2: "E-assessment tasks are not always within the content that has been covered because I want them to learn more on their own in order to prepare them for the real world."

L P3: "I want my tasks to prepare students for the world so I sometimes stretch them to see how they will answer tasks that we have not done in class."

L P4: "For me it is not always valid because some of the things I want them to learn on their own and they can only do that if I assess them and they see that they could not answer then they find out more about it."

L P5: "Not always because students to know more than what we teach them. They need to apply what they learn in different situations."

The majority of the lecturer participants confirmed that they applied the necessary principles of assessment in their e-assessment tasks. Among others, they reported that their e-assessment tasks only covered the content that they had taught (see 2.6.2.1, 2.6.2.2, 3.3.6.1); that there was consistency of results across the different e-assessment tasks (see 2.6.2.3, 3.3.6.2); and that the required infrastructure, resources, and assessment training they had acquired were sufficient (see 2.6.2.4, 3.3.6.4, 4.7.2). These views confirmed that the majority of the participants did pay attention to the credibility of the e-assessment tasks their students had to do (credibility = fairness + validity + reliability + practicability) (see 2.6.2.5).

Credible assessment is supported in order to improve students' learning because it could motivate students to be honest about their own learning and encourage them to apply a deep learning approach (see 2.2.4). Lecturers' teaching would be enhanced if they considered and balanced these principles of good assessment. However, this would require appropriate knowledge and understanding on the part of lecturers before they would be able to design and implement credible assessments (see 2.6.2, 3.3.6). The CTI IT Faculty should therefore urge their lecturers to create credible and ethical assessments. This is possible only if they put appropriate assessment policies and procedures in place.

Some lecturer participants, however, indicated that their e-assessments tasks were not necessarily fair, practicable and/or feasible, reliable, and/or valid. Reasons included that it depended on the modules that they taught (e.g., programming and Maths in IT) and that the e-assessment facilities on myLMS only allowed lower order thinking questions. Personally, I disagree with these participants because the advent of technology has made it possible for lecturers teaching modules such as Maths and programming in IT to design e-assessments that also test higher order thinking (see 3.3.4). For instance, there is a stack question type on Moodle (see 3.2.4.1) that allows multi-part mathematical questions, mathematical expressions, and where process marking can be applied. Even if they used true/false questions and/or multiple-choice questions in these modules, it would be possible to focus on higher cognitive skills (see 3.3.4). However, it would be necessary to train both students and lecturers on how to use the myLMS system in completing and designing e-assessment tasks. Lecturers, in particular, need to be made aware of the different formats in which they can design e-assessment tasks for their students on myLMS (see 3.2.7, 3.3.1, 3.3.4).

A majority of the focus group participants reported that their e-assessment tasks were not valid. I would encourage lecturers to ensure that their e-assessment tasks should be based on the content that has been covered; failure to do so could cause students to fail. Although some lecturers argued that students tended to apply a surface learning approach when their e-assessment tasks did not go beyond their course requirements (see 2.2.3.1), my advice is that for this purpose lecturers should link the assessment not only to content but also to the intended learning outcomes (ILOs), and include the requirements that are beyond the module in their ILOs. The problems identified by the focus group lecturer participants regarding why their e-assessment tasks were not practicable and/or feasible are confirmed in the literature as a possible barrier to the effective implementation of e-assessment tasks (see 3.2.8, 3.3.11). The CTI IT Faculty needs to ensure that the required resources and infrastructure are in place before conducting e-assessment tasks (see 3.3.12).

6.5.1.17 The use of IT students' assessment results

The lecturer participants were asked what they used their IT students' assessment results for.

For the sake of convenience, I summarised the uses of IT students' assessment results as described by the lecturer participants in the list below.

- For academic records [10%, (1)].
- To provide students with constructive feedback for improvement [10%, (1)].
- To adjust your own teaching methods [10%, (1)].
- To adjust the difficulty level of assessment tasks (if required) [10%, (1)].

- To provide students with their grades [10%, (1)].
- To determine students' predicate [10%, (1)].
- To increase/decrease students' workload [10%, (1)].
- To determine students' performance and progress [10%, (1)].
- To determine if a student has passed/failed a course [10%, (1)].
- To determine students' level of understanding of the relevant module [10%, (1)].

L P1: "…apart of students' academic records …I use their marks to give them feedback for improvement."

L P2: "To adjust teaching methods and to perform grading."

L P3: "To get the credit."

L P5: "Adjustment of lesson delivery methods, adjustment of level of difficulty when delivering work, increase/decrease workload, etc."

L P8: "To determine their performance."

L P9: "To check my students' level of understanding and performance."

L P10: "To see if they are progressing very well or not in terms of performance."

Some of the views reported by the lecturer participants were supported by the literature (see 2.6, 2.6.1, 2.9.1, 2.9.1.2). The literature confirms that for lecturers to use the assessment results effectively, they should focus on identifying those students who are struggling and assist them accordingly (see 4.5.1.1, 4.5.2.2). The literature also confirms that students' results will inform lecturers whenever they need to adjust their teaching methods (see 2.9.2.1.1, 4.4.2.2).

6.5.1.18 Quality e-assessment

The lecturer participants were asked about their views of quality e-assessment.

The lecturer participants reported different views on the quality of e-assessment. For example, one participant [10%, (1)] stated that quality e-assessment requires that errors and unfairness in the e-assessment process be avoided.

L P1: "An evaluation of the extent to which systematic errors and biases have prevented."

Five of the participants [50%, (5)] mentioned that quality e-assessment involves e-assessment tasks that are fair, relevant, reliable, valid, and/or practicable.

L P2: "If marks are awarded correctly and fairly."

L P6: “Valid, fair and reliable.”

L P7: “…is where the e-assessment tasks are valid, feasible, reliable and fair.”

L P8: “When the students have all the infrastructure and resources.”

L P9: “It is an e-assessment that provides students with the content, assessment criteria and that is fair.”

L P10: “…an e-assessment should be valid, fair and reliable.”

One participant [10%, (1)] indicated that for quality e-assessment, students’ knowledge of the module should be assessed in-depth; one participant [10%, (1)] confirmed that marks should be awarded correctly and fairly; another [10%, (1)] suggested that students’ outcomes should meet the initial objectives; and one participant [10%, (1)] reported that quality e-assessment requires that students be informed of the content and assessment criteria that the e-assessment tasks will cover.

L P2: “If marks are awarded correctly and fairly.”

L P3: “Testing the students’ knowledge of the subject matter thou-rally.”

L P4: “Outcomes meet initial objectives.”

L P5: “Students should know the content and assessment criteria.”

The literature confirms most of the views identified by the participants (see 6.5.1.18), namely that quality e-assessment should adhere to the principles of good e-assessment, that is, fairness (see 2.6.2.1, 3.3.6.3), validity (see 2.6.2.2, 3.3.6.1), reliability (see 2.6.2.3, 3.3.6.2), and practicability (see 2.6.2.4, 3.3.6.4). The literature also confirms that lecturers need to be trained on how to develop high-quality e-assessment tasks (see 3.2.9.3, 3.3.4) and that e-assessment tasks that are not of high quality tend to influence students to apply surface learning approaches (see 2.2.3, 2.2.3.1). Finally, the literature confirms that quality e-assessment has the potential to improve student learning (see 2.2.6.2).

6.5.1.19 Lecturers’ prior experience and knowledge of student assessment

The lecturer participants were asked to report on their views of the extent to which they agreed/disagreed that it is necessary for them to have prior experience of and knowledge about student assessment before they try to implement e-assessment in their teaching of IT.

Most of the lecturer participants [70%, (7)] confirmed that they needed to have prior experience and knowledge of student assessment before they could implement e-assessment in their teaching of IT. Reasons provided included that lecturers needed to design assessments that meet students' needs [20%, (2)]; that they should link teaching to assessment [20%, (2)]; that prior experience and knowledge of student assessment is needed because moving from paper-based to e-assessment involves new technology refinement and upgrades [10%, (1)]; that they would have to adapt to the change [10%, (1)]; and that lecturers should have prior knowledge and experience of student assessment if they wish to design quality e-assessment tasks that will ensure that students apply a deep learning approach [10%, (1)].

L P1: "Lecturers need experience because they can be able to provide assessments based on their teaching."

L P3: "So that they could always be a direct link between teaching and assessments."

L P5: "Assessments (types, difficulty, levels, etc.) will be created or changed based on a specific scenario (needs to adaptive). Adapting to change (realizing the need for change and implementing steps to improve the situation) is easier with experience and prior knowledge."

L P6: "It takes a lot of practice and constant refinement and upgrade of attempts when setting e-assessments."

L P7: "It will help lecturers to develop tasks that will be important to students."

L P8: "Since e-assessment involves technology, there is the need for lecturers to have prior knowledge."

L P9: "It is important in order to develop appropriate assessment that students require. If a lecturer does not have prior knowledge and experience about student assessment, he/she ends up developing assessment with only lower order thinking which will force students to use the surface approach in their learning."

The other participants [30%, (3)], however, stated that they disagreed with the requirement that they had to have prior experience and knowledge of student assessment, because e-assessment was just an automation of assessment, and that it was merely in a different format.

L P2: "E-assessment is simply automation of the assessment but the principles behind assessments remain unchanged. Prior experience is not important."

L P4: "I do not think they need prior experience; it is just given in a different format."

L P10: "E-assessment is just an automation. I don't need prior experience."

The new information that emerged from the focus group interviews was that lecturers' experience and knowledge of student assessment would allow them to appropriately apply the verbs linked to the different levels of Bloom's Taxonomy in their e-assessment tasks. This has been discussed in 6.5.1.11.

L P3: "For me I think it is important because you are able create assessment tasks that students will understand by applying the verbs in the Bloom's taxonomy."

I believe that assessment is absolutely important in the teaching and learning process. Literature reports that poor assessment may jeopardise students' learning (see 2.6). For this reason, I strongly support the opinion that lecturers should have prior experience and knowledge of student assessment before they start implementing e-assessment. The same principles required in the assessment (fairness, reliability, practicability/feasibility, validity) (see 2.6.2, 3.3.6, 4.7.2) of students in different contexts and on different levels need to be applied in e-assessment. If lecturers have no experience and knowledge of these principles, they might just design inappropriate e-assessment tasks for their students (see 3.3.11). Experienced and knowledgeable lecturers will not only require students to recall concepts but will also require them to apply, analyse, evaluate, and create (see 2.2.3, 2.2.4, 3.3.4). I therefore disagree with those participants (L P2, L P4, and L P10) who felt that prior experience and knowledge of student assessment are not necessary.

6.5.1.20 Suggestions and recommendations regarding e-assessment

The lecturer participants were asked to provide some suggestions and recommendations pertaining to how lecturers could assess their students through using computer/network technology (e-assessment/myLMS).

The suggestions and recommendations provided by the lecturer participants were very resourceful. I summarised the suggestions and recommendations identified by the participants as follows:

- Lecturers must be creative and come up with interesting assessments [10%, (1)].
- Lecturers must use a variety of e-assessment methods [10%, (1)].
- Adequate resources and training should be provided for lecturers [30%, (3)].
- Lecturers need to constantly practise and use the available e-assessment technology [10%, (1)].
- Lecturers should try and avoid the habit of developing too many true/false and multiple-choice questions in order to minimise their marking load [10%, (1)].
- Lecturers need to adapt to change and embrace technology [10%, (1)].
- Lecturers must avoid assessing only lower order skills and rather focus on higher order thinking skills [10%, (1)].

- Lecturers need to design interesting e-assessment tasks [10%, (1)].

The new suggestions and recommendations that were made by the lecturer participants during the focus group interviews are as follows:

- Lecturers should be encouraged to do e-assessment tasks at least twice per semester or once a month because the constant practice of the use of the technology (myLMS) will help them to use the system effectively [40%, (2)].
- For lecturers to effectively use the e-assessment platform, the IT administrators in charge of maintaining the platform should simplify it because as it is now, it is more for administrative purposes than a learning platform [20%, (1)].
- Lecturers' workload must be reduced in order for them to have some time to develop e-assessment tasks [20%, (1)].

The suggestions and recommendations provided by the lecturer participants in the questionnaire survey and focus group interviews are very important as they are all confirmed in the literature consulted (see 2.4.11.9, 3.2.1, 3.2.6.1, 3.2.7.1, 3.2.8.2, 3.2.9, 3.2.9.3, 3.2.10.1, 3.3.4). Of particular importance is that the CTI IT lecturers need to embrace the change of e-assessment, take part in assessment development training, and implement e-assessment tasks that will enhance their students' learning.

6.5.2 Student participants' responses to their final questionnaire and the focus group interview questions

This section reports on how the student participants answered the different questions in their final questionnaire as well as the focus group interview questions. Forty-seven IT students completed the questions in the final questionnaire; however, only 44 participants' responses were analysed because three of the student participants were younger than eighteen 18 years (see 6.4.1). Seven IT students took part in the focus group interviews. The questions asked during the focus group interviews were determined after the online survey. Upon explaining the instructions prior to the focus group interviews I first asked a broad and open question during both focus group interviews.

I hoped that the focus group members, in their answers to this broad and open question, and the discussion that followed, would touch upon most of the issues relating to the research foci that I had already identified as important for this study. I subsequently only asked a selection of 14 open questions, but more specific questions to the IT student participants if their answers to the first broad and open question did not cover everything. The questions selected therefore related to issues not covered in the groups' discussions of the first broad and open question (for the specific interview questions, see Appendices B3.2 and B3.3).

For the sake of brevity and to avoid repetition of findings, I will only discuss (accompanied by verbatim comments) the questions for which new findings emerged and add to what has already been found during the first round of data collection (the questionnaire surveys). For detailed information about the findings that were gathered during this focus group interview, please refer to Appendix D.

6.5.2.1 The need for assessment

The student participants were asked to report on their experiences and/or views as to why their IT lecturers need to assess them.

All the student participants [100%, (44)] confirmed the need for assessment. Reasons provided included to test their knowledge and level of understanding; for the lecturers to monitor their performance and/or progress; guide students where they need to be; obtain better grades/marks; prepare them for examinations; identify their strengths and weaknesses; determine their competencies; determine whether the lecturers are using the best teaching approach; improve their practical experience; and ensure that they have met all the assessment criteria in the module.

S P1: "They need to access me in order to get to know my day to day improvement."

S P2: "To test our knowledge of what we know at our current state."

S P3: "To get good marks."

S P6: "…to evaluate my performance in class and assist in areas I struggle with."

S P7: "To monitor my performance and help me where I need help."

S P8: "To determine if all the assessment criteria has been met."

S P10: "To prepare me for exams."

S P15: "To know if I understand the module and if the lecturers are doing their job well."

S P40: "So that they may understand my strengths and weaknesses."

S P42: "It will help the lecturers to know if how they teach is helping me."

S P44: "To know my strengths and weakness in what I am doing."

These views proved that the IT students agreed with their IT lecturers, the need to assess them in order to enhance their learning (see 6.5.1.1, 6.5.1.2). During the students' focus group interviews, no new information emerged from this question, which indicated confirmation of the information gathered from the questionnaire survey.

The student participants' responses therefore clearly confirmed the importance of assessment (see 2.2.6.2). The students also agreed that their lecturers' assessment must be aimed at improving their students' learning. All the reasons provided by the student participants regarding the need for assessment, are supported in the literature (see 2.6, 2.6.1). The participants indicated that their lecturers often assessed them. This is a good practice because frequent assessments would enable students to identify their own strengths and weaknesses, which would assist them to ultimately improve their performance (see 2.6.1). This also corresponds with the lecturers' views (see 6.5.1.1, 6.5.1.2). Unfortunately, however, the majority of student participants stated that they were mostly assessed through paper-based assessment tasks. In my opinion, lecturers need to shift from paper-based to e-assessment since it will ultimately save time and enable their students to access their e-assessment tasks from anywhere and at any time (see 3.3.10). Furthermore, students will learn to take responsibility for their own learning (see 3.3.10).

6.5.2.2 The frequency of assessment

The student participants were asked how often their IT lecturers assessed them.

Table 6.9: Summarised responses from the student survey participants regarding the frequency and platform of assessment

Responses (Number of times assessment occurred)	**Frequency (%)**	**Number of participants who responded to this question**
1 to 6 times	34 *(n=15)*	*n=44* (100%)
End of every 1 to 2 chapters	15.9 *(n=7)*	
Every month	11.3 *(n=5)*	
Not often	9 *(n=4)*	
Throughout the semester	11.3 *(n=5)*	
Often	6.8 *(n=3)*	
End of the semester	4.5 *(n=2)*	

Beginning of the semester	6.8 *(n=3)*	
Platform on which assessment was done		
Paper based	75 *(n=33)*	*n=44* (100%)
E-assessment (myLMS)	25 *(n=11)*	

Table 6.9 indicates that lecturers frequently assessed their IT students. I believe that this is a good practice since frequent assessment would help to enhance student learning. However, the paper-based assessments were still used more often. I suspect that this could be due to the lecturers' lack of training on the use of the e-assessment platform (myLMS) (see 3.2.9.3, 3.3.10).

S P2: "We are assessed at the beginning of each semester for each module. … Assessments are done via myLMS and paper-based methods."

S P4: "We are assessed on average every month, usually through small continuous assessments."

S P20: "We are assessed throughout the semester through paper-based class tests, assignments, semester tests and our exams."

S P24: "3 times (assignment, semester test, exam)."

S P44: "Monthly, through class tests or group verbal assessments."

During the focus group interviews, all the participants [100%, (7)] specified that they were assessed through paper-based assessment tasks. Reasons provided included that they could express themselves very well; and that they did not face any technical problems.

S P1: "Most of the time, it's done paper-based."

S P3: "And another thing they do is that like, if they actually give us a test on my-LMS, it would take like half of the class like to make sure that everyone in the class like, can connect to my-LMS and then to make them, waste a lot of time. But when doing a test on paper there is no internet problems. So I think the paper is alright."

S P4: "I think like, they prefer paper-based questions because like, all of them, they've got this question paper, you can like define like, what they are saying, much more. If they ask you a question, you can actually elaborate."

S P7: "I think they use paper-based, because in paper-based exams, you can write something and erase and start over."

One participant [14.2%, (1)] thought that some of the lecturers were not aware of how to do e-assessment tasks on myLMS, and/or they preferred the paper-based tasks because it was the traditional method of assessment and lecturers were reluctant to change.

S P2: “I think the paper based more because of experience, you know, not all the lecturers are aware that you can do assessments like that on my-LMS, or maybe they just don’t want to, they prefer paper-based themselves, because it’s a traditional method of assessment and we are creatures of habit, we don’t really like change. It’s something they know how to do, they do it well, so why change.”

In my opinion, if the institution put in place appropriate infrastructure and adequate resources they will encounter no or few technical issues, and both students and lecturers will be motivated to use the system (see 3.3.12). Furthermore, training is required for lecturers to use and know the importance of e-assessment (see 3.2.9.3, 3.3.12.9). There are some lecturers who have little or no experience or prior knowledge of technology, and without training they will be reluctant to use the system (see 3.2.8.3, 3.2.9.1, 3.2.8.11, 3.2.9.3, 3.3.4, 3.3.10, 3.3.11). It is the institution’s responsibility to provide training to its lecturers in order for them to effectively use the e-assessment platform.

6.5.2.3 Students’ knowledge of what and how they will be assessed

The student participants were asked to report on their experience and/or views as to how their knowledge of what and how they would be assessed on, influenced their own learning and performance, if at all.

Most of the participants [91%, (40)] confirmed that their knowledge of what and how they would be assessed influenced their own learning and performance. Reasons provided included that it helped them to focus on the important processes which improved their learning and performance; it helped them to know exactly what would be expected of them in the assessment; their marks subsequently improved due to better preparation; it reduced their workload (more time efficient); and it assisted them to apply specific learning methods or techniques in order to learn better.

S P1: “It improves my learning because it prepares me to know where to tackle in each and every module in order to get me ready for semester test and final exams.”

S P2: “They influence me to perform better.”

S P14: “Helps me focus on important bits to raise my mark.”

S P28: "Knowing how I will be assessed influence my own learning and performance because I will know which study methods and techniques I use and also which study materials will be essential to use."

S P29: "…it does because it helps us to improve our marks."

S P40: "…it helps me not waste too much time studying because I know what to concentrate on."

S P44: "I am able to use different method when studying."

However, some participants [9%, (4)] were of the opinion that even though it helped them to focus on some concepts it was not sufficient to enable them to cover all the important contents of the module. They indicated they memorised that which the assessment would cover; however, they immediately forgot what they had learned after completing the assessment.

S P3: "It is good but only cram the content and forget after the test."

S P9: "I like it but I only concentrate on those scope and forget it when the test is done."

S P20: "I wish the scope cover everything because if not I only study what I am given which is a problem."

S P35: "I end up not studying the whole book and I struggle when it time for exams because I only learned what the lecturer gave me."

During the students' focus group interviews no new information emerged from this question, which indicated confirmation of the information gathered from the questionnaire survey.

The majority of the student participants confirmed in the questionnaire survey that their knowledge of how they would be assessed and what they would be assessed on, influenced their performance positively. They confirmed that their lecturers often informed them in advance on what and how they would be assessed. These views corresponded with the views of the lecturer participants (see 6.5.1.12, 6.5.1.13). The assessment tasks that students did were viewed as fair (see 2.6.2.1, 3.3.6.3), valid (see 2.6.2.2, 3.3.6.1), reliable (see 2.6.2.3, 3.3.6.2), and practicable and/or feasible (see 2.6.2.4, 3.3.6.4) – provided that the students were aware of the assessment content (see 2.9.1.3, 3.2.10.2); and the criteria (see 2.9.1.3, 2.9.2.3) according to which they would be assessed; although a few students were of the opinion that providing them with the content that an assessment task would cover, could encourage some students to merely memorise the content without gaining an in-depth understanding (see 2.2.3). My advice is that students need to understand what they have been taught in order to apply themselves properly to the study material and avoid "cutting corners" since this practice would not improve their learning (2.2.3). Furthermore, lecturers need to understand that when I ask whether students should be provided with knowledge of the content that an assessment would cover, I do not mean a limited "scope" of the content but the entire content which the assessment task(s) would represent. Although the tasks/questions included in a task cannot cover the content in its entirety, the tasks/questions should at least be representative of the content.

6.5.2.4 Assessment tasks that carry marks

The student participants were asked to report on how they experienced and/or viewed assessment tasks that carried marks (e.g., tests, assignments, examination, etc.)

The majority of the participants [95%, (42)] reported that they were satisfied with those assessment tasks that carried marks (summative assessment tasks). Some specified that such assessment tasks motivated them to put extra effort into their studies, and to stay committed.

S P2: "I feel that they are necessary. For me I prefer if assessment caries marks, because it motivates me to study for the assessment and thus motivates me to actually get sit down and study my work."

S P10: "I take it seriously because it carries marks."

S P37: "It motivates me to study hard and improve on my mark."

Some reported that being motivated improved their marks and performance.

S P35: "Good, because they improve my chances of passing and give me a fair chance to proceed further with my studies."

S P37: "It motivates me to study hard and improve on my mark and performance."

Others indicated that such summative assessment tasks would determine whether or not they had passed or failed the module, and that the marks obtained reflected their progress and performance in the module. Others referred to summative assessment tasks as adding value to their learning due to the research they were required to carry out for certain assignments.

S P13: "It helps me to know if I have passed or not."

S P20: "I am able to know my progress in the module and get my DP for exams."

S P44: "I feel that some of these tasks are building blocks for our marks and I feel that assignments are essential because of the research we do."

However, one participant felt that such summative assessment tasks were stressful if students were given insufficient time to complete the assessment tasks. Another participant reported that some lecturers failed to provide them with enough information about the content and assessment criteria that the assessment tasks would cover. These issues caused them to achieve lower marks or to fail.

S P6: "They are bit fair but the problem arises when we have to work under pressure, tests and assignments cramped into a space of 2 weeks, there is not enough time to study or do proper research."

S P7: "It comes with a lot of stress and the time is very little so I sometimes don't finish the test."

S P40: "My lecturer don't give scope and I get low marks because what I study does not appear in the test."

During the focus group interviews all the student participants [100%, (7)] confirmed that they were satisfied with assessment tasks that carried marks (summative assessments). The new reasons provided were that it prepared them for real-life situations [28.5%, (2)]; and set a standard and benchmark for students [14.2%, (1)].

S P1: "I think they really help, because it sets a standard and a benchmark for you to quickly be assessed yourself in terms of the world standard."

S P2: "I think that they do help. Semester tests and exams, like they prepare you for the real life like reality challenge."

S P3: "I actually prefer assignments, because that's more real world scenarios."

One participant [14.2%, (1)], however, reported that not all the assessment tasks that carried marks prepared them for the corporate world because some were purely theoretical and had no practical content.

S P6: "Yes, I think assessment that carry marks, are there to test us based on what was covered on the semester. But not there to prepare us for corporate world because sometimes you reach a point where you have a degree, but you don't know what is. You passed all the tests and exams, but when you get to the company, there's nothing you can do... They are very serious."

The majority of the student participants emphasised that they were interested in assessment tasks that carried marks (e.g., tests, examination, assignments, etc.) (see 4.6.2.1, 4.6.2.2, 4.6.2.3). The reason was that they were motivated to study harder (see 6.5.2.4). This is a good indication that the lecturers were providing their students with appropriate summative assessment tasks. The common views by the participants regarding assessment tasks that carried marks were that they tested their level of understanding and knowledge, and determined their progress and performance in the IT modules, as confirmed by some researchers (see 2.2.6.2, 2.9.1). For summative assessment to be effective, lecturers must provide reason(s) why they are carrying out assessment of learning and whether or not students are ready for assessment (see 2.9.1.1) as well as clarification of what students should learn or expect (see 2.9.1.1). In my opinion, problem-solving scenarios and practical activities should be encouraged since they depict authentic learning (see 2.3.2). When students are able to put into practise the knowledge they have acquired they become employable because IT is a more practical discipline (see 4.4.1, 4.5.1.5, 4.5.2.2, 4.5.3.2, 4.5.3.3). Regarding the participant who mentioned that not all the assessment tasks prepare them for the real world due to its theoretical nature, I can state that IT assessment tasks should be created in a way that students would be enabled to acquire both theoretical and practical knowledge, because without theoretical knowledge, students' practical knowledge will soon become outdated (see 4.2, 4.4.1).

6.5.2.5 Assessment tasks that do not carry marks

The student participants were asked to report as to how they experienced and/or viewed assessment tasks that did not carry marks (e.g., class tests, class assignments, etc.)

Reasons provided for assessment tasks that did not carry marks included that such formative tasks prepared students for other tasks that do carry marks (e.g., examinations). Some viewed these tasks as a tool to increase students' knowledge and understanding due to the extra reading and research they require.

S P1: "I feel such activities are also good to carry out because it gets us prepared for main tests and exams which count for marks."

S P3: "…this will help you to gain knowledge and understand the work in a subject better through extra work and the research."

Some students also mentioned that these tasks reflect the learning progress of students, create an opportunity for students to ask questions and seek clarification on some specific topics, provide opportunities for students to identify their problem areas, and assist them to practise consistently in order to improve their understanding of the module content.

S P10: "It shows me if I am progressing in the module."

S P20: "I am able to work on my own and if there is something that I don't understand I can ask my lecturers to explain."

S P25: "For example in programming, my lecturer give us exercises which I practice all the time. I am now doing better in this module."

S P40: "It helps me to do some practice exercises."

However, other participants [7%, (3)] complained that some lecturers tended to ask easy questions in the assessment tasks that did not carry marks, which did not reflect that which would appear in assessment tasks that did carry marks. One participant [2%, (1)] was not motivated to do such tasks since they did not add any marks to the predicate.

S P15: "Waste of time/practice because the questions are always easy."

S P19: "I feel a lot more comfortable although the problem is if I know they aren't for marks and DP I might feel less inclined to study hard."

S P30: "My lecturers always ask easy questions in practice exercise but when it is exams it is different."

During the focus group interviews the majority of the student participants [57.1%, (4)] reported that they were happy with the assessment tasks that did not carry marks (formative assessment). No new information emerged from this question; this indicated confirmation of the information gathered from the questionnaire survey.

Assessment tasks that do not carry marks should be well implemented at the CTI IT Faculty in order to improve students' learning. Since one participant indicated that they were not motivated to do assessment tasks that did not carry marks, lecturers need to make those assessment tasks more interactive and engaging (see 2.3.1, 2.3.2, 2.4.2, 2.9.2.1.4). IT lecturers need to provide reason(s) why they carry out any form of assessment and whether or not students are ready for the assessment. Furthermore, they need to explain the procedures that may make it likely for students to prove their competencies or capabilities (see 2.9.1.1, 2.9.1.2, 2.9.3.2).

6.5.2.6 Peer assessment tasks

The student participants were asked to report on their experiences and/or views on peer assessment tasks.

The majority of the student participants [93.1%, (41)] reported that they were satisfied with peer assessment tasks. Some specified that such assessment tasks ensured team building, the ability to learn from each other (share ideas), and the ability to receive constructive feedback from peers who could be more knowledgeable about the task. Some reported that peer assessment tasks helped them to identify their own strengths and weaknesses pertaining to the task being assessed.

S P6: "It helps me to learn from my friends and work together as a team."

S P7: "It is a good thing because we get to see the other person's weaknesses and strengths, and we can also give help as classmates to other kids."

S P26: "Peer assessment allows you to be evaluated by more than just the lecturer, thus you can get more comments and know how you can improve."

S P37: "I enjoy peer assignments because we work together and try to help one another."

S P41: "Peer assessments have been the most effective form of assessment because they provide easier way of learning and everyone has an opinion."

However, some participants indicated that they were not satisfied with peer assessment tasks. Reasons provided were that such assessment tasks were not fair since students tended to assess based on their emotions and/or friendships [2%, (1)]; that their peers were not experts in the module they were assessing [2%, (1)]; and that they struggled to concentrate since they were dealing with their peers [2%, (1)].

S P2: "I feel it is unnecessary. Assessment of students should be done by the lecturers, because students tend to assess peers based on their relationship with another student."

S P39: "I always don't take it serious because they are my friends I don't concentrate."

S P44: "I don't enjoy doing it because my friends can be bias and so it is not fair. Lecturers know the subject better so they should mark my work."

The majority of the student participants in the focus group discussion [85.7%, (6)] confirmed that they were not happy with peer assessment (see 2.9.3.2, 2.9.3.2.1). This refuted the confirmation made by the participants in their questionnaire survey. One participant [14.2%, (1)] reported that peer assessment might cause conflict among peers when they feel they have been unfairly assessed [14.2%; (1)].

S P2: "I will actually say I don't like that assessment because I think that creates some sort of a conflict if other students feel that they were not fairly assessed. Destroy relationships."

Although most of the participants were interested in peer assessment, some participants were not interested in peer assessment tasks. In my opinion, peer assessment is important since this could enhance students' learning (see 2.9.3.2) if implemented well. One student participant mentioned that peer assessment was not fair because students tended to assess based on their relationship with others. I suggest that lecturers put in place proper procedures during peer assessment. Students' decisions should be concealed from one another and students should be selected randomly to avoid unfair decision making and evaluation (see 2.9.3.2). Lecturers need to be familiar with the types of students in their classes in order to design appropriate assessment tasks (see 2.4.10.1, 2.4.10.2, 2.4.10.3, 2.4.10.4).

6.5.2.7 Self-assessment tasks

The student participants were asked to report on their experiences and/or views of self-assessment tasks.

The majority of the participants [95%, (42)] stated that they were satisfied with self-assessment tasks. Reasons provided included that this enabled them to identify their own strengths and weaknesses; to determine their progress in the module; and to know their level of understanding and knowledge.

S P3: "Self-assessments are fun to do because it shows you how far you have developed and how much you have gained in knowledge."

S P20: "If I do this, I will know if I am doing good in my subject and I will study harder."

S P34: "I am able to know my strengths and weaknesses."

S P39: "It puts me in charge of when and how I study."

S P40: "Helps me understand work on my own."

Some reported that such tasks motivated them to learn harder; to take responsibility for their own learning; and to prepare them for assessment tasks that carried marks (e.g., examinations and tests).

S P30: "It helps me to put more effort in my studies."

S P35: "Self-assessment helps me to be in charge of my own studies."

S P44: "When I do self-assessment it gets me ready for test and exams."

However, some student participants were not happy with their self-assessment tasks. One participant [2%, (1)] reported that he/she found it difficult to identify his/her own mistakes or problems when doing self-assessment tasks. Another participant [2%, (1)] claimed to be less committed and did not take these assessment tasks seriously.

S P15: “I am unsure of how to assess myself as I always feel like I don’t give the correct answers even though my results show different. I can’t find problems on my own.”

S P32: “I will be lenient on myself so I don’t do it.”

During the focus group interviews, the majority of the participants [57.1%, (4)] confirmed that they did not “like” self-assessment and this refuted the confirmation of the participants during the questionnaire survey. Two participants [28.5%, (2)] reported that they were not motivated to do such assessment tasks.

S P3: “I cannot assess myself because I will not be motivated to do that.”

S P4: “I am not motivated to do them. I don’t like it.”

Self-assessment tasks were of interest to the majority of the participants who responded to the questionnaire survey. However, that was not the case during the focus group interviews. Some of the views mentioned by the participants regarding self-assessment were that it tested their level of understanding and knowledge, and determined their progress and performance in the IT module, as confirmed by some researchers (see 2.9.3.2). However, other participants reported that they were not motivated to do such tasks, and another specified that he/she did not take self-assessment seriously. I believe that the reason for students’ lack of motivation to do self-assessment was confirmed by the lecturer participants (see 6.5.1.6). Since students were aware that self-assessment would enhance their performance once they have identified the gaps between their current and desired performance, they would be encouraged to focus more on their own work (see 2.9.3.2). Furthermore, with self-assessment, students would be able to think critically and become life-long learners (see 2.9.3.2). In other words, students would indeed become better learners and improve their learning if they did self-assessment. I would entreat the lecturers to play a role in this form of assessment. The role of lecturers in self-assessment is to help students to develop effective self-monitoring strategies and ask themselves honest questions that will guide them to succeed in their learning. I believe that if self-assessment is implemented well, student learning could improve (see 2.9.3.2).

6.5.2.8 Baseline assessment

The student participants were asked to report on their experiences and/or views of baseline assessment.

The majority of participants [98%, (43)] reported that they were happy with baseline assessment tasks. Some specified that such assessment tasks prepared them for assessment tasks that carried marks; assisted them to determine their performance and progress of their own learning; helped them to identify their own strengths and weaknesses; and helped them to identify their own level of understanding of the module.

S P2: "They contribute in helping me prepare for serious assessments that have marks."

S P11: "They are a good thing to perform in order to test my level of understanding and studying progress."

S P20: "They help us to see how much we know about the course or about the module."

S P24: "The assessors are also able to know which learners within the specific module that they are giving out have a better understanding."

Some students agreed that baseline assessment would assist their lecturers in determining the teaching approach to use in class.

S P21: "I think it is a great way for the lecturer to get a "feel" of what his/her students are struggling with and to get a view of the class's overall knowledge of the module/subject. In this way he will know how to teach."

S P40: "The lecturers will know the teaching method to use if he sees that many of the students are having problems."

However, one participant [2%, (1)] was of the view that the content of baseline assessment was not always based on the scope of the module that they were doing.

S P30: "It is always out of scope."

During the student focus group interviews no new information emerged from this question, which indicated confirmation of the information gathered from the questionnaire survey.

When designing baseline assessment tasks, lecturers need to be familiar with the types of students they have in order to design appropriate assessment tasks (see 2.4.10.1, 2.4.10.2, 2.4.10.3, 2.4.10.4). This would enable lecturers to apply the appropriate method of teaching.

6.5.2.9 Preferred form(s) of assessment

The student participants were asked to report on their preferred forms of assessment.

Table 6.10: Summarised responses from the student participants regarding their preferred form of assessment

Responses (Preferred form of assessment)	**Frequency (%)**	**Number of participants who responded to this question**
Assessment tasks that carry marks	65.9 *(n=29)*	*n=44* (100%)
Self-assessment	11.3 *(n=5)*	
Baseline assessment	9 *(n=4)*	
Peer assessment	6.8 *(n=3)*	
Assessment tasks that do not carry marks	6.8 *(n=3)*	

The majority of the student participants reported that they preferred assessment tasks that carried marks. Reasons provided included that it motivated them to work harder and pass well due to the reward aspect (marks); the assessment was fair because it was drafted by an expert; it enabled them to measure what they had learned and how they learn; and it helped them to attain the predicate required for the examination.

S P5: "Assessments carrying marks. I feel that the reward of doing well is a good motivation."

S P9: "Assessments that carry marks because they force me to prepare in advance and with careful attention."

S P13: "It helps me to know if I have passed or not."

S P20: "I am able to know my progress in the module and get my DP for exams."

S P25: "I like assessment that has marks because I will know if I am learning well or not."

S P30: "Assessments that carry marks are better, because they motivate me to study hard and I get my grades."

S P44: "I like assessment task that carry marks because the lecturers know the subject better and will mark it fairly."

The five (11.3%) participants who preferred self-assessment reported that they were able to identify their own strengths and weaknesses [6.8%, (3)], and it prepared them for assessment tasks that carried marks [4.5%, (2)].

S P29: "self-assessment helps me to know my problems and strong points."

S P32: "Self-assessment is a good thing because it prepares you for the exams and test."

S P37: "Self-assessment helps me to know my weaknesses and strengths in the subject."

Participants that preferred baseline assessment mentioned that they were able to determine their level of understanding and the knowledge of the module [6.8%, (3)], and their progress [2%, (1)].

S P11: "Baseline tasks. It is a good thing to perform in order to test my level of understanding and studying progress."

S P26: "Baseline assessment because I get to know my understanding and the knowledge of the subject."

Three of the student participants indicated that peer assessment enabled them to learn from their peers [6.8%, (3)].

S P1: "Peer assessment because I can learn from my friends."

S P38: "Peer assessment, they are a fun way of learning and more information is acquired than when you are on your own."

Lastly, the few student participants that preferred assessment tasks that do not carry marks reported that it prepared them for assessment tasks that carried marks [4.5%, (2)] and created an opportunity to learn [2%, (1)].

S P10: "…assessment tasks that do not carry marks prepare you for tasks that carry marks and it's like a trial run."

S P13: "I practice with assessment tasks that do not carry marks so that I do well in exams."

S P40: "Tasks that don't carry marks because I can use it to study."

During the student focus group interviews no new information emerged from the reasons why they preferred certain assessment tasks, and this indicated confirmation of the information gathered from the surveys. Their preferred forms of assessment also corresponded to that of the responses obtained from the student questionnaire survey.

The majority of the student participants emphasised that they were interested in assessment tasks that carried marks (e.g., tests, examination, and assignments) (see 4.6.2.1, 4.6.2.2, 4.6.2.3). The reason was that they were motivated to study harder. I believe that all the forms of assessment articulated above are important since they can improve students' learning (see 2.2.6.2) if implemented well. IT lecturers need to provide reason(s) why they are carrying out any form of assessment and whether or not students are ready for the assessment.

Furthermore, they need to explain the procedures that they deem likely for students to prove their competencies or capabilities (see 2.9.1.1, 2.9.1.2, 2.9.3.2).

6.5.2.10 Types of assessment task that IT students do

The student participants were asked to report on the types of assessment task (e.g., tests, exams, assignments, etc.) that they do in IT modules and their experience of each type of task.

All the student participants [100%, (44)] confirmed that they were assessed through various types of assessment tasks. The types of assessment tasks that they performed in their IT modules were mostly tests, assignments/projects and examinations.

S P1: "We are accessed mostly about continues assessment tests and main projects."

S P19: "Tests, semester test, exams and one assignment."

S P22: "We do all of them."

S P29: "Assignments."

S P33: "Tests, Exams, Assignment and continuous assessment."

S P44: "The tests and assignments."

Some mentioned that tests and examinations prepared them for the real world (the IT industry) and assisted them in identifying the difficulties that they faced in studying the module.

S P19: "The tests help you to prepare for the work place."

S P22: "The exams and tests have scenario questions so it prepares us for the real world."

S P33: "Tests, Exams, Assignment and continuous assessment. I feel that they are very fair because they determine what I have learned and the problems I have with the subject."

S P44: "The tests and assignments are good because I can see if I am struggling with the subject or not but the time is always too short and I get low marks."

Some reported that such types of assessment tasks motivated them to study well; acquire more knowledge about the module; assess their knowledge and level of understanding (competency); and assess their own performance.

S P2: "I study hard when it is time for exams and test."

S P20: "When I write test and exams it helps me to know more about the subject."

S P25: “Sometimes I think I know the module well but when we write a semester test I am able to determine if I really understand it and have more knowledge about it.”

S P30: “I don’t joke with exams. I study hard for it and I am able to know my performance.”

S P40: “Continuous assessment helps me to determine my understanding and knowledge of the module I am doing.”

Some student participants indicated that assignments/projects helped them to improve their research skills and to acquire practical experience of the module, which would prepare them for the real world.

S P1: “The project assessment in Software development helps us to grow in terms of working with others in the working field.”

S P19: “The assignment is a nice research opportunity that helps you go out and learn about something related to your study field but see how it’s implemented in the real world.”

S P29: “Assignments, because I always learn more during the process of doing assignments. I get practical experience and improve my research skills.”

S P33: “Tests, Exams, Assignment and continuous assessment. I feel that they are very fair because they determine what I have learned.”

However, one participant [2%, (1)] mentioned that he/she was sometimes not given enough time to do these tasks, which resulted in low marks.

S P44: “The tests and assignments are good because I can see if I am struggling with the subject or not but the time is always too short and I get low marks.”

During the focus group interviews no new information regarding the types of assessment tasks emerged from this question, and this indicated confirmation of the information gathered from the questionnaire survey.

The most common types of assessment tasks identified by the students were tests (see 4.6.2.3), assignments (see 4.6.2.2), projects (see 4.6.2.2), and examinations (see 4.6.2.1). Some participants were of the opinion that these types of assessment tasks motivated them to study hard and tested their level of understanding and knowledge of IT (see 4.3.1.1). Others reported that assignments and projects tested their practical skills which prepared them for the real world, as confirmed by the literature (see 2.6, 2.6.1). This is a good indication that the CTI IT lecturers are using appropriate assessment tasks in assessing their IT students.

However, one participant [2%, (1)] mentioned that he/she was sometimes not given enough time to prepare for these tasks, which made it stressful and difficult to obtain better marks. In my opinion, if students are not given sufficient time to complete an assessment task, then that assessment is not feasible and/or practicable (see 2.6.2.4). Students should be given appropriate time limits since too little time could result in students taking a surface learning approach, and this should be avoided (see 2.2.3, 2.2.3.2).

6.5.2.11 Format of instructions for assessment tasks

The student participants were asked to report on whether they get the instructions for their assessment tasks in printed format (e.g., in a study guide, etc.) or on myLMS

Predominant opinions [77.2%, (34)] from the participants showed that they obtained instructions on myLMS, which was a good indication that students and lecturers were making use of the e-assessment platform.

S P1: “The lecturers put our assignments instructions on myLMS so you can download it from anywhere.”

S P5: “The instructions for computer skills test are found on myLMS. I usually download it from home”

S P8: “From myLMS. You are required to download the study materials and assignment specifications at your own time.”

S P17: “…myLMS, we have to download them the assignment resources and resources.”

S P30: “…we get the assignment and project instructions on myLMS.”

Some indicated that they downloaded these instructions from myLMS for easy accessibility (anytime, anywhere).

S P1: “The lecturers put our assignment instructions on myLMS so you can download it from anywhwere.”

S P5: “The instructions for computer skills test are found on myLMS. I usually download it from home”

S P8: “From myLMS. You are required to download the study materials and assignment specifications at your own time.”

S P17: “myLMS, we have to download them the assignment resources and resources.”

S P30: “…we get the assignment and project instructions on myLMS.”

Some also stated that resources required for their modules were uploaded on myLMS by lecturers.

S P2: “The assignments are uploaded on myLMS.”

S P13: “On myLMS we can see our study guides, assignment and module outline”

S P15: “My assignments and study guides are all on myLMS.”

S P27: “I get my books and assignment on myLMS.”

S P40: “We get the assignment on myLMS.”

Other suggestions obtained from the student participants were that instructions were received in printed format [11.3%, (5)], lecturer slides [4.5%, (2)], verbally [2%, (1)], and on the campus server [2%, (1)]. The printed format enabled them to make notes on these pages. The participant who stated that he/she received instructions verbally indicated that it ensured that everyone had access to the same instructions since this was done during class time.

S P10: “Everything is printed so that I can make my notes and rough work on it.”

S P21: “Both in study guides and myLMS.”

S P23: “No we get them from campus server.”

S P29: “On paper.”

S P42: “Sometimes the lecturers use their slides to show us the instructions.”

S P44: “…verbally in class during the test. The lecturers do this so that everyone will hear the same thing at once.”

One student participant [2%, (1)] specified that he/she did not use myLMS because the lecturers did not use it.

S P43: “I don’t use myLMS because the lecturers don’t use it.”

During the focus group interviews no new information regarding the format of instructions emerged from this question, and this indicated confirmation of the information gathered from the questionnaire survey.

I would like to entreat all the CTI IT lecturers to move from the printed format of providing instructions for their assessment tasks instructions to myLMS, which some lecturers are already doing. This will save time and minimise the cost of printing, as confirmed by the literature (see 3.3.1).

6.5.2.12 Knowledge and skills in IT

The student participants were asked to report on the extent that the types of assessment tasks that they did, tested their knowledge and skills in IT.

The student participants' views proved that the types of assessment tasks that they performed tested their knowledge (see 2.2.6.2) and skills in IT (see 4.6.1). All the student participants [100%, (44)] confirmed that the types of assessment tasks that they performed tested their knowledge and skills in IT. Reasons provided included that they were able to understand their own capabilities [2%, (1)]; applied what they had learned (e.g., assignments/projects) [13.6%, (5)]; and prepared them for the industry (e.g., assignments/projects) [31.8%, (14)].

S P1: "It helps improve my studying skills and apply what I study in each module."

S P9: "They do tests my knowledge and skills to prepare me for the corporate world."

S P10: "The projects are practical so I can easily apply the theory that I study."

S P27: "They help me to understand my capabilities, strengths and weaknesses."

S P31: "Assignments and practical exams are, for me, the best way to test the practical knowledge or skills of the IT work."

Some reported that their time management skills [11.3%, (5)], report writing skills [18.1%, (8)], leadership skills [11.3%, (5)], and communication skills [6.8%, (3)] improved through peer assessment tasks (such as presentations), assignments/projects and deadlines that came with the assessment tasks.

S P11: "…better writing skills because I do projects every semester."

S P15: "Practical and theory. They assist with leadership skills in group assessments, they also teach you time management with deadlines as well as report writing based on assignments."

S P30: "When I do presentations my communication skill gets better. I was a shy person but now I can boldly talk in front of people."

S P41: "My research skills is better because of the project."

S P44: "I think I now stick to my time because of the assignments and presentations."

Furthermore, one participant [2%, (1)] mentioned that tests and examinations provided him/her with the theoretical background required to do the practical work (see 4.2, 4.3.1.1).

S P25: “Without the test and exams I will not be able to do the practical assignments. I have to understand the theory before I do the practical.”

One participant [2%, (1)] stated that the continuous assessment tasks assisted him/her to gain an in-depth understanding and knowledge of the module since it covered the entire content of the module.

S P19: “Continuous assessment gives me more understanding because it the lecturers make sure that every topic is in the assessment.”

Another participant [2%, (1)] stated that the different formats of the assessment tasks improved his/her skills and knowledge of IT since they tended to learn something new from time to time.

S P29: “Every lecturer does the tasks in different way and I have learned new things.”

During the student focus group interviews two participants [28.5%, (2)] reported that the assessment tasks they performed did not always test their knowledge and IT skills. This refuted what was reported by the student participants in their questionnaire survey. One of these two participants indicated that most of the time the questions provided in the assessment tasks were not real-life scenarios and did not require critical thinking, merely recall.

S P2: “I think sometimes they don’t help, because maybe on the examination they can test, you... With the different things than a real life situation and you only memorise without critically thinking about them. So exams are normally theory which is not practical and so no critical thinking is needed. We just memorise and write the answers. In real life situation, maybe you know how to do some of the things, but what they ask you on the exam, that’s not what you know.”

S P3: “Like I think they don’t help sometimes.”

The confirmation and reasons provided by the participants in their questionnaire survey and the subsequent focus group interviews indicated that the types of assessment tasks that they did tested their knowledge and skills in IT, this clearly indicated that the CTI IT lecturers were implementing these assessment tasks appropriately. I would entreat the lecturers to also design the assessment tasks with the students in mind because assessment tasks will meet their needs if the lecturers are aware of the types of students they have in their classrooms (see 2.4.10.1, 2.4.10.2, 2.4.10.3, 2.4.10.4). However, regarding the issue raised by the student participants during the focus group interviews, lecturers should attempt to avoid assessment tasks that only require recall (surface learning approach) (see 2.2.3, 2.2.3.1, 2.2.3.2) as students tend to forget the study material once the assessment task has been completed.

6.5.2.13 Short-answer questions that IT students have to answer

The student participants were asked to report on their experiences and views of short-answer questions that they have to answer in IT assessment tasks (e.g. true/false questions, multiple-choice questions, etc.) and whether these short-answer questions in fact tested their level of understanding of what they had learned (in other words, were they too easy or too difficult, or neither of these two?)

The majority of the student participants [95.4%, (42)] confirmed that short-answer questions tested their level of understanding of what they had learned. They indicated that short-answer questions were too easy [81.8%, (36)], too difficult [9%, (4)], or neither of the two [4.5%, (2)].

S P2: “Easy way to get marks to increase my DP.”

S P4: “I feel they are too easy.”

S P7: “It is good but people only guess the answers because it too easy.”

S P10: “They are not always easy and not always difficult.”

S P22: “No they are not too easy as they still require one to have a good knowledge of the subject matter.”

S P37: “Sometimes they are difficult and sometimes too easy. It depends.”

S P41: “It can be easy or difficult.”

S P43: “They can be difficult sometimes but I like it.”

Reasons provided were that they were adequately prepared for such assessment tasks, which helped them to acquire knowledge, boost their confidence to attempt long-answer questions, and save time.

S P1: “Yes it does test my knowledge based on the module as it makes me study hard and think broadly before attempting to answer.”

S P13: “They are a great way to boost confidence just before you go to the hard questions.”

S P22: “They still require one to have a good knowledge of the subject matter.”

S P33: “They test our knowledge about how much we know about the module.”

S P35: “I don’t waste time because they [are] always short.”

S P39: “I don’t mind them. They test my general knowledge of the module because I prepare for it.”

S P44: “I finish quickly because they are just multiple choices.”

Some reported that with short-answer questions, marks were easily obtained; the impact of lower marks did not affect the predicate since marks allocated for these types of questions did not amount to much; the assessments were fair and a good alternative way to improve student learning.

S P2: “Easy way to get marks to increase my DP.”

S P5: “I don’t feel bad when I get low marks because it does not really affect my DP.”

S P12: “The questions are fair because they are straightforward.”

S P13: “They are a great way to boost confidence just before you go to the hard questions.”

S P28: “I use it as practice to improve the way I study.”

S P38: “I like short questions because you don’t use a lot of time and it only counts 10% of our assessment. It helps you to know your performance and improve on it if you are not doing well.”

However, some participants indicated that short-answer questions did not test their knowledge and competency. Reasons provided were that students could easily guess the answers [2%, (1)]; and that they could merely memorise concepts just to pass without gaining an in-depth understanding of these concepts [2%, (1)].

S P4: “I feel they are too easy, and do not test knowledge. Simply listing items does not guarantee that you know what the importance of those items is.”

S P7: “It is good but people only guess the answers.”

S P19: “I like it but I can just memorise the work and pass but will not understand it.”

One participant [2%, (1)] advised that lecturers should develop short-answer questions based on the nature of the module that they teach since short-answer questions were not suitable for all modules.

S P41: “I don’t think it is good for all subjects. For example, programming is practical and short answer questions will be useless. The lecturers should ask short answer questions for theory modules like networking.”

During the focus group interviews the majority of the student participants [71.4%, (5)] confirmed that short-answer questions did not test their level of understanding of what they had learned. This refuted what was reported by some participants in the questionnaire survey. Reasons provided were that it was too easy [14.2%, (1)]; it was confusing due to the related possible answers to the questions [14.2%, (1)]; that it limited students' thinking abilities [14.2%, (1)]; and that it did not promote critical thinking since students only had to rely on recall [14.2%, (1)].

S P4: "I also think sometimes they are confusing, because there was this time, they ask us to choose two questions and we don't know what to choose."

S P5: "I don't like it, it's too easy. It simplifies everything way too much. I mean what exactly you're assessing."

S P6: "I think they limit our thinking skills because of the nature of the question they ask."

S P7: "It doesn't help towards your critical thinking, it just helps with recall. If I can recall then, ja, I can."

According to some of the student participants short-answer questions (e.g., true/false questions and multiple-choice questions, etc.) tested their level of understanding and knowledge of the IT modules that they were studying, which ultimately improved their learning. These views were confirmed in the literature (see 3.3.4). However, some participants stated that short-answer questions did not test their knowledge since they could easily guess the answers and merely memorise concepts in order to pass. My opinion on this is that if lecturers are appropriately trained on student assessment, they would be able to design short-answer questions that would require students to apply a deep-learning approach (see 2.2.4.1, 2.2.4.2, 3.3.4) and not merely memorise concepts (see 2.2.3.1, 2.2.3.2). IT lecturers need time to create questions that would help students in their learning (see 3.3.4). Regarding the confusion of related answers in short-answer questions, students need to apply a deep learning approach (see 2.2.4, 2.2.4.1, 2.2.4.2) instead of recall (see 2.2.3, 2.2.3.1, 2.2.3.2). They would then be able to choose appropriate answers without getting confused.

6.5.2.14 Students' knowledge about what and how they will be assessed and assessment information they are provided

The student participants were asked to report on the extent to which they were informed about what content they would be assessed on, how they would be assessed (e.g., the types of questions that would be asked and/or the criteria according to which they would be assessed) and the assessment information they received from their IT lecturers.

Table 6.11: Summarised responses from the student participants about the extent to which they were informed about the content they would be assessed on, and how they would be assessed

Responses **(Extent to which students were informed about the content that assessment tasks would cover)**	**Frequency (%)**	**Number of participants who responded to this question**
A week before an assessment	56.8 *(n=25)*	*n=44* (100%)
Days before an assessment	18.1 *(n=8)*	
A month before an assessment	11.3 *(n=5)*	
Often	9 *(n=4)*	
Not often	4.5 *(n=2)*	
Responses (Extent to which students were informed about how they would be assessed)		
Often	22.7 *(n=10)*	*n=44* (100%)
Beginning of the semester	45.4 *(n=20)*	
Month before an assessment	11.3 *(n=5)*	
Week before an assessment	13.6 *(n=6)*	
Not often	6.8 *(n=3)*	

The majority of the participants [95.4%, (42)] confirmed that they were informed in advance about the content that an assessment task would cover. Some participants specified that their knowledge of the content that an assessment tasks would cover, provided them with enough time to prepare [68.1%, (30)]; gave them the opportunity to consult their lecturers on content they did not understand [4.5%, (2)]; and helped them to focus on the most important content in order to achieve better marks [18.1%, (8)].

S P1: "Mostly a week before and they do that to give us time ahead to study and prepare for the assessment."

S P3: "The scope helps us to prepare very well. Maybe a month before the test."

S P8: “They give us what to concentrate on, like the chapters and I am able to go them to explain the things I don’t understand.”

S P24: “They inform us on all the chapters that will be covered for the different tasks a week to the test.”

S P31: “They give us scope, so that we can be fully prepared for the test or an assignment when it is some days to write the test.”

S P40: “The scope helps us to focus on the important topics to get higher marks.”

Some participants [4.5%, (2)] reported that the lecturers informed them of the chapters to concentrate on for the assessment tasks.

S P8: “They give us what to concentrate on, like the chapters and I am able to go them to explain the things I don’t understand.”

S P24: “They inform us on all the chapters that will be covered for the different tasks a week to the test.”

Some students [4.5%, (2)] were, however, of the opinion that the content provided by some lecturers was too vague and did not help them in any way.

S P9: “They sometimes give you a scope but you end up studying everything so it does not help.”

S P30: “My lecturer always tells us to study everything without telling us the exact topic or chapter to cover. I don’t see how that will help me.”

The majority of the participants [93.1%, (41)] confirmed that they were informed in advance about assessment criteria according to which they would be assessed. Some of the participants indicated that their awareness of how they would be assessed prepared them for the assessment [43.1%, (19)], and helped them to focus more on important concepts [34%, (15)].

S P1: “Mostly a week before and they do that to give us time ahead to study and prepare for the assessment.”

S P3: “The scope helps us to prepare very well. Maybe a month before the test.”

S P37: “…also a week before to get us prepared and know what to expect.”

A number of participants reported that some lecturers discussed the criteria against which the assessment task would be marked [11.3%, (5)], and that rubrics were sometimes attached to the assessment task [6.8%, (3)].

S P5: “We are told how the assessment will be marked.”

S P35: “Some lecturers give us the criteria they will use for the marking.”

S P39: “We normally get the rubric for the assignment.”

Furthermore, student participants indicated that some lecturers went through past examination papers with them [2%, (1)]; created mock tests in examination format for students to attempt in class [2%, (1)]; and provided the class with the types of questions they could expect [2%, (1)].

S P7: “They go through previous examination papers with us in class.”

S P19: “They give us class test that is set up in the same format as the exams. This is done often.”

S P24: “Sometimes they would give information of what question we can expect and what would be expected of us to know for the assessment.”

S P32: “Types of questions that will be asked, because they always give activities that are based on the exam.”

During the focus group interviews some new information emerged. One participant [14.2%, (1)] reported that some of the lecturers did not provide them with specific assessment information but that, in class, some lecturers would call attention to certain segments of the content that they should take note of. Two participants [28.5%, (2)] complained that some of the lecturers provided them with incorrect information.

S P5: “Some of the lecturers give you like direct scope in class né Sir, and then when you get to the exam, you find out like, they tricked you yes.”

S P6: “Some lecturers will say, why did you listen to me, it was more of a guideline. No it’s not, you said it was scope. They give to us when teaching in class.”

S P7: “I think that they some do in terms of what the lecturers tell you in class, if it is made on a particular aspect, in class but as a student, some student can take note, but some can’t. So if you can’t take note while listening to the lecturer then that will be a problem.”

The student participants highlighted that the assessment information that they received from their IT lecturers was based on the content that the assessment would cover [34%, (15)]; when the assessment would take place [22.7%, (10)]; the marks to be allocated [6.8%, (3)]; the question types [2%, (1)]; the criteria to be assessed [18.1%, (8)]; rubrics [6.8%, (3)]; the chapters that the assessment tasks would cover [4.5%, (2)]; and the structure of the assessment tasks [4.5%, (2)]. During the focus group interviews no new findings regarding the information that students received from their lecturers emerged from this question, and this indicated confirmation of the information gathered from the questionnaire survey.

S P1: "…when we will be accessed and the marks allocated to it in class."

S P7: "They go through previous examination papers with us in class."

S P10: "The chapters and content that the assessment will be based on. Sometimes they send e-mails to tell us what to prepare."

S P13: "Assignment rubrics are printed for us."

S P17: "The structure of assessment and the date are printed for every student."

S P39: "Which assessment criteria will be covered, but still we need more scope detail. Some of the lecturers put the information on the server."

S P40: "They inform us when the tests will be written and how they will be structured."

Regarding how assessment information was conveyed to them, the participants indicated that this was done in class [79.5%, (35)], through e-mails [4.5%, (2)], through the campus server [4.5%, (2)], and/or printouts [11.3%, (5)].

S P1: "…in class."

S P7: "…class."

S P10: "Sometimes they send e-mails to tell us what to prepare."

S P13: "…printed for us."

S P17: "…printed for every student."

S P39: "Some of the lecturers put the information on the server."

Although the majority of the participants indicated that they had knowledge of what they would be assessed on and how, some reported that they did not often receive such information. It is therefore important for the CTI IT lecturers to be aware that assessment should be fair (see 2.6.2.1), valid (see 2.6.2.2), and reliable (see 2.6.2.3), that students should be aware of the content (what) they will be assessed on, and the assessment criteria according to which they would be assessed. This is confirmed by the literature (see 2.7.3.2, 2.7.3.3, 3.2.10.2). Students were concerned that they were sometimes given the wrong information and that this should be avoided by lecturers. I suggest that a lecturer should truthfully inform the students that he/she has no knowledge of the assessment tasks rather than being deceptive. However, the institution should provide the assessment criteria and content (what) that the assessment would cover to all the relevant IT lecturers, which should be relayed to the students.

6.5.2.15 Feedback from IT lecturers and/or via myLMS system

The student participants were asked to report on the extent to which they received feedback from their IT lecturers and/or via the myLMS system on their performance in assessment tasks, and the type of feedback they received and how it was received.

The majority of the student participants [97.7%, (43)] confirmed that they received feedback on their performance in assessment tasks.

However, one participant [2%, (1)] reported that some lecturers did not provide any feedback, especially when a student obtained poor marks.

S P3: "Some lecturers don't give feedback when you don't do well. They only write poor."

Some participants reported that feedback was received from their lecturers in class (verbally) [63.6%, (28)]; individual appointments [4.5%, (2)]; through comments attached to their assessment tasks (in writing) [22.7%, (10)]; and via the myLMS platform (electronically) [9%, (4)].

S P2: "We get feedback that is fully discussed in class."

S P5: "Either through myLMS or they bring our scripts back with comments."

S P13: "My lecturers give verbal feedback."

S P15: "Lecturers give us feedback in class."

S P22: "We are told in class what we did and where we can improve our studies."

S P25: "Our assignments have feedback sheets so lecturers write comments there."

S P28: "We always get feedback from the lecturers in class and individual appointments."

S P32: "We get our assignments, tests and examination sheets back with feedback."

S P40: "Some lecturers give us feedback in their offices one by one."

Pertaining to the type of feedback, some participants indicated that their lecturers used the memorandum to make corrections in class [68.1%, (30)] and through scheduled one-on-one consultations [4.5%, (2)]. Some participants specified that feedback on student performance in assignments and tests was discussed with the students in class [18.1%, (8)] and information on how to improve on the assessment tasks was provided by the lecturer [9%, (4)].

S P2: "We get feedback that is fully discussed. When feedback is applied the lecturers discuss with us the assessment feedback and give us tip for improvement."

S P13: “My lecturers give verbal feedback and they discuss anything that was not properly understood.”

S P15: “Lecturers give us feedback in class. They discuss the memo.”

S P22: “We are told in class what we did and where we can improve our studies.”

S P32: “We get our assignments, tests and examination sheets back with feedback and marks and how to improve.”

S P40: “Some lecturers give us feedback in their offices one by one.”

One participant [14.2%, (1)] was specific during one of the focus group interviews in that he/she was not satisfied with the feedback he/she received from lecturers because it was too vague and the feedback information was insufficient.

S P7: “The feedback is given in class. Most of the lecturers, they tell you to redo a certain question in an assignment, that you got wrong. Is... Okay, I will redo it, but the reason I did it the way that I did it, was because I thought it was right. What did I do wrong? I mean I wouldn’t have done it, if I knew it was wrong. So I say that lecturers... One thing to give you an assignment back, okay do question one all over again. Like yes, but tell me how I should try to do it differently, and what exactly did I do wrong, why is this question wrong? Information is not enough and the feedback is not clear. That is something they usually don’t do.”

The feedback students received for their assessment tasks were mostly from their lecturers and not via the myLMS system. This was an indication that the lecturers may not have been aware of the correct procedures, or they were not appropriately trained (see 3.2.9.3, 3.3.10) to use the feedback mechanism available on myLMS. When lecturers use the myLMS system students will receive feedback without delay, which will empower them immediately (see 3.3.7). I believe that for feedback to be effective and enhance students’ learning, it should be timely. The timely provision of feedback is possible through myLMS (see 2.9.2.1.3, 4.7.1). Furthermore, when a student does not understand the feedback provided to him/her, then the feedback is of no value (see 2.9.2, 2.9.2.1.3, 2.9.2.2.3, 2.9.2.3, 2.9.3.1). Lecturers need to ensure that their feedback is well understood, and students should be able to improve on their work based on the feedback provided.

6.5.2.16 Impact of feedback on how students learn

The student participants were asked to report on the extent to which the feedback they received from their IT lecturers and/or on the myLMS system influenced how they learned afterwards.

The majority of the participants [95.4%, (42)] confirmed that the feedback they received from their lecturers "positively" influenced how they learned. Reasons they provided included that their study approach improved [23.8%, (10)]; they were able to determine their mistakes and subsequently correct them [50%, (22)]; they were motivated to work harder for better grades [7.1%, (3)]; they were able to pay attention to the areas that they struggled with and improve on them [7.1%, (3)]; and they gained a clearer understanding of the assessment task, which helped them to improve their performance in subsequent assessment tasks [9.5%, (4)].

S P1: "I was able to see the mistakes I did and corrected them."

S P2: "It helps us get to know how we should've answered a question or dealt with a specific task."

S P5: "By evaluating my mistakes in previous assessments I know where my knowledge is faulty and I can then rectify that."

S P15: "The feedback helped me to study harder to get good marks."

S P21: "It makes me see where I need to focus on and if it is possible to improve my marks."

S P35: "It shows me which areas I need to work on."

However, two participants [4.5%, (2)] reported that the feedback did not influence their way of learning since it was not detailed enough.

S P11: "It doesn't influence anything. They just write good or bad so I don't know what I did wrong."

S P44: "I don't understand my feedback because my lecturer does not explain anything."

During the focus group interviews, no new information emerged from this question and indicated confirmation of the information gathered from the questionnaire survey.

Some student participants indicated that the feedback they received from their lecturers improved their learning. This meant that the purpose of providing feedback (enhanced student learning) was being fulfilled because when constructive feedback is provided, students tend to perform well in their studies (see 2.9.2.1.3, 3.3.7, 4.6.2.2). The students' views corresponded to that of the lecturer participants (see 6.5.1.14, 6.5.1.15). However, some participants reported that the feedback they received from their lecturers did not influence their way of learning since it was not detailed enough. I will encourage the CTI IT lecturers to provide constructive and detailed feedback to their students because constructive feedback teaches students to learn from their mistakes and indeed improve their grades (see 2.9.2.1.3, 3.2.9.10, 3.3.7). In other words, constructive feedback is an authentic way of personal development.

6.5.2.17 Fairness of e-assessment tasks

The student participants were asked to report on the extent to which the e-assessment tasks based on the IT modules were deemed fair.

The majority of the student participants [97.7%, (44)] confirmed that the e-assessment tasks that they did in IT modules were fair. Reasons provided included that the same opportunity was given to all students; the same e-assessment tasks were written; the same resources were provided to them; it did not favour a specific group of students; the same information about the e-assessment was given to all; and there was consistent marking by the system.

S P1: "Fair."

S P2: "They are very fair and not advantageous to only some students but all students because it gives us all the opportunity to better our marks and improve our learning strategy."

S P3: "Yes. Every student in class gets the same assessment tasks, we take it at the same time and hand it in together."

S P8: "We have the same assessment and it is what of what we covered in class."

S P13: "The Internet did have good connection and makes it unfair."

S P34: "They are indeed fair because all students are assessed in the same way."

S P44: "We use the same type of computers and internet speed for the test so no bias."

Some participants mentioned that assignments, examinations, multiple-choice questions, true/false questions, programming, and database practical tests were fair e-assessment tasks.

S P1: "Exams, assignments and the tests are all fair."

S P12: "Assignments, exams. With tests you are not always sure what to study."

S P13: "Programming and database practical tests."

S P21: "True or false questions and multiple choice questions."

However, one participant [2%, (1)] reported that the e-assessment task (a test) was not fair because the infrastructure (Internet) was not reliable.

S P13: "The Internet did not have good connection and makes it unfair."

During the focus group interviews, one participant [14.2%, (1)] reported that the e-assessment tasks were not always fair. The reason was that sometimes lecturers did not inform students in advance that there would be an e-assessment task, and as a result they did not prepare properly.

S P1: “In the situation, they usually get asked them when we are unprepared or just a quick assessment. In that way, I think it is unfair.”

The majority of the student participants’ confirmed that the e-assessment tasks (assignments, examinations, multiple-choice questions, true/false questions, tests, etc.) were fair. This confirmed that their IT lecturers paid attention to the principle of good assessment in the e-assessment tasks that they provided for the students (see 2.6.2.1, 3.3.6.3). It also confirmed what the lecturer participants said about providing students with fair assessment tasks (see 6.5.1.16). In my opinion, when the principles of good assessment are applied in e-assessment tasks, students may be able to achieve their academic goals. This practice should therefore be encouraged across the CTI IT Faculty. However, some of the participants raised concerns about poor resources and the lack of infrastructure (such as poor Internet connection) which rendered e-assessment tasks unfair; this problem was also confirmed by the literature (see 3.2.8, 3.3.11) and by the lecturer participants (see 6.5.1.16). It is important that the necessary infrastructure and resources are made available before e-assessment tasks are carried out. This would ensure the practicability/feasibility of the e-assessment (see 2.6.2.4, 3.3.6.4). Regarding one participant’s issue of lecturers not informing them of assessment tasks (surprise tests) lecturers need to understand that assessment tasks should not be a “surprise.” Students should know when an e-assessment task will be taking place in order to adequately prepare (see 2.6.2.1, 3.3.6.3).

6.5.2.18 Content that e-assessment tasks cover (i.e. validity)

The student participants were asked to report on the extent to which the e-assessment tasks that they did in IT modules tested the content that had been covered in the relevant IT modules.

Most of the participants [93.1%, (41)] confirmed that the e-assessment tasks in their IT modules tested the content that they had already covered with their lecturers. Some participants specified that their tests, assignments, and examinations were always within the scope of the content that they had been taught.

S P1: “Exams and semester tests cover what we know.”

S P3: “They are all in the content of the module.”

S P5: “A high amount of our assessments are related to the work we are studying.”

S P19: “We were tested on what we learnt; it was based on the content of the module.”

S P22: “They test most of the contents we covered in the module.”

S P23: “They are good because they test us how much we know about the content that we have covered.”

S P30: “Tests, exams, assignments are all in the module.”

One participant [2%, (1)] reported that he/she learned the content of the assignment over time since the assignment covered most of the content that had not been covered in the module.

S P43: “I learn the assignment content as the lecturer teaches because we get assignment from day 1 of the semester and even though we know nothing about the module.”

However, two participants [4.5%, (2)] claimed that not all their e-assessment tasks covered the content that had been done in class.

S P26: “Not all the time.”

S P30: “Tests, exams, assignments are all in the module.”

S P40: “Some lecturers give us test that we know nothing about.”

During the focus group interviews, no new information emerged from this question, and this indicated confirmation of the information gathered from the questionnaire survey.

The literature supports what the lecturers did in their teaching and assessment (providing students with e-assessment tasks that test the content they have covered) (see 2.2.4.1, 2.6.2.2, 3.2.9.7, 3.2.9.12). This confirms that their IT lecturers paid attention to the principle of good assessment in the e-assessment tasks that they provided for the students (see 2.6.2.2, 3.3.6.1). However, some student participants reported that their e-assessment tasks were not always within the content that had been covered. In my opinion, when lecturers’ e-assessment tasks test the content that has been covered, students tend to apply a deep learning approach since they would try to evaluate the content in order to gain a better understanding of the study material (see 2.2.4.1). Lecturers need to learn and know that e-assessment tasks are valid (see 2.6.2.2) if they test the content that has been covered (see 2.6.2.2, 3.3.6.1). Furthermore, students will be motivated to study when they are familiar with the content that their e-assessment tasks cover.

6.5.2.19 Comparison of marks obtained for the various e-assessment tasks (reliability)

The student participants were asked to report on their experiences and/or views as to how the marks they obtained for the various e-assessment tasks compared with one another.

The majority of the student participants [91%, (40)] confirmed that the marks they obtained for the various e-assessment tasks were fairly consistent. Reasons provided were that they prepared adequately for all their e-assessment tasks; and their marks were a true reflection of what and how they learned.

S P2: "I feel they are all fair and consistent because I study hard for all."

S P3: "They are constant, meaning they are very similar. I work just as hard for every module and study the same for each, so my assessment is almost a reflection of each other."

S P5: "My marks are usually consistent and fall within the same range."

S P12: "I get good marks when I study and I get bad marks when I don't study."

S P44: "Since I study hard for every test my marks are usually the same."

Some participants reported that their marks were inconsistent based on the type of module [2%, (1)]; the lecturer's teaching method [2%, (1)]; and the type of questions asked in the e-assessment tasks [2%, (1)].

S P21: "It differs; it also depends on the type of questions."

S P22: "They vary from module to module sometimes they are good and sometimes are just fair."

S P27: "They are not the same as lecturers vary in teaching so you get to understand one more than other; then obviously the performance won't be equal."

S P30: "It depends on how the lecturer teaches me."

One participant [2%, (1)] reported that lower marks were obtained because of the inability to revert to the e-assessment platform (myLMS) to correct an answer.

S P8: "…you can't change your mind about an answer and the marks are sometimes just so bad because you guess and you don't give it your all."

During the focus group interviews no new information emerged from this question, and this indicated confirmation of the information gathered from the questionnaire survey.

Literature confirms that e-assessment tasks indeed improve students' grades and performance (see 3.2.5). Lecturers are entreated to provide students with e-assessment tasks that will engage their students. E-assessment tasks should be designed in such a way that the students are encouraged to participate (see 2.3.1, 3.2.5, 3.2.10.1, 3.2.10.2). Students' marks will improve when they are encouraged to show interest in the e-assessment tasks (see 3.2.5).

6.5.2.20 Comparison of the marks obtained for the various e-assessment tasks compared with paper-based assessment tasks (reliability)

The student participants were asked to report on their experiences and/or views as to how the marks they obtained for the various e-assessment tasks compared with conventional paper-based assessment tasks.

The majority of the student participants [72.7%, (32)] confirmed that their marks were consistent for both e-assessment tasks and paper-based tasks. Reasons provided included that they put in the same effort when studying for both tasks.

S P2: "I feel they are all fair and consistent because I study hard for all."

S P3: "They are constant, meaning they are very similar. I work just as hard for every module and study the same for each, so my assessment is almost a reflection of each other."

S P44: "Since I study hard for every test my marks are usually the same."

Some participants reported that their marks in paper-based assessment tasks were higher than that of e-assessment tasks because some lecturers award marks for their effort [11.3%, (5)] and are sometimes lenient when marking [9%, (4)].

S P15: "Paper tests involve the emotions of the lecturer and he/she can decide whether you have answered the question partially right."

S P22: "The marks on paper are much better than the ones on e-assessment because lecturers can be lenient sometimes when marking papers."

S P28: "Paper is better because lecturers are sometimes lenient but myLMS is not."

S P35: "My tests on paper have good marks because the lecturer sometimes gives me some marks for my effort."

Two participants [4.5%, (2)] mentioned that their marks in paper-based assessment tasks were lower. One of the two participants indicated that this happens because lecturers sometimes mark unfairly (based on emotions or moods).

S P9: "My paper based marks are low because my lecturer is moody and usually give me bad marks, which is not fair."

S P12: "Paper-based assessment marks are always lower than e-assessments."

One participant [2%, (1)] indicated that the marks he/she obtained depended on the module.

S P24: "It is highly dependent on the module."

During the student participants' focus group interviews the majority of the participants [85.7%, (6)] reported that they usually received higher marks in paper-based assessment tasks compared to e-assessment tasks. This refuted what most of the participants reported in the questionnaire survey. Reasons provided were that they had the flexibility of explaining their answers in detail [28.5%, (2)]; and that there was always enough time to complete paper-based tasks [28.5%, (2)].

S P3: "…whereas where it's paper-based, I can write based on my own experience, and not have to confine to somebody's understanding. Paper-based are higher."

S P4: "My paper based are always higher. You hardly have time to think about online tests, you know they are always short.

S P7: "For me, I get higher marks in paper-based questions. …The time is not enough in online tests."

One participant [14.2%, (1)] reported that he/she performed better in practical assessment tasks, but most of their e-assessment tasks were theoretical and as a result he/she obtained low marks.

S P6: "…e-assessment is usually theoretical, I'm more of a practical person, but give me a scenario where I can explain what I'm doing, by all means and that is why my marks are better when on paper and my online marks are low."

However, one participant [14.2%, (1)] stated that he/she usually obtained higher marks in e-assessment tasks because they were short-answer questions and required only recall.

S P5: "I think I was getting high marks on the e-assessment test, because you just choose, you don't have to think - you follow your gut and you recall."

Literature confirms that e-assessment tasks indeed enhanced students' grades and performance (see 3.2.5). The views provided by the student participants were a clear indication that the IT lecturers did not provide e-assessment tasks that would engage their students. Lecturers need to create e-assessment tasks that will motivate the students to participate (see 2.3.1, 3.2.5, 3.2.10.1, 3.2.10.2). When students are interested in the e-assessment tasks, their marks will be better (see 3.2.5) than that of paper-based tasks. The issue of students' inability to explain their answers better has already been discussed (see 6.5.2.22). Regarding the limited time, lecturers are entreated to provide adequate time for their IT students to complete the e-assessment tasks. When inadequate time is provided, then the e-assessment tasks do not adhere to the principle of practicability/feasibility (see 2.6.2.4) and students tend to take a surface learning approach (see 2.2.3, 2.2.3.2). One participant mentioned that he/she obtained higher marks in e-assessment tasks because they only require recall. This issue of recall has been discussed already (see 6.5.1.19, 6.5.2.12, 6.5.2.13). I encourage lecturers to develop e-assessment tasks that will help students to apply a deep learning approach which will improve their learning (see 2.2.4, 2.2.4.1, 2.2.4.2).

6.5.2.21 Examples of e-assessment tasks and paper-based assessment tasks

The student participants were asked to give some examples of e-assessment tasks and conventional paper-based assessment tasks in IT modules.

Please note that many of the participants provided more than one example of both e-assessment tasks and paper-based tasks.

Examples of e-assessment tasks identified by the majority of student participants [68.1%, (30)] were tests. Some participants mentioned continuous assessment tasks [11.3, (5)]; software development [2%, (1)]; programming (coding) and database practical tests [2%, (1)]; simulations [2%, (1)]; multiple-choice questions [13.6%, (6)]; and surveys [2%, (1)].

S P2: "Software development assessment, continuous assessment is online."

S P3: "E-assessment tasks – class tests are normally put up on myLMS to do."

S P10: "Multiple choice, true/false use myLMS."

S P16: "E-assessments – programming practical tests, database practical tests."

S P20: "Exams are paper."

S P30: "We do network simulations and coding on myLMS."

S P34: "My lecturer let us do surveys online for our practicals."

S P44: "Semester tests are also e-assessment tasks."

Regarding the examples of paper-based assessment tasks that they did in their IT modules, some participants specified assignments [45.4%, (20)], tests [68.1%, (30)], and examinations [100%, (44)].

S P1: "Exams, test and assignment are paper."

S P3: "Paper-based - baseline assessments."

S P4: "Tests, assignments, continuous assessment and exams."

S P6: "Paper-based tasks: Assignments, projects, tests, class assessments and exams."

S P16: "Paper-based – semester tests, class tests."

S P20: “Exams are paper.”

S P44: “Examinations, tests, semester tests, assignment are paper based.”

The examples of e-assessment tasks that the student participants reported (tests, assignments, examinations, simulations, multiple-choice questions, and surveys) are confirmed in the literature (see 3.3.4, 4.6.2.1, 4.6.2.2, 4.6.2.3, 4.6.3, 4.7.2). Assignments, tests, and examinations were examples of paper-based assessment tasks provided by the student participants. Since these assessment tasks can be implemented on myLMS, lecturers are encouraged to do that, in order to save time and the cost of printing (see 3.2.8.1, 3.3.1).

6.5.2.22 Problems experienced with e-assessment tasks

The student participants were asked to report on the problems that they encountered with the e-assessment tasks in IT modules.

The most common problems that students faced in their e-assessment tasks in IT modules were power failures which caused students to lose their work [18.1%, (8)]; compatibility issues [11.3%, (5)]; inexperience with the e-assessment system (myLMS) [22.7%, (10)]; unstable network (Internet) which made it difficult for students to meet deadlines and time limits [11.3%, (5)]; and the inability to access/open e-assessment tasks due to server problems [4.5%, (2)].

S P13: “When the network is down and you will have to submit before the link is closed.”

S P25: “I don’t know how to use myLMS.”

S P28: “The questions are sometimes very complex and if you lose internet connection you are unable to continue with the task until the connection is restored. You will not be able to finish the work.”

S P35: “One time I was doing my test and the power went off and I lost everything. I had to start all over again.”

S P40: “I don’t know how myLMS works so I always have problems.”

S P42: “myLMS is difficult to use because we have no idea how to use it and sometimes don’t know how to go through the test.”

S P43: “Sometimes the server does not work and one cannot upload or download anything.”

Other identified problems were difficulty with navigating through the e-assessment tasks [4.5%, (2)]; the instability of the e-assessment platform (sometimes the e-assessment site crashes) [6.8%, (3)]; and the inability to change answers that had already been entered [4.5%, (2)].

S P16: “Sometimes the myLMS site crashes.”

S P21: “The major problem was being unable to change your answer.”

S P29: “myLMS always crashes when a lot of people are working on it.”

S P42: “myLMS is difficult to use because we have no idea how to use it and sometimes don’t know how to go through the test.”

Two student participants [4.5%, (12] said that some students cheated during e-assessment tasks by browsing through the Internet for answers.

S P4: “One issue that comes to mind is that of people using easily available browser functions such as searching the Internet during a test.”

S P30: “Some students cheat by opening other websites to copy the answers.”

Other participants [11.3%, (5)] made it clear that they did not experience any problems with the e-assessment tasks in the IT modules.

S P1: “I am cool. No problems at all.”

S P2: “I haven’t encountered any problems concerning any assessment so far.”

S P3: “myLMS is alright for me. I use it without having problems.”

S P41: “I don’t remember having problems with it.”

S P44: “No problems.”

During the focus group interviews all the student participants [100%, (7)] confirmed that they had some “bad” experiences with e-assessment. Reasons provided were that they had password problems (login issues) [57.1%, (4)]; difficulty in downloading materials because some students were not registered on myLMS [14.2%, (1)]; and that they were limited in the way they answered questions [28.5%, (2)].

S P1: “But for me, myLMS specifically, is lacking. Because I know, for example, this year I’m not even enrolled on a course on my-LMS so I can’t download my materials. Sometimes my password doesn’t want to work and it frustrates me.”

S P3: “I agree with that. Paper-based and exams are a bit better, because like, let’s say maybe you have a question, you can even draw a diagram or something with this question, which can explain much better.”

S P4: “Online assessments are sometimes limiting in the way of answering. I do agree with that one.”

S P5: "…but there was a problem because they kept changing the log in platform, so sometimes you have to come and make a new password but it does not work."

S P6: "…ever since my-LMS was launched né, they tell you that your password has expired and then when you change it, it doesn't like give you confirmation that your password has been changed, it says, incorrect password.

S P7: "…but the password is a problem, because there was a time when I forgot my password and I had to wait for. I think forty-eight hours."

The problems raised by the student participants are confirmed in the literature (see 3.2.8, 3.3.11) and were also confirmed by the lecturer participants (see 6.5.1.1, 6.5.1.2, 6.5.1.8). The CTI IT Faculty needs to ensure that the necessary infrastructure and resources (see 3.2.9, 3.3.12) are made available for the successful implementation of e-assessment tasks on myLMS. One predominant issue mentioned by the student participants in the questionnaire survey, was the fact that they were unable to change their answers and/or move back and forth when doing e-assessment tasks. I believe that this was due to a lack of training on the use of myLMS because the e-assessment platform does allow flexibility (ability to move back and forth when attempting e-assessment tasks) (see 3.3.8). Students need to be trained (see 3.3.12.9) on how to use the myLMS system in answering e-assessment tasks.

I can conclude that the problems raised by the participants during the focus group interviews are technical problems. The institution should ensure that they have a technical support team available for the students, and they should be prompt in responding to such issues (see 3.2.8.4, 3.3.12.9). When students get frustrated with technical problems, they are not motivated to use the system. The issue of students' inability to answer questions properly on an e-assessment platform is a clear indication of the lack of support and adequate training on the part of the institution (see 3.3.12.9). E-assessment can assess any type of questions, and there are drawing tools on the platform that students can use to draw diagrams to support their explanations (see 3.3.4).

6.5.2.23 Value of e-assessment tasks to students' learning

The student participants were asked if the e-assessment tasks in IT modules added value to their own learning.

The majority of the student participants [97.7%, (43)] confirmed that e-assessment tasks added value to their learning. Reasons provided were that they were able to access and/or practise assessment tasks anytime and anywhere [43.1%, (19)]; they were able to interact with technology which boosts students' confidence [15.9%, (7)]; they were able to solve more advanced questions (e.g., simulations, practical-based questions, etc.) which provided them with a real-world experience [11.3%, (5)]; they were able to receive immediate feedback and the results of assessment tasks [22.7%, (10)]; and they were able to exhibit knowledge in different ways due to the different types of questions available on myLMS [4.5%, (2)].

S P1: “I love coding on myLMS it gives you the real feel.”

S P4: “I think they add value to my learning because they are more readily available than paper based assessments.”

S P10: “I can practice my work anywhere.”

S P15: “The marks can be obtained quickly and the tests can be written even if you are not in the class room, thus e-assessments have a big advantage over paper based assessments.”

S P18: “It helps us learn how to deal with such technology and determines our knowledge due to different approaches.”

S P25: “You can get results at the same time.”

S P30: “We do network simulations and coding on myLMS.”

S P40: “I can answer any question on myLMS.”

However, one participant [2%, (1)] reported that e-assessment tasks did not add value to his/her learning due to the inability of the programme to change answers that had already been entered.

S P21: “Not add value to, because once you make a mistake you can’t change it.”

During the focus group interviews the new information that emerged was that it was easy to conduct forum discussions on the e-assessment platform because students could take part in discussions from anywhere. He/she further reported that his/her lecturer used Socrative (which is also an e-assessment platform) to conduct e-assessment tasks.

S P1: “…the only thing we have done was a forum discussion, but it was informative and convenient, you could discuss at any place at any location, didn’t have to come to class specifically. Let’s say Socrative, that’s a very good platform to do a quick online test.”

The reasons provided by the majority of the student participants’ regarding the value of e-assessment in their learning of IT are confirmed in the literature (see 3.2.6, 3.2.6.1, 3.2.6.2, 3.3.3, 3.3.4, 3.3.8, 3.3.10, 4.6.2, 4.7.1, 4.7.2). This is an indication that when e-assessment tasks are developed well, student learning is indeed improved. Lecturers need to have time to create appropriate e-assessment tasks in order for their students to acquire the benefits that come with e-assessment. When discussion forums are created on an e-assessment platform, students are able to take control of the discussion and freely/genuinely express their views without any hints or suggestions (rendering e-assessment flexible and user-friendly) (see 3.2.3.4, 3.2.4.1, 3.2.10.1, 3.3.8). I therefore encourage lecturers to create more of such tasks. The participant further mentioned that Socrative was used for online tests. In my opinion, myLMS will be effectively used if the institution creates a user-friendly and an easy-to-use interface for the system (see 3.2.8.4). The issue of students' inability to revert to a previously answered question on an e-assessment platform has already been discussed (see 6.5.2.22).

6.5.2.24 Types of assessment task that mostly improve student learning

The student participants were asked to identify the types of assessment tasks that they thought could help them most in improving their own learning.

The types of assessment task that the student participants confirmed that improved their own learning were group projects [4.5%, (2)]; self-assessment [18.1%, (8)]; practical assessment tasks [2%, (1)]; assessment tasks that carried marks (e.g., tests, examinations, and assignment) [72.7%, (32)], and role play [2%, (1)].

S P1: "Group project and self-assessment."

S P3: "I think practical assessment tasks would help improve my learning the most."

S P5: "Assignments."

S P11: "Tasks that carry marks."

S P13: "Test and exam."

S P15: "Assignment and test."

S P20: "Assignment."

S P39: "I think self-assessment."

S P40: "Group project."

S P44: "Doing practical and role plays."

Reasons they provided were that the assessment tasks provided them with the necessary experience required for the IT industry (e.g., assignments); that they helped them to study and develop an understanding of the module; and that they gained more knowledge about the module.

S P3: "I think practical assessment tasks would help improve my learning the most. Doing work practically often helps me understand the work better."

S P5: “Assignments because they require research, and through research you gain more knowledge.”

S P11: “Tasks that carry marks, because they motivate me to study seeing that they count marks.”

S P13: “When I write test and exam I get more knowledge and understanding.”

S P20: “Assignments help me to get practical experience.”

One participant reported that role play enabled him/her to permanently remember what he/she had learned because of the actions involved which improved his/her performance.

S P44: “Doing practical and role plays, we never forget actions we did and performed better due to that. The roles I play are always in my mind.”

During the focus group interviews no new information regarding the types of e-assessment and reasons why these assessment tasks mostly improved student learning emerged from this question, and this indicated confirmation of the information gathered from the questionnaire survey.

The identified assessment tasks that the student participants believed improved their own learning (group projects, practical assessment tasks, self-assessment, and assessment tasks that carry marks, and role play), I believe will engage the students (see 2.3., 2.3.2), test their understanding, and provide them with the necessary skills and real-world experience (see 2.3.3, 4.6.3). Other assessment tasks that lecturers may consider are group discussions. This will help students to acquire new knowledge from their peers (see 2.3.2.2).

6.5.2.25 Recommendations for the use of e-assessment in the teaching and learning of IT

The student participants were asked to report on their experiences and/or views of the extent to which e-assessment should be used/not used in the teaching and learning of IT.

The use of e-assessment in the teaching and learning of IT was highly recommended by all the student participants [100%, (44)]. They recommended its use because it was cost effective (paperless system) [22.7%, (10)]; had high security [4.5%, (2)]; could be accessed anytime and anywhere; and saved time [34%, (15)].

S P4: “I think it should be used a lot more than it currently is. This would save on pricing costs for both students and the campus.”

S P17: “I think that they should be used to test the students studying progress and understanding.”

S P18: "…very secure than paper assessment."

S P29: "E-assessment is the future. It should be well maintained and practiced."

S P30: "You do the test at any place and any time of your choice."

S P44: "No time wasting because one can access information anywhere."

Some participants suggested that for the effective use of e-assessment in the teaching and learning of IT, there should be proper resources and IT infrastructure available [11.3%, (5)]; students should be trained on how to use the technology in their learning [4.5%, (2)]; it should be done if the security of the e-assessment tasks are in place because some students can cheat [2%, (1)]; lecturers should have the necessary knowledge of the technology in order to assist students who might face challenges when doing e-assessment tasks [13.6%, (6)]; e-assessment tasks should be done in a controlled environment [2%, (1)]; and should test students' understanding and progress [4.5%, (2)].

S P8: "Also this should only be done if the security of these assessments can be ensured, since students always find a way to cheat on assessments."

S P11: "They should be used in a controlled environment."

S P20: "The lecturers should learn how to use myLMS so that they will be able to assist students if there are any issues."

S P17: "I think that they should be used to test the students studying progress and understanding."

S P43: "Students and lecturers need training on how myLMS works."

Some participants suggested that for the effective use of e-assessment in the teaching and learning of IT, proper IT infrastructure and resources should be put in place, as confirmed in the literature (see 3.2.9, 3.3.11, 3.3.12); students should be trained on how to use the technology in their learning (see 3.2.8.8, 3.2.9); lecturers should have adequate knowledge of the technology in order to assist students who might face challenges when doing e-assessment tasks (see 3.2.9.3); and e-assessment should be done in a suitable environment (see 3.2.9.4). In my opinion, all the stakeholders (institution, lecturers, and students) need to work together in order to implement an effective e-assessment system at CTI. The necessary requirements for e-assessment implementation should be readily in place for the smooth running of the e-assessment system.

The new suggestions and recommendations that were made by the student participants during the focus group interviews are as follows:

- E-assessment cannot assess high stake assessment tasks (e.g., exams) [14.2%, (1)].
- E-assessment should only be used for baseline assessment and self-assessment [14.2%, (1)].
- E-assessment should be used for class activities and not for assessment tasks that carry marks [14.2%, (1)].
- A mobile application should be created for myLMS in order to provide easy access [14.2%, (1)].

S P1: “E-assessment is a better way to assess what the students know and you can practise multiple choice, true/false, you know, but you can’t test as much broader knowledge as the basis of a more natural exam but it can be done at any place.”

S P3: “Although students do not have to be on campus to do their tests, I think it can be used for only baseline assessment and self-assessment because it will help the lecturers to see what the students understand or don’t understand.”

S P4: “I think it will be good if they use it as a class activity, not for assessment tasks that carry marks.”

S P6: **“**I think there should be a mobile application for myLMS instead of the website in order to make it easier for students and lecturers to access.”

I completely disagree with the participants who claimed that e-assessment cannot assess high-stake assessment tasks (e.g., exams); e-assessment should only be used for baseline assessment, self-assessment; and that e-assessment should be used for class activities and not for assessment tasks that carry marks. This is because Wikis, blogs, self-review, peer-review, scenario questions, simulation software, role play, and observations can all be used in e-assessments to assess students’ higher order thinking abilities as well as their hands-on skills (see 3.3.4, 4.7.1, 4.7.2) and therefore e-assessment should not only be restricted to certain tasks. I think the participant who suggested that there should be a mobile application for myLMS, made a viable recommendation. I will entreat the CTI institution to consider this in future because with the mobile application, both students and lecturers will be able to log into the system with ease.

6.6 CONCLUSION

In this chapter I reported and interpreted the different experiences and perceptions of CTI IT lecturers and IT students regarding the role of e-assessment in their teaching and learning of IT. Chapter 7 now addresses the answers to the research questions provided in this chapter, and how I compiled a preliminary framework for the implementation of e-assessment in the teaching and learning of IT at the CTI Education Group. The compilation of the required framework, integrates the data obtained from the literature review, the lecturer and student questionnaire, and focus group findings presented in this chapter. In addition, Chapter 7 also reports on how a panel of purposively selected experts in the teaching and learning, IT as a discipline, ICTs in education, assessment, e-assessment and e-learning in higher education ultimately reviewed and validated my preliminary framework.

A summary of the major findings from the first round of data collection (the questionnaire surveys and focus group discussion) for both the IT lecturers and IT students can be found in Appendix E.

CHAPTER 7

PROPOSED FRAMEWORK FOR THE IMPLEMENTATION OF E-ASSESSMENT IN THE TEACHING AND LEARNING OF INFORMATION TECHNOLOGY

7.1 INTRODUCTION

This chapter builds on Chapter 6 where I reported and interpreted the different experiences and perceptions of CTI IT lecturers and IT students regarding the role of e-assessment in their teaching and learning of IT respectively. The different experiences and perceptions were obtained from the first round of data collection (the questionnaire surveys and focus group discussions) in which the participants were IT lecturers and IT students from the CTI Education Group.

Based on the above interpretation of the different experiences and perceptions reported in Chapter 6 and the views obtained from the literature review done for the study in Chapters 2, 3, and 4, this chapter aims to address the fourth and final research question:

- *What would be the best way to implement e-assessment in the teaching and learning of IT as a subject/discipline at CTI?*

Bearing in mind the research question, I shall propose a preliminary framework for the implementation of e-assessment in the teaching and learning of IT at CTI in this chapter. The compilation of the framework required integration of the data obtained from the literature review, the lecturer and student questionnaires, and focus group findings presented and interpreted in Chapter 6.

The first part of this chapter reports the demographic characteristics of the purposefully selected panel of experts who evaluated the potential feasibility and importance of the features/components of the proposed framework, based on their relevant expertise and experiences (see 5.3.1.1 [c]). The second part introduces the compilation and evaluation of the proposed framework. The final part reports on each major component/feature (based on the importance ratings and limitations) of the proposed framework as recommended by the expert panel (the second round of data collection); interpretation of the feedback and findings; and the consequential amendments.

Finally, this chapter is concluded and the final framework is presented in Chapter 8 together with conclusions and limitations.

The steps followed in this chapter are shown in Figure 7.1.

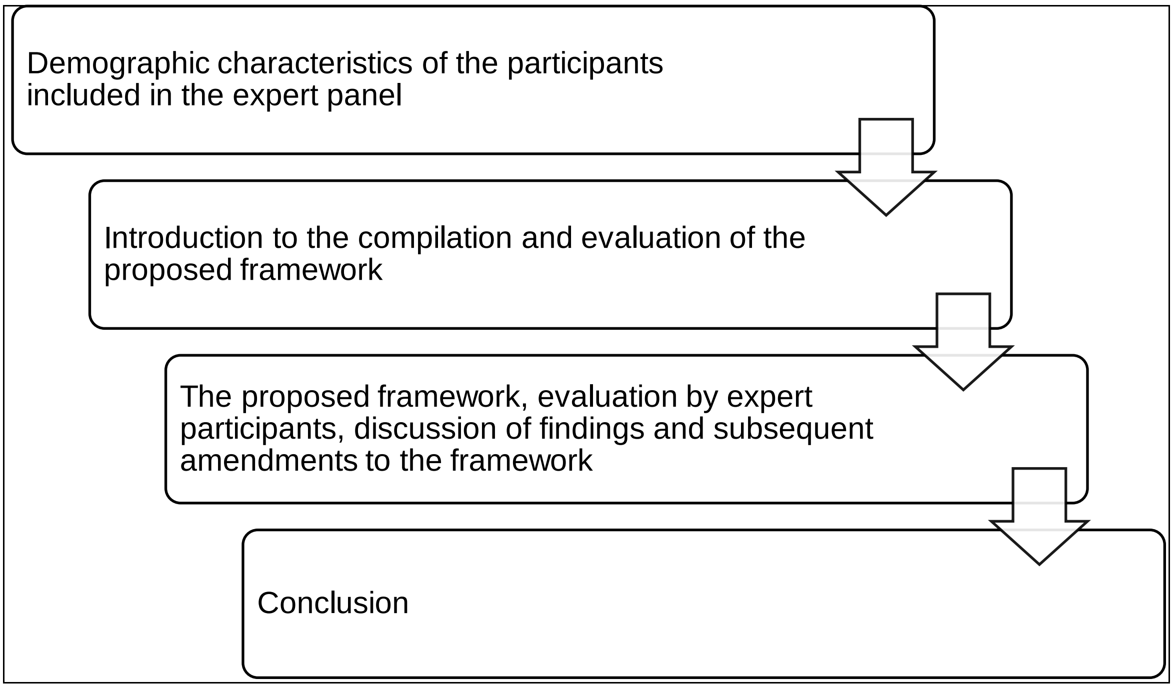

Figure 7.1: Steps used in the discussion of Chapter 7

7.2 DEMOGRAPHIC CHARACTERISTICS OF EXPERT PARTICIPANTS

This section reports the participants' demographic characteristics that were gathered during the experts' survey. The demographic information collected from the participants that took part in the evaluation of the proposed framework are gender; years of experience in the field of teaching, learning and assessment in higher education; years of experience in the teaching, learning, and assessment of Information Technology specifically; and years of experience pertaining to e-learning and/or e-assessment.

The aim of these demographic characteristics is to describe the expert panel in general but not to claim or demonstrate generalisation to a wider population.

7.2.1 Position and expertise of expert participants

The occupational position and expertise of the 26 invited participants of the expert panel were as follows:

- An expert in teaching and learning at a higher education institution in South Africa (number of invitees: 1).
- An expert in assessment and e-assessment in higher education at a higher education institution in the United Kingdom (number of invitees: 1).
- The manager of e-learning programme in the United Kingdom (number of invitees: 1).

- Two experts in student assessment in higher education; one from each of two different higher education institutions in South Africa (number of invitees: 2).
- Five lecturers in the field of Information Technology (IT); one from each of five different higher education institutions in South Africa (number of invitees: 5).
- Two lecturers in the field of Information Technology (IT); one from each of two different higher education institutions in Namibia and Nigeria respectively (number of invitees: 2).
- The IT academic manager at a private higher education institution in South Africa (number of invitees: 1).
- Two learning management system (LMS) administrators; one from each of two different private higher education institutions in South Africa (number of invitees: 2).
- The teaching and learning manager at a private higher education institution in South Africa (number of invitees: 1).
- The national assessment manager at a private higher education institution in South Africa (number of invitees: 1).
- The Dean: IT Faculty at a private higher education institution in South Africa (number of invitees: 1).
- Two e-learning specialists at a higher education institution in South Africa (number of invitees: 2).
- The Director: Centre for E-learning and Educational Technology at a higher education institution in South Africa (number of invitees: 1).
- An educational technologist at a higher education institution in South Africa (number of invitees: 1).
- An instructional designer at a higher education institution in South Africa (number of invitees: 1).
- The Director: E-skills Strategic Alliances at a higher education institution in South Africa (number of invitees: 1).
- The manager of an online instructor care institution in South Africa (number of invitees: 1).
- A researcher on e-learning and m-learning at a higher education institution in Mauritius (number of invitees: 1).

7.2.2 Gender

Seventeen of the invitees ultimately agreed to take part. The majority of the expert participants were male [65%, (11)], with the minority being female [35%, (6)]. The substantial difference between the male and female participants can be as a result of the nature and purpose of the study. The expert participants were invited based on their occupational position and expertise in order to obtain rich information. The gender distribution of the expert participants is shown in Figure 7.2

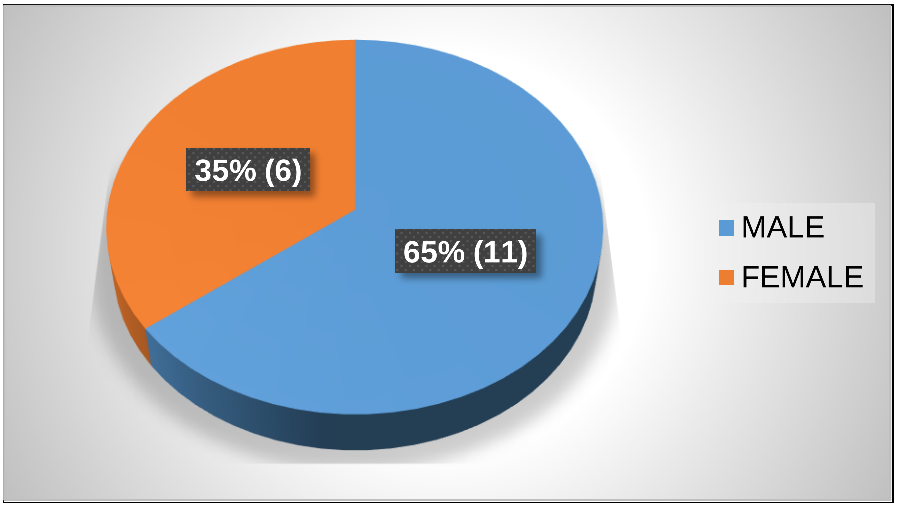

Figure 7.2: Gender distribution of expert participants (*n=17*)

7.2.3 Years of experience in the field of teaching, learning and assessment in higher education

The expert participants were requested to indicate their number of years' experience in the field of teaching, learning, and assessment in higher education. All 17 participants answered this question. Their years of experience ranged from three to 30 years, as shown in Figure 7.3.

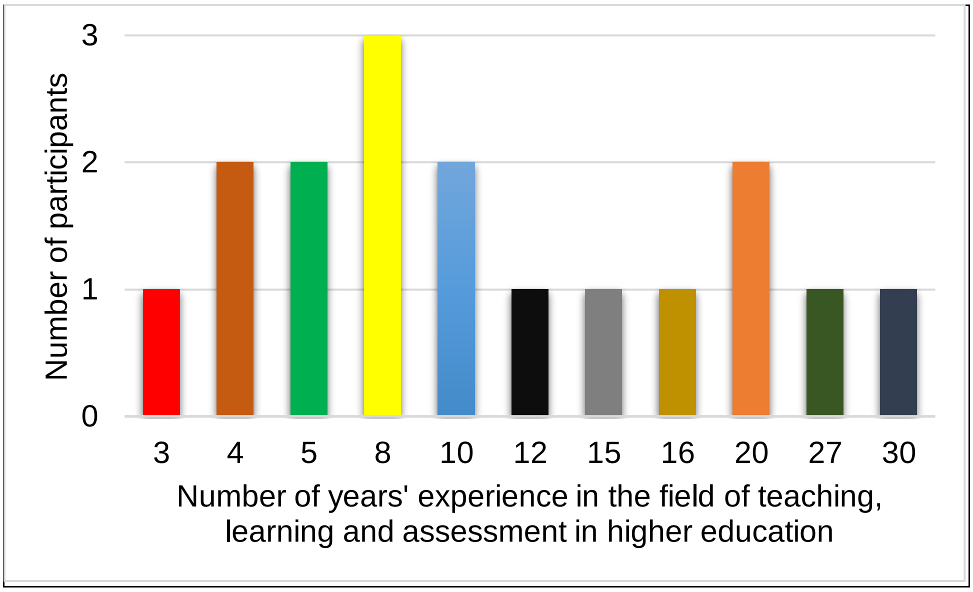

Figure 7.3: Years of experience in the field of teaching, learning and assessment in higher education (*n=17*)

Thus all 17 participants had at least three years' experience in the field of teaching, learning, and assessment in higher education. Based on the years of experience and expertise of the expert participants, they satisfied the selection criteria for participants who could evaluate the propose framework (see 5.3.1.1 [c]).

7.2.4 Years' experience in the teaching, learning, and assessment of information technology as a discipline

The expert participants were requested to indicate their number of years' experience in the field of teaching, learning, and assessment of information technology specifically. All 17 participants answered this question. Their years of experience ranged from three to 20 years, as shown in Figure 7.4.

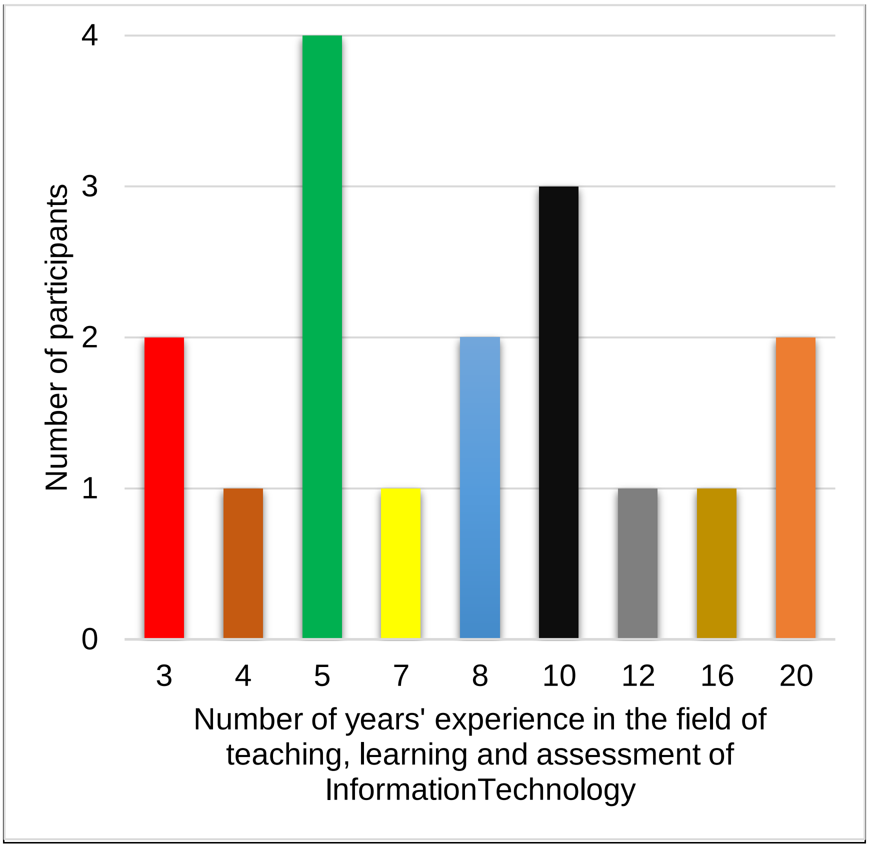

Figure 7.4: Years' experience in the field of teaching, learning, and assessment of Information Technology (*n=17*)

7.2.5 Years' experience pertaining to e-learning and/or e-assessment

The expert participants were requested to indicate their number of years' experience pertaining to e-learning and e-assessment. All 17 participants answered this question. Their years of experience ranged from two to 12 years, as shown in Figure 7.5.

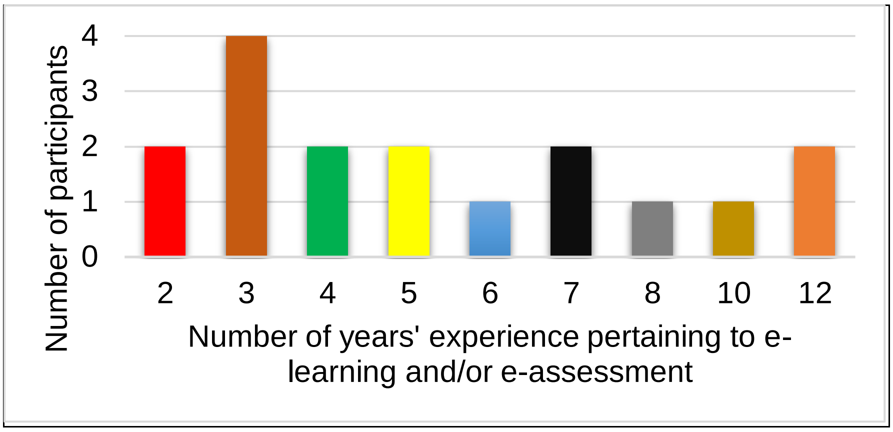

Figure 7.5: Years of experience pertaining to e-learning and/or e-assessment (*n=17*)

7.2.6 Response rate

Table 7.1 below shows the response rate of the expert participants who were invited to participate in the second round of data collection (evaluation of the proposed framework).

Table 7.1: Participants' response rate

	Number invited	Number of participants that responded	Response rate
Expert panel	**26**	**17**	**65%**

The response rate is deemed satisfactory as more than half of the invited participants responded to the online questionnaire. A reminder was sent to all the participants who did not participate initially in order to ensure a good response rate. However, since the main focus in this study was to collect qualitative data, with only enhancement by the quantitative data in this survey, generalisation of the data was never the aim. The frequency of responses per every single feature/sub-feature in the proposed framework was used to assist me in deciding which of the features in the proposed framework should be retained and which had to be removed.

7.3 INTRODUCTION TO THE COMPILATION AND EVALUATION OF THE PROPOSED FRAMEWORK

The section below elaborates upon the compilation of the proposed framework and the process related to its evaluation.

7.3.1 Compilation of proposed framework

As reported earlier, the proposed framework was compiled through the comparison and convergence of the data obtained from the literature review, the lecturer and student questionnaires, and the focus group surveys presented in Chapter 6.

The proposed framework involves the following 12 main components:

1. Characteristics and/or requirements for the successful implementation of e-assessment (see 3.3.12.1 to 3.3.12.11; 6.5.1.3; 6.5.1.8; 6.5.2.22; 6.5.2.23).
2. Lecturers' prior experience and knowledge of student assessment (see 2.6; 2.9.2.5; 3.3.4; 3.2.3.4; 4.7.1; 6.5.1.19).
3. Using IT students' e-assessment results for different teaching and learning purposes (see 2.6; 2.6.1; 6.5.1.17).
4. Setting deadline dates for the completion/submission of e-assessment tasks (see 2.2.3.1; 2.2.3.2; 2.4.7; 3.2.10.2; 3.3.9; 3.3.12.2; 3.3.12.8; 4.6.1; 4.6.2.2; 6.5.1.9).
5. Setting duration limits (limiting the allowed duration) for the completion of e-assessment tasks (see 2.2.3.1; 2.2.3.2; 2.4.7; 3.2.10.2; 3.3.9; 3.3.12.2; 3.3.12.8; 4.6.1; 4.6.2.2; 6.5.1.10).
6. Relationship between IT students' marks and how and what they have learned (see 2.2.3; 2.2.4; 2.2.5.1; 2.2.6.2; 2.4.7; 2.4.10.2; 2.9.1; 2.9.1.4; 2.10.2; 4.9; 6.5.1.11).
7. Students' knowledge regarding what (the content) they will be assessed on (see 2.6.2.2; 2.7.3.3; 3.2.10.2; 6.5.1.12).
8. Students' knowledge regarding how they will be assessed (what the assessment criteria will be) (see 2.6.2.2; 2.6.2.3; 2.9.1.3; 2.9.2.3; 3.3.6.3; 6.5.1.13).
9. Feedback to IT students about their performance in e-assessment tasks (see 2.9.1.4; 2.9.2; 2.9.2.1.3; 2.9.3.1; 3.2.3.4; 3.2.9.10; 3.3.7; 3.3.12.3; 4.7.2; 6.5.1.14; 6.5.1.15; 6.5.2.15; 6.5.2.16).
10. Forms of e-assessment in higher education (see 2.9; 2.9.1; 2.9.2; 2.9.3; 3.2.9.10; 3.2.9.11; 4.6.2; 6.5.1.6; 6.5.2.4; 6.5.2.5; 6.5.2.6; 6.5.2.7; 6.5.2.8).
11. Types of assessment tasks that may be used in e-assessment (see 2.9.1; 2.9.2; 2.9.3; 3.2.4.1; 3.3.3; 3.3.4; 4.6.1; 4.6.2; 4.7.2; 6.5.1.7; 6.5.2.10).
12. Principles of good e-assessment (see 2.6.2; 2.6.2.1; 2.6.2.2; 2.6.2.3; 2.6.2.4; 2.6.2.5; 3.3.6; 3.3.6.1; 3.3.6.2; 3.3.6.3; 3.3.6.4; 4.7.2; 6.5.1.16; 6.5.2.17; 6.5.2.18; 6.5.2.19; 6.5.2.20).

7.3.2 Evaluation of the proposed framework

In Chapter 5 (see 5.3.1.1), there is a detailed discussion of how the questionnaire completed by the expert panel was organised and distributed.

In this chapter, however, all the features and sub-features of each component that was derived are presented in the form of one table per major feature. In the subsequent sections, each component of the proposed framework is presented by including the findings of the expert survey simultaneously, followed by a discussion of the findings as well as why particular amendments were made (where applicable) (see 7.4.1 to 7.4.12).

In the questionnaire (see Appendix B4.2), the participants had to evaluate the *importance* of each feature/sub-feature by making use of the following three-point rating scale:

“Essential” = E; “Useful” = U; “Not necessary” = N.

In addition, each set of sub-features that was grouped together in the same table as a major feature also allowed the expert participants to provide their own comments and/or suggestions regarding this particular set of sub-features; in other words, also the feature as a whole. Thus, besides requesting the participants to rate the importance of each feature/sub-feature (which led to quantitative data), qualitative data was also collected from the participants per set of features/sub-features.

The expert survey therefore consisted of closed questions (the ratings of features) and open-ended questions (space was provided for comments or suggestions). The expert panel was afforded an opportunity to provide their own perceptions regarding the strengths and weaknesses of the proposed framework. The feedback and views provided by the expert participants enabled me to further improve the framework.

All the features and sub-features of all the components of the proposed framework are listed in Tables 7.2 to 7.32. The total number of participants who rated each feature as “essential” (E), “useful” (U), or “not necessary” (N) is reported adjacent to the particular feature/sub-feature. The written comments or suggestions made by the expert participants on each set of proposed features (the collection of sub-features) are also presented in each table. The format of the framework and the questionnaire therefore resembles each other closely. (Please note, however, that not all the expert participants provided further comments or suggestions in addition to their ratings of the importance of all the features and sub-features). Following each table, the findings are discussed and the subsequent amendments made are also reported.

During the interpretation of the findings, all the features that were rated "essential" by the participants were maintained in the framework as an essential feature. Where a feature was rated "useful" it was assumed that the participants were not against the particular feature but rather agreed to the inclusion of the feature in the framework. However, when a feature was rated "not necessary," it was an indication that the participant was of the opinion that the feature was in fact not necessary, and should therefore be removed from the framework.

Of course, the frequencies of participants' rating of a feature/sub-feature as, for example, E, U, or N, were calculated and interpreted in order to make a decision. Based on the above interpretation process, I concluded that if 71% (12 out of 17) of the participants rated a feature either "essential" or '"useful," it would definitely be retained in the framework. However, if more than 50% (nine or more) of the participants rated a feature '"not necessary," it would either be reviewed or removed from the framework. All the ratings were interpreted and deliberated, bearing in mind the comments and suggestions made by the participants.

7.4 THE EVALUATION OF THE PRELIMINARY FRAMEWORK FOR THE IMPLEMENTATION OF E-ASSESSMENT IN THE TEACHING AND LEARNING OF IT AT CTI

In this section the evaluation and discussion of the findings as well as the subsequent amendments regarding the individual components, features and/or sub-features in the proposed framework, are reported. Furthermore, in each of the sections and subsections, the findings summarised in the relevant table(s) regarding the component/feature at hand, are discussed with reference to the participant ratings of each feature/sub-feature as well as their comments or suggestions concerning the different features/sub-features shown in the relevant table(s).

7.4.1 Characteristics and/or requirements for the successful implementation of e-assessment

The findings of this section are discussed in terms of the participant ratings, and their comments and/or suggestions (as applicable) concerning the suggested individual sub-features of the major feature of e-assessment, e.g., delivery system (see Tables 7.2 to 7.9).

7.4.1.1 The delivery system for e-assessment

The sub-features pertaining to the delivery system for e-assessment (sub-features A1 to A5) were rated either "essential" or "useful" by the 17 participants. In general, each sub-feature was rated "essential" by more than half of the participants and "useful" by at least one other participant. None of the sub-features was viewed as "not necessary." I therefore regarded this rating pattern as an indication that the participants agreed to all the features and sub-features pertaining to the delivery system. These features were therefore all retained in the final framework.

Table 7.2: Characteristics and/or requirements for the successful implementation of e-assessment: Delivery system (*n=17*)

Rating scale: E=Essential feature U=Useful feature N=Not necessary				
		E	U	N
A: ***The delivery system for e-assessment should be appropriate. This requires the following considerations:***		**16**	**1**	**0**
A1	The IT server must be in place.	**17**	**0**	**0**
A2	The delivery system should have stable Internet connectivity.	**16**	**1**	**0**
A3	Students should be able to access e-assessment tasks on any browser and on any operating system (there should be interoperability and compatibility).	**13**	**4**	**0**
A4	The system should be able to randomize questions/tasks.	**10**	**7**	**0**
A5	The system should be able to award marks automatically for students' answers.	**11**	**6**	**0**
Verbatim comments from participants regarding the delivery system for e-assessment EP4: "The randomization of questions and answers are essential, as students tend to try and use each other's answers." EP5: "Randomization of questions and answers is such a required feature in e-learning systems." EP6: "While automatic marking would be a good feature to have in such a system, this is not always feasibly when it comes to questions/tasks which assess higher order thinking skills, which is essential in higher education assessment, as the marking usually requires marker discretion and interpretation of the student's answer and is not as simple as picking out key words or indicating correct selections." EP11: "The delivery system should also be secure to prevent leakages."				

The comments made by EP4 and EP5 emphasise the sub-feature that questions and answers in e-assessment need to be randomised (sub-feature A4) (see 3.3.10; 3.3.12.1; 6.5.1.8). EP4 mentioned that such randomisation ensures that students do not copy from each other. The comment made by EP6 about sub-feature A5 is valid to a certain extent; however, if appropriate training is provided for lecturers, they will be able to develop and programme the e-assessment system to automatically mark higher order thinking questions (see 3.3.4). The comment made by EP11, however, was about security which is a major feature of the characteristics and/or requirements for the component of successful implementation of e-assessment (see Table 7.6).

7.4.1.2 The control mechanisms for e-assessment

The majority of the features regarding the control mechanisms for e-assessment were supported by the participants who either rated the features "essential" or "useful." Feature B5 (the e-assessment system should allow switching between synchronous and asynchronous modes of e-assessment) was rated "not necessary" by only one of the participants. However, because the exclusion rate was determined to be a "not necessary" rating by nine or more participants (see 7.3.2), I retained the feature in the final framework, and argued that it is important for e-assessment to allow both modes in any e-assessment tasks, as well as the students' needs (see 3.2.3; 3.2.3.1; 3.2.3.2; 3.2.3.3; 3.2.3.4; 4.4; 4.7.1). All the features, except B3, were rated essential by more than 50% of the participants.

Table 7.3: Characteristics and/or requirements for the successful implementation of e-assessment: Control mechanisms *(n=17)*

Rating scale: E=Essential feature U=Useful feature N=Not necessary				
		E	**U**	**N**
B:	***The control mechanisms for e-assessment should be appropriate. This requires the following considerations:***	**14**	**3**	**0**
B1	The e-assessment system should enable an assessor to set a time limit (duration limit) for the completion of any e-assessment task.	**14**	**3**	**0**
B2	The e-assessment system should allow a cut-off time/date for access to e-assessment tasks after deadline submission dates.	**13**	**4**	**0**
B3	The e-assessment system should allow candidates to revert to previous questions/tasks and make amendments.	**8**	**9**	**0**
B4	The e-assessment system should limit the number of times a student can re-attempt a task.	**10**	**7**	**0**

<table>
<tr><th colspan="5">Rating scale: E=Essential feature U=Useful feature N=Not necessary</th></tr>
<tr><td colspan="2"></td><td>E</td><td>U</td><td>N</td></tr>
<tr><td colspan="2">B: The control mechanisms for e-assessment should be appropriate. This requires the following considerations:</td><td>14</td><td>3</td><td>0</td></tr>
<tr><td>B5</td><td>The e-assessment system should allow switching between synchronous and asynchronous modes of e-assessment.</td><td>9</td><td>7</td><td>1</td></tr>
<tr><td colspan="5">Verbatim comments from participants regarding the control mechanisms for e-assessment
EP1: “In a South African context with limited access to affordable data and infrastructure (such as large computer labs etc.) that is sometimes lacking, it is important that it is possible to have asynchronous modes of e-assessment. Synchronized e-assessment is however in some cases also necessary - especially in high-stakes/summative types of e-assessment as this is often the only way to ensure the integrity of the assessment.”
EP5: “Synchronous and asynchronous modes depend on activity type.”
EP11: “Students should be able to log their answers to personal storage for future references.”</td></tr>
</table>

EP1 made mention of the fact that South Africa has limited access to affordable data and infrastructure, and as such the use of both asynchronous and synchronous modes of e-assessment should be considered, depending on the type of e-assessment task (see 3.2.3; 3.2.3.1; 3.2.3.2; 3.2.3.3; 3.2.3.4; 4.4; 4.7.1). EP5 was in support of the mode of e-assessment (asynchronous or synchronous), depending on the type of e-assessment task. I agree with both participants and this is the reason why feature B5 emphasises that the e-assessment system should allow switching between synchronous and asynchronous modes of e-assessment (see 3.2.3; 3.2.3.1; 3.2.3.2; 3.2.3.3; 3.2.3.4; 4.4; 4.7.1). The comment made by EP11 is important but it falls under the component of recording and reporting of e-assessment results (see Table 7.7). With e-assessment platforms, students’ answers are stored and they can retrieve these at any time (see 3.3.12.11).

7.4.1.3 The system feedback for e-assessment

All three sub-features pertaining to the system feedback for e-assessment were supported by a majority of participants who either rated the features “essential” or “useful.” However, features C1 and C3 were rated “not necessary” by one and two of the participants respectively. However, because the exclusion rate was neither reached nor exceeded (see

7.3.2), I retained these features in the final framework. The e-assessment system should allow assessors the flexibility to turn feedback on or off, based on the type of questions or e-assessment tasks (see 3.3.12.3). Furthermore, the ability to provide feedback for each question is necessary to enable students to understand what they did wrong or right on a specific question (see 2.9.2.1.3; 3.3.7; 3.3.12.3).

Table 7.4: Characteristics and/or requirements for the successful implementation of e-assessment: System feedback (*n=17*)

Rating scale: E=Essential feature U=Useful feature N=Not necessary				
		E	**U**	**N**
C: *The system feedback for e-assessment should be appropriate. This requires the following considerations:*		**17**	**0**	**0**
C1	The e-assessment system should allow assessors to turn feedback on an e-assessment task on or off.	**7**	**9**	**1**
C2	The e-assessment system should be programmed to provide appropriate feedback when an answer is correct or incorrect.	**10**	**7**	**0**
C3	The e-assessment system should allow assessors to provide feedback per question.	**7**	**8**	**2**
Verbatim comments from participants regarding the system feedback for e-assessment EP1: “Feedback is especially important in formative assessment tasks. However, in a summative assessment such as an examination we often do not want to make the same level of feedback available. Therefore, the key for me in the above statements is the ability to switch it on and off.” EP4: “This is true, because you might want to give feedback (which might be hints to students) in formative assessments, but not necessarily for summative assessments.” EP6: “Transparency is key when it comes to providing students with feedback. Limiting students viewing capabilities suggests a lack of transparency. Feedback is an integral part of assessment and learning and should not be withheld or limited.” EP11: “Feedback to students should have options for students to verify their answers.”				

The comments from EP1 and EP4 actually were in support of feature C1 (the e-assessment system should allow assessors to turn feedback on an e-assessment task on or off). Participants EP1 and EP4 further mentioned that feedback can be switched on for formative e-assessments tasks and off for summative e-assessment tasks. I believe this will depend on the type of module and the lecturer. Some lecturers may want to provide feedback for summative or formative e-assessment tasks, or both (see 2.9.1.4; 2.9.2.1.3). The comments made by EP6 and EP11 confirmed feature C2 (automated feedback), which I see as an important feature because students' feedback can be valuable for other students, and can be applied in subsequent e-assessment tasks (see 2.9.1.4; 2.9.2.1.3; 2.9.2.3; 3.2.6.1g; 3.2.9.10; 3.2.10.1; 3.3.7; 4.4; 4.6.2; 6.5.1.14, 6.5.1.15; 6.5.2.15; 6.5.2.16).

7.4.1.4 The stability and speed of the e-assessment system

All the features regarding the stability and speed of the e-assessment system were either rated "essential" or "useful" by at least 94% (16) of the participants. Feature D3 was rated "not necessary" by only one of the participants (6%) and was therefore retained in the final framework.

Table 7.5: Characteristics and/or requirements for the successful implementation of e-assessment: Stability and speed (*n=17*)

Rating scale: E=Essential feature U=Useful feature N=Not necessary				
		E	**U**	**N**
D: ***The stability and speed of the e-assessment system should be appropriate. This requires the following considerations:***		**16**	**1**	**0**
D1	The e-assessment system should be stable while the assessor is compiling the task.	**14**	**3**	**0**
D2	Regardless of the number of students who are completing the e-assessment task (e.g., simultaneously), the system should remain stable.	**14**	**3**	**0**
D3	In case of a power failure when students are completing the e-assessment tasks, there should be an alternative/ emergency power source.	**12**	**4**	**1**
D4	The delivery of relevant tests, videos, graphics, and e-assessment tasks from the server to the student's computer should be fast and not be delayed.	**14**	**3**	**0**
Verbatim comments from participants regarding the stability and speed for the e-assessment system EP1: "If an asynchronised e-assessment is taking place, how would one ensure an alternative power source? I think you need to be more specific here to say that alternative				

power sources should be available in computer labs. Some e-assessments are completed on students' mobile devices for which one cannot ensure alternative power sources for instance. Furthermore, I think it is a little unrealistic to expect a system to remain stable regardless of the number of students who are completing a task. You need to determine what you need in a specific institution and scope for that. No institution has a server capacity that allows for unlimited number of assessment participants to take an assessment simultaneously. Neither is there a need for that - we know how many students we have in each institution. We know what the need is for e-assessment in specific institutions. We can plan for that."

EP4: "This is one of the major components that can sway lecturers to not use e-assessments, if technical problems arise regularly, as in above."

EP5: "Digital items such as videos and graphic depend on Internet speed to load quickly, not necessarily the e-learning system."

EP6: "Alternative/emergency power sources tend to keep the device (PC) on during power failures; however, many times this causes a dip in the Internet connectivity which could cause the system to kick students out of the assessment. Alternative/emergency power sources should also cover the lighting and possibly the air conditioning of the room as this could also affect the student's ability to focus on the assessment."

EP7: "There should be a means of saving answers, so that if there is a disruption such as a power failure the students will be able to continue from where they were interrupted."

EP11: "Stability should be extended to the Internet facilities."

The comment made by EP1 regarding the impracticability of an alternative power source in an asynchronised e-assessment, was considered. I agree with EP1 on this because as he/she mentioned, when e-assessment tasks are done on tablets or mobile phones, then an alternative power source for the system is not relevant. I therefore adapted feature D3 in the final framework to include the suggestion made by EP1 (an alternative power source should be available in computer laboratory).

EP1's comment regarding feature D2 was also noted and the feature was adapted in the final framework. The word "regardless" was removed to accommodate specific numbers of students in institutions. The comment made by EP6 (regarding the alternative/energy power source), namely that it might slow down the Internet connectivity, might be true. However, there is no other way to ensure the continuity of e-assessment tasks (especially synchronous e-assessment tasks) if there is a power failure. I therefore recommend that an alternative power source should be in place for e-assessment tasks in laboratories (see 3.2.9; 3.3.11; 3.3.12.6; 6.5.2.25). EP6 further mentioned that the room should be conducive throughout the period that the students are completing an e-assessment task. I agree with this suggestion because if the students are not comfortable in the room (especially the temperature) it may affect them negatively; and this falls under the practicability/feasibility of e-assessment tasks (see 2.6.2.4; 3.3.6.4; 6.5.1.16; Table 7.30).

I seriously considered the comments made by EP5 and EP11, namely that the stability of the Internet connection is also important (see 3.2.8.3; 3.2.9; 3.3.11; 3.3.12.1; 6.5.2.22). In as much as I agree with EP5 and EP11, I believe it sometimes depends on the mode of e-assessment task. If it is asynchronous, then the Internet connection will not be a factor since students can download and then complete the e-assessment task offline (see 3.2.3; 3.2.3.2; 3.2.3.4; 4.4; 4.7.1). EP4 remarked that technical problems demotivate some lecturers to use an e-assessment system (see 3.2.8; 3.3.11; 3.3.12). Therefore, I recommend that the e-assessment system should be stable in order to avoid too many technical problems (see 3.3.12.6). I also considered the comment made by EP7 (there should be a means of saving answers, so that if there is a disruption such as a power failure, the students will be able to continue from where they were interrupted) (see 3.3.8; 3.3.12.6), as important, and added it as a feature in the final framework.

7.4.1.5 The security of e-assessment

All the features regarding the security of an e-assessment system were either rated “essential” or “useful” by at least 94% (16) of the participants. Feature E6 was strongly supported by all the participants.

Table 7.6: Characteristics and/or requirements for the successful implementation of e-assessment: Security (*n=17*)

Rating scale: E=Essential feature U=Useful feature N=Not necessary				
		E	**U**	**N**
E: The security of e-assessment should be appropriate. This requires the following considerations:		**16**	**1**	**0**
E1	Only students who are registered for the module should be able to access an e-assessment task.	**16**	**0**	**1**
E2	The e-assessment system should allow for the e-assessment task to be scheduled for a pre-specified date and time (it should allow a synchronous mode, if required).	**14**	**3**	**0**
E3	The e-assessment system must allow assessors to set the number of times students will be allowed to access an	**14**	**3**	**0**

Rating scale: E=Essential feature U=Useful feature N=Not necessary				
		E	U	N
E: *The security of e-assessment should be appropriate. This requires the following considerations:*		**16**	**1**	**0**
	e-assessment task.			
E4	The time a student logs on and off, the system/e-assessment task should be recorded and made available for the lecturer to monitor.	**13**	**4**	**0**
E5	Before an e-assessment task is uploaded and ready, the student's login and password should be operational.	**15**	**2**	**0**
E6	Students should be authenticated (by using their own unique usernames and passwords) when accessing an e-assessment task.	**17**	**0**	**0**

Verbatim comments from participants regarding the security for e-assessment

EP1: "An LDAP integration is preferable in this regard or some sort of single sign-on so students do not have to remember multiple passwords."

EP4: "If you cannot be sure that it is the student him-/herself that did an assessment, it is actually worthless."

EP7: "E6 refers: Consider using a random password to access an e-assessment in addition to using unique username and passwords (then providing this random password to each student when accessing the e-assessment. This will eliminate the possibility of students completing e-assessment for other students."

EP11: "For high category assessment, authentication should include biometrics."

Based on the comments made by EP7 and EP11, feature E6 was adopted in the final framework to also include random passwords (uniquely generated passwords) and biometrics (as other authentication methods). The concepts of random passwords and biometrics are important in e-assessment as they will prove the identity of the students who are completing the e-assessment task (see 3.2.4; 3.2.4.1; 3.3.11; 3.3.12.7; 4.4). Feature E1 (only students who are registered for the module should be able to access the e-assessment tasks) was rated "not necessary" by only one of the participants. This feature was retained in the final framework since the number of participants was not within the exclusion rate. E1 is an important feature because if students who are not registered for the module can access the e-assessment tasks, then there will be no integrity since other students can do the e-assessment task on their behalf (see 3.2.4; 3.3.3; 3.3.11; 3.3.12.7; 6.5.1.3; 6.5.2.25).

All the comments made by EP1, EP4, EP7, and EP11 confirm that security is a very important feature in an e-assessment system. EP1's comment regarding a lightweight directory access protocol (LDAP) integration or single sign-on by the students, clearly supports feature E6. This is because LDAP and/or single sign-on allows students to access an e-assessment task by using unique usernames and passwords (see 3.2.4; 3.3.3; 3.3.11; 3.3.12.7; 6.5.1.3; 6.5.2.25).

7.4.1.6 The recording and reporting of e-assessment results

Features F to F4, shown in Table 7.7, were all rated either '"essential" or "useful" by at least 94% (16) of the participants. Therefore, all these features were retained in the final framework. One participant rated feature F4 as "not necessary." This was not enough to require the removal of this feature.

Table 7.7: Characteristics and/or requirements for the successful implementation of e-assessment: Recording and reporting (*n=17*)

Rating scale: E=Essential feature U=Useful feature N=Not necessary				
		E	**U**	**N**
F: ***The recording and reporting of e-assessment results should be appropriate. This requires the following considerations:***		**17**	**0**	**0**
F1	The e-assessment system must be able to download, report, and upload data such as student numbers, names, and marks in Excel, Word, or any other relevant text format.	**13**	**4**	**0**
F2	The e-assessment system must be able to record, calculate, and report results per topic per student.	**13**	**4**	**0**
F3	The e-assessment system must be able to report an individual student's average performance or achievement.	**11**	**6**	**0**
F4	The e-assessment system must be able to report the average time spent by a student to complete an e-assessment task.	**8**	**8**	**1**
Verbatim comments from participants regarding the recording and reporting of e-assessment results				
EP1: "It is also useful if such a system can report on the question types used per module but also overall by the institution. Item analysis reports should also be available to allow assessors to continuously monitor and evaluate their question banks."				

Rating scale: E=Essential feature U=Useful feature N=Not necessary			
	E	U	N
EP4: “Again, if the system makes tasks more difficult than what lecturers are doing on paper, it will not be used. This should save lecturers time, and if reporting is not done well, it will not save time.” EP7: “F1 - refers: Not sure why it will be necessary to upload data into the system, except of course before the e-assessment task is made available.” EP11: “Reports should include options for sending to parents, guardians or next of kin.”			

The comment made by EP1 regarding the availability of the item analysis in an e-assessment system is insightful and was therefore added as an enriching feature in the final framework. Item analysis reports will allow assessors to continuously monitor and evaluate their questions/items in the question bank (see 3.3.12.5; 3.3.12.11; 6.5.1.3). It is important for assessors to check students’ responses to the individual questions in order for them (the assessors) to assess the quality of those questions and the e-assessment task as a whole (see 3.3.12.4; 3.3.12.5; 3.3.12.11). EP1 further suggested that the system should be able to report on the types of questions used per module. I agree that this is important as it will enable assessors to determine how the students performed in the different types of questions and the time they spent on each question (see 3.3.12.3; 3.3.12.5; 3.3.12.8). The comment made by EP7 is a clear indication that the word “upload” misled the participant. I therefore replaced it with the word “export” in the final framework. EP4’s comment is confirmation that an e-assessment system should have an accurate and good reporting system (see 3.3.12.8). Although the comment made by EP11 regarding the system sending reports to parents, guardians, or next of kin may be useful I believe that such decision depends on the institutional policies regarding students’ identities and academic results (see 3.2.4.1; 3.3.1; 3.3.12). The Protection of Personal Information (PoPI) Act will also limit this process.

7.4.1.7 Appropriate support and training opportunities about the e-assessment system

All the features regarding the appropriate support and training of e-assessment system (G1 to G8) shown in Table 7.8, were either rated '“essential” or “useful” by at least 94% (16) of the participants. Consequently, all these features were retained in the final framework. One participant rated feature G5 “not necessary” but did not provide a reason for his/her choice.

Table 7.8: Characteristics and/or requirements for the successful implementation of e-assessment: Support and training opportunities (*n=17*)

Rating scale: E=Essential feature U=Useful feature N=Not necessary				
		E	U	N
G: *Appropriate support and training opportunities about the e-assessment system should be available for staff and students. This requires the following considerations:*		**17**	**0**	**0**
G1	Technical support must always be available for lecturers and students in the institution.	**16**	**1**	**0**
G2	A mobile application needs to be developed for the e-assessment system to ensure easy access for all.	**6**	**11**	**0**
G3	Proper and adequate training should be given to both students and staff to enable them to use and benefit fully from the implementation of e-assessment.	**14**	**3**	**0**
G4	In the event of a technical problem, there should be a prompt response by the technical support team.	**16**	**1**	**0**
G5	A legal service agreement should be in place.	**8**	**8**	**1**
G6	IT administrators need to ensure that there are no restrictive modes of capturing typed information (the e-assessment should allow lecturers and students to type mathematical formulas and symbols).	**11**	**6**	**0**
G7	The necessary technological infrastructure (such as computers, Internet connections, etc.) should be available for all students.	**15**	**2**	**0**
G8	The required resources (physical, human, and financial resources) should be readily available.	**14**	**3**	**0**

Verbatim comments from participants regarding the appropriate support and training of e-assessment system for staff and students

EP1: "I am saying that the statement about necessary technological infrastructure such as computers and Internet connections should be available to all students is useful and not essential because the reality in South Africa is that very few institutions have proper infrastructure to cater for ALL of their students. In many instances computer labs are not large enough to accommodate all large classes at an institution but yet that does not prevent an institution from using e-assessment in different ways (for asynchronised assessment for instance or e-assessment students complete from their mobile devices).

Having proper infrastructure would definitely be preferred though."

EP4: "If these are not in place, lecturers will stop using such a system after a few occurrences of problems."

EP5: "Formulas work differently in that a proper add-on has to be in place, for example, science and mathematics more or less would share the same add-on but you may be required to have a separate add-on for mechanical and electrical engineering."

EP11: "Training should be made available as video tutorials in order to save cost and guarantee retraining."

The last comment made by EP1 ("Having proper infrastructure would definitely be preferred though") shows that the participant supports feature G7. However, participant EP1 made a preceding comment that there is a lack of proper infrastructure (see 3.2.8; 3.2.9; 3.3.11; 3.3.12; 6.5.1.1; 6.5.1.3; 6.5.1.16; 6.5.2.22) in most institutions in South Africa, and that institutions should use different modes of e-assessment (either asynchronous or synchronous) (see 3.2.3; 3.2.3.1; 3.2.3.2; 3.2.3.3; 3.2.3.4; 3.2.4; 4.4; 4.7.1). Although I agree with EP1, I do contend that institutions should attempt to have the necessary technological infrastructure in place (see 3.2.9; 3.3.11; 3.3.12) that will enable students to do synchronous e-assessment tasks, since not all e-assessment tasks can be done asynchronously (e.g., summative and/or high-stake e-assessment tasks). Furthermore, students may not attempt e-assessment tasks if they are expected to use their mobile devices, due to the cost of mobile data (see 3.3.11; 6.5.1.16). EP4's comment shows that appropriate support and training should be in place in order to motivate lecturers to use the system (see 3.2.8.3; 3.2.8.11; 3.2.9.1; 3.2.9.3; 3.3.4; 3.3.10; 3.3.11; 3.3.12.9; 4.7.3; 6.5.1.1; 6.5.1.20; 6.5.2.2). The comment made by EP5 is a recommendation for feature G6. It was an important suggestion because if the appropriate add-on or plug-in (software that adds a specific/additional feature to an existing programme) is included in the specific modules, both students and lecturers will be able to use different formulas (see 6.5.1.2; 6.5.1.8). Feature G6 will then be adapted to include the word "add-on" in the final framework. The comment made by EP11 that training should be made available in the form of video tutorials, is an important issue. For this reason G3 was adapted in the final framework, (video tutorials were added). I believe that video tutorials will be a good option for training both staff and students as they can refer to it at any time whenever they encounter problems (see 3.2.3.4; 3.2.8.3; 3.2.8.11; 3.2.9.1; 3.2.9.3; 3.3.4; 3.3.10; 3.3.11; 3.3.12.9; 4.7.3; 6.5.1.1; 6.5.1.20; 6.5.2.2).

7.4.1.8 Evaluation of the e-assessment system

All the features pertaining to an evaluation of the e-assessment system were either rated "essential" or "useful" by at least 94% (16) of the participants. Only one participant rated feature H2 "not necessary." However, 94% (16) of the participants rated this feature "essential" or "useful," and it was therefore retained in the final framework.

Table 7.9: Characteristics and/or requirements for the successful implementation of e-assessment: Evaluation of the e-assessment system (*n=17*)

Rating scale: E=Essential feature U=Useful feature N=Not necessary				
		E	**U**	**N**
H:	***An evaluation of the e-assessment system should be in place. This requires the following considerations:***	**16**	**1**	**0**
H1	An institution should first implement the e-assessment system on their network for pilot testing.	**14**	**3**	**0**
H2	An institution should obtain permission to use the e-assessment system in a "live" test/assessment situation for a specified period of time.	**12**	**4**	**1**
H3	Evaluation of the e-assessment system should be done by consulting different stakeholders, e.g., students, lecturers, ICT staff, and other relevant stakeholders.	**16**	**1**	**0**
H4	All the relevant e-assessment policies should be made known and be clear to lecturers, students, and all other participants.	**14**	**3**	**0**
H5	The institution should have an appropriate e-assessment policy that integrates pedagogical and practical aims.	**10**	**7**	**0**
H6	There must be policies and procedures in place to ensure reliability and validity of e-assessment.	**11**	**6**	**0**

Verbatim comments from participants regarding an evaluation of the e-assessment system

EP1: "From my own experience a pilot is absolutely essential. Policies come later and I think it should also be like that. It is better to develop a policy with a sound knowledge of how e-assessment works at an institution rather than developing policies before piloting and testing procedures and feasibility of aspects to the e-assessment process."

EP11: "Evaluation should incorporate organizations who are already in use of e-assessment"

The comments made by EP1 and EP11 are an indication of their support for feature H1 and H3 respectively (see 3.2.9; 3.2.11; 3.2.11.1b; 3.3.12.10; 6.5.1.1; 6.5.2.25).

7.4.2 Lecturers' prior experience and knowledge of student assessment

Features A to A5 depicted in Table 7.10 were rated either "essential" or "useful" by at least 88% (15) of the participants. Based on these ratings, all features were retained in the final framework. Features A1 and A2 were each rated "not necessary" by only one participant. Feature A (lecturers who are assessors need to have prior experience and knowledge of student assessment) was rated "not necessary" by only two participants (12%).

Table 7.10: Lecturers' prior experience and knowledge of student assessment (*n=17*)

Rating scale: E=Essential feature U=Useful feature N=Not necessary				
		E	**U**	**N**
A: ***Lecturers who are assessors need to have prior experience and knowledge of student assessment. This requires the following considerations:***		**14**	**1**	**2**
A1	Lecturers (assessors) need to design e-assessment tasks of which the contexts are related to the students' socio-economic backgrounds (the tasks must be relevant).	**13**	**3**	**1**
A2	Lecturers (assessors) should have prior experience and knowledge of information technology or e-learning.	**10**	**6**	**1**
A3	Lecturers (assessors) require prior experience of change in education to enable them to adapt to the change towards e-assessment.	**8**	**9**	**0**
A4	Lecturers (assessors) should have the knowledge and skills required for designing and implementing quality e-assessment tasks.	**11**	**6**	**0**
A5	Lecturers (assessors) should have knowledge of how to make appropriate use of action verbs (e.g., according to Bloom's Taxonomy) in formulating items and questions.	**11**	**6**	**0**

Verbatim comments from participants regarding lecturers' prior experience and knowledge of student assessment before implementing e-assessment
EP1: "How does one gain experience if one is required to have experience before attempting to use e-assessment? I find that it is necessary for e-learning/assessment experts to work very closely with assessors/lecturers in this regard. Training and individual consultation should be available."
EP4: "E-assessments can easily be seen as "watered-down" assessments, if not done properly."
EP5: "Lecturers should adapt to the changing environment in education."
EP11: "Seminars and workshops should be made available to lecturers in order to integrate and consolidate innovative addition."
EP16: "E-assessment requires moderation and quality assurance."

Participants EP1 and EP11 mentioned that assessors need to be trained by e-learning or e-assessment experts, or attend workshops and seminars in order to gain more experience in the use of e-assessment (see 3.2.8.11; 3.2.9.1; 3.2.9.3; 3.3.4; 3.3.11; 3.3.12.9; 4.7.3; 6.5.1.1; 6.5.1.20; 6.5.2.2). Participant EP11 further stated that training by e-learning and/or e-assessment experts will enable assessors to be innovative when designing e-assessment tasks (see 2.4.12.1; 3.2.10.1; 4.3.1.6; 4.5.3; 6.5.1.20). This is a good contribution since e-assessment tasks that come with innovation will motivate students to do them (see 3.2.10.1). The comments made by participants EP4 and EP5 encourage assessors to design appropriate e-assessment tasks and adapt to changes in education (see 3.2.8.10; 3.2.9.3; 3.3.4; 6.5.1.3; 6.5.1.16; 6.5.1.19). I believe the comment made by participant EP16 (e-assessment requires moderation and quality assurance) is important as it will ensure that all the e-assessment tasks designed by assessors are of high quality (see 3.2.8.9; 3.2.9.3; 3.3.4; 3.3.12; 4.7.3; 6.5.1.5; 6.5.1.18; 6.5.1.19). However, I believe that the comment made by EP16 falls under the component: reliability of e-assessment (see 7.4.12.3) and it was subsequently added as a feature in the final framework.

7.4.3 Using IT students' e-assessment results for different teaching and learning purposes

All the features regarding the use of IT students' results (the purpose of e-assessment) shown in Table 7.11 were either rated "essential" or "useful" by all participants [100%, (17)]. Consequently, all these features were retained in the final framework.

Table 7.11: Using IT students' e-assessment results for different teaching and learning purposes (*n=17*)

Rating scale: E=Essential feature U=Useful feature N=Not necessary				
		E	**U**	**N**
A: *Students' e-assessment results should be used for different purposes, for example:*		**16**	**1**	**0**
A1	Lecturers should use e-assessment results to provide students with constructive feedback about their learning (feedback on their performance and progress).	**14**	**3**	**0**
A2	Students' e-assessment results should enable lecturers to assess their students' progress and performance.	**13**	**4**	**0**
A3	Based on the students' e-assessment results, lecturers should evaluate and enhance the efficiency of their own methods of teaching.	**12**	**5**	**0**
A4	The efficiency of the curriculum/programme should be evaluated and enhanced based on the students' e-assessment results.	**11**	**6**	**0**
Verbatim comments from participants regarding the use of IT students' results (the purpose of e-assessment) EP1: "Curriculum evaluation should be based on more than e-assessment results although it would be useful if e-assessment results were also considered." EP11: "Consents and agreements of students are necessary in this regard."				

Participant EP1 suggested that curriculum evaluation should be based on more than e-assessment results, although it would be useful if e-assessment results were also considered. I believe this comment was as a result of feature A4. Among others, I agree with the participant that curriculum evaluation should be based on more than e-assessment results (see 2.6.1; 6.5.1.17); however, this part of the framework was dealing with students' e-assessment results and that was why the curriculum evaluation was related to only students' results. For clarity purposes, feature A4 was adapted in the final framework to include the words "among others". Arguably, I think that the comment made by participant EP11 (consent and agreement of students are necessary) is not particularly important as the students' e-assessment results will not be used for other purposes apart from students' own academic purposes and improvement (see 2.6.1; 6.5.1.17).

7.4.4 Setting deadline dates for the completion/submission of e-assessment tasks

All the features pertaining to the setting of deadlines for the submission of e-assessment tasks were supported by at least 94% (16) of the participants who either rated the features '"essential" or "useful." All these features were therefore retained in the final framework. Features A1 and A2 were each rated "not necessary" by one of the participants. Nevertheless, because the exclusion rate was determined to be a "not necessary" rating by nine or more participants (see 7.3.2), I retained these features in the final framework.

Table 7.12: Setting deadline dates for the completion/submission of e-assessment tasks (*n=17*)

Rating scale: E=Essential feature U=Useful feature N=Not necessary				
		E	**U**	**N**
A: *Deadlines should be set for the submission of e-assessment tasks. This should be done by considering the following:*		**17**	**0**	**0**
A1	Deadlines are necessary to teach students how to effectively manage time, which is a requirement for employability.	**12**	**4**	**1**
A2	Deadlines force students to complete e-assessment tasks on time, because they know that the link for submission will not be available once the deadline lapses.	**10**	**6**	**1**
A3	Deadlines for completion of e-assessment tasks should be reasonable. For example, unforeseen circumstances (such as server failure or inability to upload e-assessment tasks on the platform) must be taken into account.	**15**	**2**	**0**
Verbatim comments from participants regarding the setting of deadlines for the submission of e-assessment tasks EP1: "Deadlines should be appropriate for the type of assessment. A formative/informal assessment may be open for a longer period than for instance an e-exam." EP4: "Students tend to leave all assessments and assignments until the very end if no due dates are set." EP11: "Deadline may also be spread with warning days before the actual day." EP16: "Students can learn about time management in different manners, not specifically via e-assessment."				

The comments made by participants EP1 and EP11 were regarded as important and were added as additional features in the final framework. Participant EP4's comment shows that he/she agrees with setting deadline dates for the completion/submission of e-assessment tasks (see 2.2.3.1; 2.2.3.2; 2.4.7; 3.2.10.2; 3.3.9; 3.3.12.2; 3.3.12.8; 4.6.1; 4.6.2.2; 6.5.1.9). Participant EP16 mentioned that students can learn about time management in different ways, not specifically via e-assessment. Although I agree that students can learn about time management in different ways, I do argue that when deadlines are set for e-assessment tasks, students are more inclined to respond knowing that the link for the submission will not be available once the deadline lapses (see 3.2.6; 6.5.1.9; Feature A2).

7.4.5 Setting duration limits for the completion of e-assessment tasks

All the features regarding the setting of time limits for the completion of e-assessment tasks were supported by at least 94% (16) of the participants who rated the features either "essential" or "useful." All the features were consequently retained in the final framework. Features A1 and A2 were each rated "not necessary" by one of the participants. However, because the exclusion rate was determined to be a "not necessary" rating by nine or more participants (see 7.3.2), I retained the feature in the final framework.

Table 7.13: Setting duration limits for the completion of e-assessment tasks (*n=17*)

Rating scale: E=Essential feature U=Useful feature N=Not necessary				
		E	**U**	**N**
A:	***Setting duration (time) limits for the completion of e-assessment tasks is necessary, but the following should be considered:***	**16**	**1**	**0**
A1	Duration limits prepare students for the working environment (to perform tasks within a prescribed period).	**10**	**6**	**1**
A2	Duration limits should motivate students to set fixed targets for the achievement of their tasks.	**9**	**7**	**1**
A3	Duration limits work well on an e-assessment platform because students are forced to complete the tasks on time, knowing that they will not be able to continue with the tasks once the duration limit expires.	**10**	**7**	**0**
A4	Duration limits must suit the complexity of the e-assessment task.	**13**	**4**	**0**
A5	Duration limits must suit the types of questions in the e-assessment tasks.	**13**	**4**	**0**
A6	Duration limits for e-assessment tasks should be reasonable, in that the assessor needs to make provision for unforeseen	**11**	**6**	**0**

Rating scale: E=Essential feature U=Useful feature N=Not necessary				
		E	U	N
	circumstances (e.g., technical problems such as a slow Internet connection, unreliable computer software or hardware, etc.).			
Verbatim comment from a participant regarding the setting of time limits for the completion of e-assessment tasks EP11: “The computer and IT skills level of the students should be guaranteed before setting limits.”				

Participant EP11’s comment (the computer and IT skills level of the students should be guaranteed before setting limits) was considered important and was added as an additional feature in the final framework. If students lack computer and IT skills, then they will take longer to complete, or fail to complete, the e-assessment tasks which could influence their e-assessment results, and vice-versa (see 3.2.8; 3.2.8.8; 3.2.9; 3.2.9.5; 3.2.9.6; 4.5.1.3; 6.5.1.2; 6.5.1.16).

7.4.6 Relationship between IT students’ e-assessment marks and how and what they have learned

All the features regarding the relationship between IT students’ e-assessment marks and how and what they have learned were confirmed by at least 71% (12) of the participants who rated the features either “essential” or ‘“useful.” All the features were consequently retained in the final framework. Features A1, A3.1, A3.2, and A3.4 were each rated “not necessary” by one of the participants. Feature A2 was rated “not necessary” by four of the participants. Features A3.3 and A3.5 were each rated “not necessary” by five of the participants. Only three of the participants rated feature A3.5 essential; thus, it did not receive such strong support if compared to the other features in this category. However, because the exclusion rate was determined to be a “not necessary” rating by nine or more participants, I retained all the features in the final framework.

Table 7.14: Relationship between IT students' e-assessment marks and how and what they have learned (*n=17*)

Rating scale: E=Essential feature U=Useful feature N=Not necessary		E	U	N
A: ***There is a need for a consistent relationship between IT students' e-assessment marks and how and what they have learned. This involves the following:***		**16**	**1**	**0**
A1	Students should achieve good e-assessment grades when they apply a deep approach to learning/are actively engaged.	**8**	**8**	**1**
A2	Students should not achieve good e-assessment marks if they merely recall what they learned (if they applied a surface learning approach).	**8**	**5**	**4**
A3	***The marks students obtain for e-assessment tasks should be a reflection of the following:***			
		E	U	N
A3.1	The quality of lecturers' teaching.	**6**	**10**	**1**
A3.2	The way in which the e-assessment tasks are formulated (whether the assessor used appropriate action verbs that represent the appropriate cognitive levels in Bloom's Taxonomy).	**12**	**4**	**1**
A3.3	The assessor's level of leniency or strictness during marking.	**6**	**6**	**5**
A3.4	The leniency or strictness built into an automated marking tool.	**7**	**9**	**1**
A3.5	Students' interest in the IT module.	**3**	**9**	**5**

Verbatim comments from participants regarding the relationship between IT students' e-assessment marks and how and what they have learned

EP1: "The level of the questions depends on the type of assessment and the purpose of the assessment. It is preferable that higher-order thinking is tested in certain instances, especially where students can complete the assessments in their own time without invigilation for example. In some types of assessments however there is a place for the evaluation of lower-order thinking. It is also an important part of scaffolding."

EP11: "Other assessment methods should be used to corroborate student's positions."

The comments made by EP1 and EP11 show that students' e-assessment marks depend on how the e-assessment task was conducted and/or assessed (see 2.2.3; 2.2.4; 4.5.1; 6.5.1.11; 6.5.2.19; 6.5.2.20). These comments correspond especially with feature A3.2, but are also related to A3.3 and A3.4.

7.4.7 Students' knowledge regarding what they will be assessed on

All the features regarding students' knowledge about what (the content) they will be assessed on, were supported by at least 71% (12) of the participants who rated the features as either "essential" or "useful." All the features were consequently retained in the final framework. Features A1 and A3 were each rated "not necessary" by two of the participants. Feature A2 and A4.1 were each rated "not necessary" by one of the participants. Feature A4.2 was rated "not necessary" by five of the participants. Only seven of the participants rated feature A4.2 essential; thus, it did not receive such strong support if compared to the other features in this category. However, because the exclusion rate was determined to be a "not necessary" rating by nine or more participants, I retained all the features in the final framework.

Table 7.15: Students' knowledge regarding what they will be assessed on (*n=17*)

Rating scale: E=Essential feature U=Useful feature N=Not necessary				
		E	**U**	**N**
A: *Informing IT students in advance of what (the content) they will be assessed on, is important. The following also need to be considered:*		**17**	**0**	**0**
A1	Providing students in advance with information about the content that will be assessed, is a principle of good e-assessment.	**11**	**4**	**2**
A2	The e-assessment task should assess students' mastery of a representative sample of the content being assessed.	**10**	**6**	**1**
A3	The lecturer should not provide students with a reduced "scope" of content (a reduced sample of content).	**11**	**4**	**2**
A4	***Besides informing students in advance of the content that will be assessed, the lecturer may also do the following:***			
		E	**U**	**N**
A4.1	*Discuss/make available previous examination papers.*	**9**	**7**	**1**

A4.2	*Discuss/make available a memorandum for the task.*	**7**	**5**	**5**
A4.3	*Design and discuss mock tests or examination papers with the students.*	**9**	**8**	**0**
Verbatim comments from participants regarding students' knowledge about what (the content) they will be assessed on EP1: "One does not have to let students know what they are going to be assessed about in all instances. A diagnostic assessment for instance does not require this information necessarily. Why should a scope not be provided? Making a memo available depends on the type of assessment. Feedback is however important in assessment, making the memo available indefinitely is however not." EP4: "These are all part of good assessment principles." EP6: "Care must be taken not to guide students to what is in the actual assessment, but rather review what has been learnt." EP11: "E-assessment should not lower the quality of the course."				

The comments made by participants EP1, EP4, EP6, and EP11 are confirmation that students should be informed in advance of the content that they will be assessed on (see 2.6.2.2; 2.7.3.3; 3.2.10.2; 6.5.1.12); however, this should be done with care. Participant EP1 mentioned that the availability of a memorandum for a task depends on the type of assessment. Arguably, I believe that regardless of the type of e-assessment tasks, tasks that take place on an e-assessment platform should have a memorandum or a rubric of criteria (see 2.7.3.4; 2.9.1.3), because once students have submitted their tasks they will be able to see whether the questions they had answered were correct or incorrect (see 3.3.12.3; 3.3.12.5). Participant EP6 advised that care should be taken when providing students with the content that they will be assessed on. That is, assessors should not provide students with the actual questions in the e-assessment tasks because when this happens the students tend to apply a surface learning approach (see 2.2.3; 2.2.3.1; 6.5.1.12). I support EP6's comment because such a practice will hinder the integrity of the e-assessment, and should be frowned upon (see 6.5.1.12).

7.4.8 Students' knowledge regarding how they will be assessed

All the features regarding students' knowledge about how (assessment criteria) they will be assessed were rated either "essential" or "useful" by at least 88% (15) of the participants. All the features were therefore retained in the final framework. Features A3 and A4 were rated "not necessary" by two of the participants and one of the participants respectively. However, none of the participants provided a reason for their choice.

Table 7.16: Students' knowledge regarding how they will be assessed (*n=17*)

Rating scale: E=Essential feature U=Useful feature N=Not necessary				
		E	U	N
A: ***Informing IT students in advance of how they will be assessed (what the e-assessment criteria will be) is important. However, the following also need to be considered:***		**16**	**1**	**0**
A1	Students will be made aware in advance of the competencies that they will be required to demonstrate through the e-assessment task.	**12**	**5**	**0**
A2	If students are informed in advance of how they will be assessed, they will be better motivated to prepare adequately.	**12**	**5**	**0**
A3	If students are informed in advance of how they will be assessed, they will become aware of the alignment between teaching/learning activities, e-assessment tasks, and the relevant learning outcome(s) (the constructive alignment of e-assessment tasks).	**8**	**7**	**2**
A4	Informing students in advance of how they will be assessed, should include how marks will be awarded (what information will be required and what will not, etc.).	**9**	**7**	**1**
Verbatim comments from participants regarding students' knowledge about how (assessment criteria) they will be assessed EP1: "I think it is a bit of a leap to say that students will become aware of constructive alignment if they are informed of how they will be assessed in advance..." EP11: "Care should be taken to avoid revealing the assessment content."				

Participants EP1 and EP11's comments indicate that students should be aware of the e-assessment criteria according to which they will be assessed. Participant EP1, however, commented that it is "a bit of a leap to say that students will become aware of constructive alignment if they are informed in advance of how they will be assessed" (see A3). Arguably, I can say that when the practice of informing students in advance about how they will be assessed is done continuously by lecturers, students will eventually be aware of the teaching/learning activities to focus on, the types of e-assessment tasks to expect, and the relevant learning outcomes to focus on (and this is proof of constructive alignment) (see 2.6.2.2; 2.6.2.3; 2.7.1; 2.7.2; 2.7.3; 2.9.1.3; 2.9.2.3; 3.3.6.3; 6.5.1.13).

7.4.9 Feedback to IT students about their performance in e-assessment tasks

All the features regarding the possible effect of feedback on IT students' performance in e-assessment tasks were supported by at least 94% (16) of the participants who rated the features either "essential" or "useful." All the features were therefore retained in the final framework. Feature A4 was rated "not necessary" by one of the participants who did not provide a reason for his/her choice.

Table 7.17: Feedback to IT students about their performance in e-assessment tasks (*n=17*)

Rating scale: E=Essential feature U=Useful feature N=Not necessary				
		E	**U**	**N**
A: ***Providing constructive feedback on IT students' performance in their e-assessment tasks is important. However, the following should also be considered:***		**16**	**1**	**0**
A1	Automated feedback on e-assessment tasks should inform students of the competency levels at which they performed.	**11**	**6**	**0**
A2	Automated feedback on e-assessment tasks should be timely (prompt) in order for it to be effective.	**15**	**2**	**0**
A3	Feedback provided by lecturers on e-assessment tasks should be timely (prompt) in order for it to be effective.	**13**	**4**	**0**
A4	Automated feedback on e-assessment tasks should be detailed so that the students will have a clear understanding of what they did correctly or incorrectly.	**14**	**2**	**1**
A5	Lecturer's feedback on e-assessment tasks should be detailed so that the students will have a clear understanding of what they did correctly or incorrectly.	**15**	**2**	**0**
A6	Automated feedback on e-assessment tasks must be constructive and/or motivating in order for the students to consider and apply the feedback.	**12**	**5**	**0**
A7	The lecturer's feedback must be constructive and/or motivating in order for the students to consider and apply the feedback.	**13**	**4**	**0**

Verbatim comments from participants regarding the possible effect of feedback on IT students' performance in e-assessment tasks, and how the feedback is provided

EP1: "The level of detail required in feedback depends on the type of assessment..."

EP4: "Feedback is always a very important factor to keep learners motivated."

EP5: "Automated feedback and lecturer's feedback is the same thing, feedback should only be provided by the lecturer, in that way they're responsible for it NOT the system."

EP6: "Students with low assessment results should be given face-to-face feedback where possible and interventions should be put in place to improve their understanding of the content."

EP11: "Feedback should include the general performance of students."

Participants EP1, EP4, EP5, EP6, and EP11 made profound comments regarding feedback. The comment from participant EP1 is confirmation of feature A5. Although participant EP1 mentioned that the level of detail required in feedback depends on the type of assessment (see 2.9.1.4; 2.9.2; 2.9.2.1.3; 2.9.2.3; 3.3.7; 4.6.2.2; 6.5.2.16), since feature A5 emphasises the detail of feedback, no amendments were made to feature A5 in the final framework. The comment made by participant EP4 relates to features A6 and A7 (see 2.9.1.4; 2.9.2; 2.9.2.1.3; 2.9.2.3; 3.3.7; 4.6.2.2; 6.5.2.16). Participant EP5 mentioned that automated feedback and lecturers' feedback are the same, and that feedback should only be provided by the lecturer since lecturers are responsible for the feedback, and not the system. I view this as a slight misunderstanding of the meaning of automated feedback and lecturers' feedback. Automated feedback is generated through the e-assessment software; however, it is the lecturer who enters the feedback into the system (see 3.3.7; 3.3.10; 6.5.1.3; 6.5.2.15; 6.5.2.23). This means that if automated feedback is not clear to students, it remains lecturers' responsibility to provide clarification on their feedback. Lecturers' feedback in the context of the framework is the feedback provided to students face-to-face, through the discussion of memoranda or one-on-one consultations (see 6.5.1.14; 6.5.2.15).

The comment made by EP11 ("Feedback should include the general performance of students") is regarded as important and was added as an additional feature in the final framework. Participant EP6 mentioned that students with low assessment results should be given face-to-face feedback where possible, and interventions should be put in place to improve their performance. Although I agree with this to some extent, I believe that feedback should be provided to all students regardless of how they performed in an e-assessment task (see 6.5.2.15). Furthermore, instead of providing face-to-face feedback, the e-assessment system can be programmed by lecturers to provide constructive feedback to students with low e-assessment results in order for them to improve on subsequent e-assessment tasks (see 2.9.2; 2.9.2.1.3; 2.9.2.2.3; 2.9.2.3; 2.9.3.1; 3.3.7; 4.6.2.2; 4.7.2; 6.5.2.16; Feature A7).

7.4.10 Forms of e-assessment in higher education

The findings of this section regarding the different forms of e-assessment in higher education are discussed with reference to the participant ratings and their comments or suggestions (where applicable) concerning the individual features in this category (see Tables 7.18 to 7.22).

7.4.10.1 Formative assessment

Features A1 to A3, A5 to A10, and A11.1 to A11.6 were supported by at least 94% (16) of the participants who rated the features either “essential” or “useful.” All these features were therefore retained in the final framework. Feature A4 was rated “not necessary” by six of the participants. Only one participant viewed the feature as essential; thus it did not receive such strong support if compared to the other features in this category. Based on such results, I agreed with the comment made by Participant EP1 that marks in formative e-assessment tasks may motivate students, although it is not necessary to award marks for formative e-assessment tasks (see 2.9.2; 2.9.2.3). This comment was considered and feature A4 was retained; however, it was adapted in the final framework to include the statement “but it is possible to award marks in order to motivate students.”

Table 7.18: Forms of e-assessment in higher education: Formative e-assessment (*n=17*)

Rating scale: E=Essential feature U=Useful feature N=Not necessary				
		E	**U**	**N**
A: ***Formative e-assessment is important, but the following should also be taken into account:***		**15**	**2**	**0**
A1	Lecturers may design formative e-assessment tasks that will assist in preparing students for forthcoming e-assessment tasks that are awarded marks (summative e-assessment tasks, such as an examination or test paper).	**10**	**7**	**0**
A2	E-assessment tasks should be followed up in order to provide an opportunity for students to ask questions and seek clarifications.	**10**	**7**	**0**
A3	Questions and instructions in formative e-assessment tasks	**11**	**6**	**0**

Rating scale: E=Essential feature U=Useful feature N=Not necessary				
		E	U	N
	should motivate students to make an extra effort (e.g., motivate them to do some extra reading and research).			
A4	It is not necessary to award marks for formative e-assessment tasks.	**1**	**10**	**6**
A5	Some summative e-assessment tasks may also be used for formative purposes (if feedback is provided to the student about his/her performance in the e-assessment task, it is also used formatively).	**4**	**13**	**0**
A6	Formative e-assessment tasks should be used for providing feedback to the lecturer on how well he/she is teaching.	**8**	**9**	**0**
A7	Formative e-assessment tasks should be used for providing feedback to the lecturer on how well the student is learning (how well the student performs and progresses).	**9**	**8**	**0**
A8	Feedback on formative e-assessment tasks should be prompt, continuous, and constructive (continuously show the student the way forward in the learning process).	**9**	**8**	**0**
A9	If problem-solving scenarios are included in formative e-assessment tasks, they may assist in preparing students for the world of work.	**11**	**6**	**0**
A10	If practical tasks are used as formative e-assessment tasks, they may assist in preparing students for the world of work.	**9**	**8**	**0**
A11	***The types of formative e-assessment tasks that will best improve student learning include:***			
		E	U	N
A11.1	Online presentations.	**8**	**9**	**0**
A11.2	E-group discussions and e-activities.	**9**	**8**	**0**
A11.3	E-journal or e-article reviews.	**7**	**10**	**0**
A11.4	Online question-and-answer sessions.	**9**	**8**	**0**
A11.5	Online discussions between students and lecturers.	**8**	**8**	**1**

Rating scale: E=Essential feature U=Useful feature N=Not necessary			
	E	U	N
Verbatim comments from participants regarding how formative e-assessments are conducted and the assessment tasks used for formative e-assessment EP1: "I agree that it is not necessary to award marks for formative assessment but it is however possible to and in most instances awarding marks acts as motivation in itself. Quizzes can be formative as well." EP11: "Video chats among students and between lecturers and students. Suggest that it includes error correction options for students of lower skills to upgrade."			

Participant EP1 mentioned quizzes (see 2.9.2.4; 6.5.1.6) as another possible type of formative e-assessment tasks. EP11 also mentioned video chats (see 2.9.2.4) as an example of formative e-assessment tasks. These tasks mentioned by EP1 and EP11 were considered and added to the final framework because these formative e-assessment tasks can help students to monitor their progress (see 2.9.2; 2.9.2.4). Participant EP11 further made a comment that formative e-assessment should include error correction options for students with lower level skills to enable them to upgrade their performance (see 2.9.2; 2.9.2.1.3; 2.9.2.3; 3.3.7; 4.6.2.2; 6.5.2.16). This relates to feature A8 that states that students should be gradually guided in the learning process based on the feedback provided on formative e-assessments (see 2.9.2; 2.9.2.1.3; 2.9.2.3).

7.4.10.2 Summative assessment

Regarding how summative e-assessments are conducted and the assessment tasks used for summative e-assessment, all the features pertaining to this section (features B, B1 to B5, and B6.1 to B6.6) were rated either "essential" or "useful" by at least 94% (16) of the participants. Features B1, B2, B3, and B6.4 were each rated '"not necessary" by only one participant. All the features were subsequently retained in the final framework.

Table 7.19: Forms of e-assessment in higher education: Summative e-assessment (*n=17*)

Rating scale: E=Essential feature U=Useful feature N=Not necessary		E	U	N
B: Summative e-assessment is important, but should take the following into account:		**14**	**3**	**0**
B1	Summative e-assessment tasks should require some research in order to add value to students' learning.	**13**	**3**	**1**
B2	Lecturers should conduct summative e-assessment after completing a section or chapter of work, a module, and/or at the end of a semester to determine how their students are learning (how they are performing and progressing).	**9**	**7**	**1**
B3	If constructive feedback is provided after summative e-assessment tasks have been done, some students will learn to take the feedback into consideration and not only focus on the marks obtained.	**9**	**7**	**1**
B4	If problem-solving scenarios are included in summative e-assessment tasks, they may assist in preparing students for the world of work.	**10**	**7**	**0**
B5	If practical tasks are used as summative e-assessment tasks, they may assist in preparing students for the world of work.	**12**	**5**	**0**
B6	***The types of summative e-assessment tasks that will best improve student learning include:***			
		E	**U**	**N**
B6.1	Online research reports (e.g., academic assignments) for undergraduate students.	**10**	**7**	**0**
B6.2	E-tests.	**11**	**6**	**0**
B6.3	E-examinations.	**11**	**6**	**0**
B6.4	E-portfolios.	**12**	**4**	**1**
B6.5	Online presentations.	**10**	**7**	**0**
B6.6	E-project reports.	**10**	**7**	**0**

Verbatim comment from a participant regarding how summative e-assessments are conducted and the assessment tasks used for summative e-assessment
EP11: "Online discussion."

Online discussion was suggested by participant EP11 as a possible summative e-assessment task (see 2.9.1.2). It was considered and added to the final framework.

7.4.10.3 Peer assessment

With regards to how peer e-assessments are conducted and the assessment tasks used for peer e-assessment, all the features were rated either "essential" or "useful" by at least 88% (15) of the participants, while features C5, C6, C9, C14, C15, and C16.1 in this section, however, were each rated "not necessary" by one participant. Features C10 and C13 were each rated "not necessary" by two participants. Nevertheless, because the exclusion rate was determined to be a "not necessary" rating by nine or more participants, I retained all the features in the final framework.

Table 7.20: Forms of e-assessment in higher education: Peer e-assessment (*n=17*)

Rating scale: E=Essential feature U=Useful feature N=Not necessary				
		E	**U**	**N**
C: ***Peer e-assessment is important, but should take the following into account:***		**11**	**6**	**0**
C1	Lecturers may divide students into small groups and require group members (peers) to assess one another.	**7**	**10**	**0**
C2	Peer e-assessment tasks should motivate students to share ideas and learn from one another.	**7**	**10**	**0**
C3	Peer e-assessment tasks should be used very effectively during group work.	**8**	**9**	**0**
C4	Peer e-assessment tasks should be planned in such a way that they elicit students' creative questioning of topics.	**7**	**10**	**0**
C5	Peer e-assessment requires peer assessors to identify their peers' mistakes.	**4**	**12**	**1**
C6	Peer e-assessment requires peer assessors to identify their peers' strengths.	**6**	**10**	**1**
C7	Peer e-assessment feedback should assist students to	**7**	**10**	**0**

Rating scale: E=Essential feature U=Useful feature N=Not necessary				
		E	**U**	**N**
	identify their own mistakes.			
C8	Peer e-assessment feedback should assist students to identify their own strengths.	**7**	**10**	**0**
C9	If more able students have to give feedback to less able peers, they will also benefit since they have to explain procedures to less able students.	**6**	**10**	**1**
C10	Peer e-assessment will make students feel that they own the assessment process.	**5**	**10**	**2**
C11	Peer e-assessment will motivate peers to explain their decisions and/or answers to one another.	**6**	**11**	**0**
C12	Peer assessors may be selected randomly in order to avoid unfair or biased assessment among peers, where possible.	**7**	**10**	**0**
C13	Peer e-assessment can be used at the end of any learning period (e.g., students' final project presentations).	**5**	**10**	**2**
C14	Peer e-assessment usually works well if short questions and answers are used.	**6**	**10**	**1**
C15	Peers' feedback on e-assessment tasks will motivate student engagement.	**6**	**10**	**1**
C16	***The types of peer e-assessment tasks that will best improve student learning include:***			
		E	**U**	**N**
C16.1	Peers' e-assignments (undergraduate research reports)	**6**	**10**	**1**
C16.2	E-tests.	**8**	**9**	**0**
C16.3	Online academic essays.	**8**	**9**	**0**
C16.4	Online presentations.	**9**	**8**	**0**
Verbatim comment from a participant regarding how peer e-assessments are conducted and the assessment tasks used for peer e-assessment EP11: "The remote login to the portal should be made efficient."				

Participant EP11's comment that the remote login to the portal (the e-assessment platform) should be effective is very important as it will enable students to do e-assessment tasks with their peers at any time and from anywhere. This comment falls under the stability and speed for e-assessment system (see 3.2.8.3; 3.3.12.6; 6.5.2.22; 7.4.1.4; Table 7.5).

7.4.10.4 Self-assessment

All the features (D, and D1 to D7) regarding how self e-assessments are conducted were rated either '"essential" or "useful" by all 100% (17) participants. This is a strong indication of their support of how self e-assessments are conducted. Pertaining to the types of e-assessment tasks used for self e-assessment, at least 94% (16) of the participants rated all the features (D8.1 to D8.4) as either "essential" or "useful". Features D8.3 (online academic essays) and D8.4 (online preentations) were, however, each rated "not necessary" by one participant. However, because the exclusion rate was determined to be a "not necessary" rating by nine or more participants (see 7.3.2), I retained all the features in the final framework.

Table 7.21: Forms of e-assessment in higher education: Self e-assessment (*n=17*)

Rating scale: E=Essential feature U=Useful feature N=Not necessary				
		E	**U**	**N**
D: *Self e-assessment is important, but the following should also be taken into account:*		**15**	**2**	**0**
D1	Self e-assessment tasks should contain questions and/or instructions that enable students to evaluate their own level of understanding of a specific topic or content.	**11**	**6**	**0**
D2	Self e-assessment questions and/or instructions should enable students to evaluate their own knowledge of specific topics or content.	**12**	**5**	**0**
D3	Self e-assessment tasks should help students to identify their own weaknesses.	**11**	**6**	**0**
D4	Self e-assessment tasks should help students to identify their own strengths.	**11**	**6**	**0**
D5	Self e-assessment can prepare students for forthcoming assessment tasks that are awarded marks (summative e-assessment tasks such as examinations, tests, etc.).	**10**	**7**	**0**
D6	Self e-assessment tasks should encourage students to think critically about their own work.	**9**	**8**	**0**

Rating scale: E=Essential feature U=Useful feature N=Not necessary				
		E	U	N
D7	Self e-assessment tasks should be aimed at empowering students in their own learning processes.	**10**	**7**	**0**
D8	***The types of self e-assessment tasks that will best improve student learning include:***			
		E	U	N
D8.1	E-assignments (e.g., research reports).	**10**	**7**	**0**
D8.2	E-tests.	**9**	**8**	**0**
D8.3	Online academic essays.	**10**	**6**	**1**
D8.4	Online presentations.	**8**	**8**	**1**
Verbatim comment from a participant regarding how self e-assessments are conducted and the assessment tasks used for self e-assessment EP11: "Downloadable offline practice e-tests. There should be resources where students can access and choose which self-assessment options they want."				

Participant EP11's suggestion of having downloadable offline practice e-tests as a possible self e-assessment task falls under e-test (see 2.9.3.2; 6.5.2.7), which has already been included as a feature in D8.2. Furthermore, EP11's comment that there should be resources where students can access and choose their own self-assessment options that they want to do, was considered important and therefore added to the final framework as a feature (see 2.9.3.2). I believe that when students have the liberty to access different types of questions, they can focus on the content of which they lack understanding. For instance, if lecturers have practice self e-assessment tasks for different chapters/units that they have covered, students can decide to do the task that they need most (see 2.9.3.2; 6.5.1.6).

7.4.10.5 Diagnostic assessment

All the features regarding how diagnostic e-assessments are conducted and the assessment tasks used for diagnostic e-assessment were rated either "essential" or "useful." Each feature in this section was rated "essential" by more than half the participants; and "useful" by at least four participants. None of the features was viewed as "not necessary". I regarded this rating pattern as an indication that the participants agreed to all the features pertaining to diagnostic e-assessment. These features were therefore retained in the final framework.

Table 7.22: Forms of e-assessment in higher education: Diagnostic e-assessment (*n=17*)

Rating scale: E=Essential feature U=Useful feature N=Not necessary				
		E	**U**	**N**
E: ***Diagnostic e-assessment is important, but the following should be considered:***		**13**	**4**	**0**
E1	Diagnostic e-assessment should be used to determine what students understand or do not understand at a specific point in time.	**11**	**6**	**0**
E2	Diagnostic e-assessment can help lecturers to plan meaningful and efficient teaching methods.	**12**	**5**	**0**
E3	Diagnostic e-assessment can also be used as baseline assessment (assessment done at the beginning of a module to establish what the students' knowledge and levels of understanding are).	**12**	**5**	**0**
E4	***The types of diagnostic e-assessment tasks that will best improve student learning include:***			
		E	**U**	**N**
E4.1	Online activities/exercises.	**9**	**8**	**0**
E4.2	Online chapter/unit pre-tests.	**9**	**8**	**0**
Verbatim comments from participants regarding how diagnostic e-assessments are conducted and the assessment tasks used for diagnostic e-assessment EP6: "This could also assist the lecturer to evaluate his/her own teaching effectiveness." EP11: "Diagnostic tests may extend to prerequisite knowledge."				

The comment from EP6 was confirmation of feature E2 in the framework (see 6.5.1.6). Participant EP11 mentioned that diagnostic tests may extend to prerequisite knowledge (see 6.5.1.6). This made sense because it means that diagnostic e-assessment can be used to prove that students have a certain amount of knowledge about the module and clearly relates to baseline assessment as referred to in E3. It also confirms the validity of feature E2 (see 6.5.1.6).

7.4.11 Types of assessment tasks that may be used in e-assessment

The findings of this section regarding the types of assessment tasks that may be used in e assessment are discussed with reference to the participant ratings and comments or suggestions (where applicable) concerning the individual features in this category (see Tables 7.23 to 7.28).

7.4.11.1 Presentations

All the features pertaining to how presentations in the context of e-assessment are conducted were rated by all the participants [100%, (17)] either "essential" or "useful. None of the features was rated "not necessary". This is an indication that all the participants were in support of the features related to presentations in the context of e-assessment. These features were consequently retained in the final framework.

Table 7.23: Types of assessment tasks that may be used in e-assessment: Presentations (*n=17*)

Rating scale: E=Essential feature U=Useful feature N=Not necessary				
		E	**U**	**N**
A: *Presentations in the context of e-assessment is important, but the following should also be considered:*		**13**	**4**	**0**
A1	Students should be able to upload their presentation slides on the e-assessment platform.	**10**	**7**	**0**
A2	Students should be given the opportunity to ask the online presenters some questions for clarity so that they can learn from one another.	**10**	**7**	**0**
Verbatim comment from a participant regarding how presentations in the context of e-assessment are conducted EP11: "Students can upload videos of them doing the presentation if possible."				

The comment made by participant EP11 that students can upload videos of themselves doing presentations onto the e-assessment platform was a valuable input, because assessors can then download the videos onto their laptops or computers and watch the videos at any time and from anywhere (see 2.9.1.2; 2.9.3.2; 4.5.2.3; 6.5.1.7). This suggestion was added to the final framework.

7.4.11.2 Short-answer questions

All the features regarding how short-answer questions are used in e-assessment were rated by all the participants [100%, (17)] either "essential" or "useful." None of the features was rated "not necessary". This is an indication that all the participants were in support of the features regarding how short-answer questions are used in e-assessment. These features were consequently retained in the final framework.

Table 7.24: Types of assessment tasks that may be used in e-assessment: Short-answer questions (*n=17*)

Rating scale: E=Essential feature U=Useful feature N=Not necessary				
		E	**U**	**N**
B: *Short-answer questions can be used in e-assessment, but require the following considerations:*		**14**	**3**	**0**
B1	Lecturers should design short-answer questions in a way that requires students to think critically.	**10**	**7**	**0**
B2	Lecturers should design short-answer questions that focus on higher cognitive levels.	**10**	**7**	**0**
B3	Short-answer questions should be alternated with long-answer questions.	**11**	**6**	**0**
B4	Lecturers need to design short-answer questions or tasks that will prevent students from merely memorising and regurgitating knowledge.	**11**	**6**	**0**
Verbatim comment from a participant regarding how short-answer questions are used in e-assessment EP11: "Some short answer questions should have specific answers."				

Participant EP11 suggested that some short-answer questions should have specific answers. I agree with the participant that in as much as some short-answer questions may require students to provide their own answers, some lecturers should also develop short-answer questions that have possible options that students can choose from (e.g., true/false questions, multiple-choice questions) (see 6.5.2.13). This means that lecturers can design short-answer questions that can indeed assess the higher cognitive level (see 3.3.4; 6.5.2.13) of students on a topic before asking long-answer questions. This suggestion was added as an additional feature to the final framework.

7.4.11.3 Tests and examinations

All the features (C, and C1 to C6) regarding how e-tests and e-examinations are conducted were rated either "essential" or "useful" by at least 94% (16) of participants. However, features C5 and C6 in this section were each rated "not necessary" by one participant. Since the exclusion rate was determined to be a "not necessary" rating by nine or more participants (see 7.3.2), I retained all the features in the final framework.

Table 7.25: Types of assessment tasks that may be used in e-assessment: Tests and examinations (*n=17*)

Rating scale: E=Essential feature U=Useful feature N=Not necessary				
		E	**U**	**N**
C: *E-tests and e-examinations may be used, but the following should also be considered:*		**15**	**2**	**0**
C1	Lecturers should ensure that the e-test or e-examination paper assesses students' competence pertaining to what they have learned after a particular learning period (use them as summative assessments).	**12**	**5**	**0**
C2	If e-tests and e-examinations are appropriately developed, they can also be used to prepare students for the real world (by including IT industry-related/authentic tasks/questions).	**13**	**4**	**0**
C3	E-tests and e-examinations must be followed up with constructive feedback so that students will be able to identify their own problems/mistakes.	**11**	**6**	**0**
C4	E-tests and e-examinations should be used to determine students' performance at a particular point in time.	**11**	**6**	**0**
C5	E-examinations should be written at the end of a semester or year course (for summative purposes).	**10**	**6**	**1**
C6	E-tests should be written upon completion of a unit, section, or chapter (for summative purposes).	**9**	**7**	**1**
Verbatim comment from a participant regarding how e-tests and e-examinations are conducted EP1: "e-tests can be written for formative purposes."				

Participant EP1 mentioned that e-tests can be written for formative purposes as well. I agree with the comment because if the purpose of the e-test is to provide continuous and constructive feedback for students in order for them to improve on their performance, then it is formative (see 2.9.2.1.3). This suggestion was then added in the final framework.

7.4.11.4 Assignments

E-assignments refer to an online task or an activity given to students, typically as part of their studies. All the features regarding how e-assignments are conducted were rated either "essential" or "useful" by at least 94% (16) of participants. Only feature D4 in this section was rated "not necessary" by one participant. All the features were subsequently retained in the final framework.

Table 7.26: Types of assessment tasks that may be used in e-assessment: Assignments (*n=17*)

Rating scale: E=Essential feature U=Useful feature N=Not necessary				
		E	**U**	**N**
D: *E-assignments may be used, but the following should be considered:*		**15**	**2**	**0**
D1	E-assignments should be aimed at developing students' practical experience in IT.	**12**	**5**	**0**
D2	E-assignments should be aimed at developing students' skills in IT.	**13**	**4**	**0**
D3	Students' research skills will be improved if the e-assignment instructions and/or questions encourage them to read about and apply relevant information/knowledge/skills.	**11**	**6**	**0**
D4	Lecturers should set e-assignments in advance (at the beginning of the semester or the year, and not later).	**10**	**6**	**1**
Verbatim comment from a participant regarding how e-assignments are conducted EP11: "Practical tutorials should be included to enhance practical skills acquisition."				

The comment made by participant EP11 that practical tutorials should be included in e-assessment to enhance practical skills acquisition was considered an important suggestion (see 4.6.2.4; 6.5.1.7), although it relates to feature D1. Feature D1 was therefore adapted in the final framework and was formulated as: "E-assignments should include practical tutorials in order to develop students' practical experience in IT."

7.4.11.5 Group projects

With regards to how e-group projects are conducted, all the features were rated "essential" or "useful" by at least 94% (16) of the participants. Consequently, all the features were retained in the final framework. Feature E5 (e-group projects must be designed in advance, namely in the beginning of the semester or the year, and not later) was rated "not necessary" by only one participant.

Table 7.27: Types of assessment tasks that may be used in e-assessment: Group projects (*n=17*)

Rating scale: E=Essential feature U=Useful feature N=Not necessary				
		E	**U**	**N**
E: *E-group projects may be used after considering the following:*		**14**	**3**	**0**
E1	Lecturers need to design e-group projects in such a way that they will enable students to acquire practical experience in IT.	**10**	**7**	**0**
E2	Lecturers need to design e-group projects in such a way that they will enable students to acquire the necessary skills in IT.	**10**	**7**	**0**
E3	E-group projects should encourage students to apply what they have learned practically in an authentic context.	**10**	**7**	**0**
E4	Members of groups doing e-group projects should be heterogeneous in order for the students to learn from one another and share ideas.	**7**	**10**	**0**
E5	E-group projects must be designed in advance, namely in the beginning of the semester or the year, and not later.	**8**	**8**	**1**
E6	Peer assessment can be used in e-group projects.	**6**	**11**	**0**
Verbatim comments from participants regarding how e-group projects are conducted EP4: "Some section of the group assessment should provide for making sure that not only 1 student does all the work, and the other just get the marks…" EP11: "Students lecturer consultation should be available during the group work."				

Participant EP4 mentioned that lecturers need to ensure that all the students doing an e-group project participate fully (see 2.4.11.8; 2.9.3.2). This is an important suggestion because it will not be fair if only one member within the group does all the work and the other members receive the marks for doing nothing (see 2.9.3.2). This suggestion was therefore added as an additional feature in the final framework. Participant EP11 also indicated that there should be student/lecturer consultation during the e-group project. This is also important especially when group members require clarification on the project (see 2.9.3.2). In my opinion, such consultation can be done synchronously through the chat application on the e-assessment platform (see 3.2.4.2; 3.2.6.1b; 4.5.3.1; 6.5.2.23). The suggestion made by EP11 was amended to read: "…during e-group projects, lecturers should be available for consultation either asynchronously or synchronously." This was then added as an additional feature in the final framework.

7.4.11.6 Case studies

All the participants [100%, (17)] rated all the features regarding how e-case studies are conducted either "essential" or "useful." None of the features was rated "not necessary." All the features were therefore retained in the final framework.

Table 7.28: Types of assessment tasks that may be used in e-assessment: Case studies (*n=17*)

Rating scale: E=Essential feature U=Useful feature N=Not necessary				
		E	**U**	**N**
F: *Case studies may be used in e-assessment after considering the following:*		**13**	**4**	**0**
F1	E-case studies must require students to think critically.	**11**	**6**	**0**
F2	E-case studies must require students to apply higher cognitive skills.	**12**	**5**	**0**
F3	E-case studies must require students to devise solutions to real-world problems.	**13**	**4**	**0**
Verbatim comment from a participant regarding how e-case studies are conducted EP11: "Case studies must be IT related."				

Participant EP11 stated that the case studies provided for students should be IT related. I agree with this since lecturers sometimes tend to give case studies which are not really relevant to the particular IT course. When that happens, students do not benefit from it (see 6.5.1.7). It was therefore seen as an important comment and was added to the final framework.

7.4.12 Principles of good e-assessment

In this section, the findings regarding the good principles of e-assessment are discussed with reference to the participant ratings and their comments or suggestions (where applicable), concerning the individual features in this category (see Tables 7.29 to 7.32).

7.4.12.1 Fairness

All the participants [100%, (17)] rated all the features regarding the fairness of e-assessment tasks either "essential" or "useful." None of the features was rated "not necessary." This was a strong indication of the participants' support. All the features were therefore retained in the final framework.

Table 7.29: Principles of good e-assessment: Fairness (*n=17*)

Rating scale: E=Essential feature U=Useful feature N=Not necessary				
		E	**U**	**N**
A: *E-assessment always needs to be fair, and should consider the following:*		**15**	**2**	**0**
A1	The content that is assessed through the e-assessment task should fall within the scope of the relevant IT module's curriculum.	**12**	**5**	**0**
A2	The e-assessment task does not favour/benefit only certain students.	**13**	**4**	**0**
A3	The marking of the e-assessment tasks by the assessor should be consistent.	**12**	**5**	**0**
A4	The automated marking of the e-assessment tasks by the system should be consistent.	**13**	**4**	**0**
A5	The assessor who sets and/or marks the e-assessment task should be adequately trained to create e-assessment tasks.	**14**	**3**	**0**
A6	The assessor who marks the e-assessment task should award marks for the different steps that students must follow in order to arrive at the final answer.	**15**	**2**	**0**
A7	The e-assessment task should include both higher order questions/tasks and lower order questions/tasks, particularly if the platform selects questions at random.	**14**	**3**	**0**
A8	Students' prior knowledge and understanding should be considered when designing/selecting e-assessment tasks.	**13**	**4**	**0**

Rating scale: E=Essential feature U=Useful feature N=Not necessary				
		E	U	N
A: ***E-assessment always needs to be fair, and should consider the following:***		**15**	**2**	**0**
A9	Students' levels of technology experience should be considered when designing/selecting e-assessment tasks for students.	**12**	**5**	**0**
Verbatim comment from a participant regarding the fairness of e-assessment tasks EP11: "Upon these lie the survival of any e-assessment platform."				

The comment from participant EP11 confirms the importance of fairness as a principle of e-assessment (see 2.6.2.1; 2.6.2.5; 3.3.6.3; 4.7.2; 6.5.1.16; 6.5.2.17).

7.4.12.2 Practicability/feasibility

With regards to the practicability/feasibility of e-assessment tasks, all the features were rated either "necessary" or "useful" by all the participants [100%, (17)]. All the features were thus retained in the final framework.

Table 7.30: Principles of good e-assessment: Practicability/feasibility (*n=17*)

Rating scale: E=Essential feature U=Useful feature N=Not necessary				
		E	U	N
B: ***All e-assessment tasks must be practicable/feasible, and the following must be considered:***		**15**	**2**	**0**
B1	The e-assessment environment should be conducive to learning (e.g., it should not cause unnecessary pressure, etc.).	**13**	**4**	**0**
B2	Lecturers (assessors) should be trained on how to insert complicated texts such as formulae and symbols that are required in some IT modules (e.g., programming, mathematics, etc.).	**13**	**4**	**0**
B3	If possible, students should be trained on how to insert complicated texts such as formulae and symbols that are required in some IT modules (e.g., programming, mathematics, etc.).	**12**	**5**	**0**

Rating scale: E=Essential feature U=Useful feature N=Not necessary				
		E	U	N
B: ***All e-assessment tasks must be practicable/feasible, and the following must be considered:***		**15**	**2**	**0**
B4	Students should not be overloaded with e-assessment tasks to perform.	**12**	**5**	**0**
B5	Lecturers' (assessors') marking load should be manageable.	**11**	**6**	**0**
Verbatim comment from a participant regarding the practicability/feasibility of e-assessment tasks EP11: "Video tutorials could be used for training."				

The comment made by participant EP11 relates to features B2 and B3, namely that training should be provided for students and lecturers on how to insert complicated texts that are required in some IT modules. I agree with EP11's comment regarding the use of video tutorials for training. The e-assessment and/or e-learning experts can provide lecturers and students with these video tutorials as to how they can insert formulas in their modules on the e-assessment platform. Lecturers and students can refer to the videos whenever the need arises (see 3.2.3.4; 3.2.8.11; 3.2.9.1; 3.2.9.3; 3.3.4; 3.3.11; 3.3.12.9; 4.7.3; 6.5.1.1; 6.5.1.20; 6.5.2.2). This comment was therefore considered important and was added as an additional feature in the final framework.

7.4.12.3 Reliability

Pertaining to the reliability of e-assessment tasks, all the participants [100%, (17)] rated all the features either "necessary" or "useful." Subsequently, all the features were retained in the final framework.

Table 7.31: Principles of good e-assessment: Reliability (*n=17*)

Rating scale: E=Essential feature U=Useful feature N=Not necessary				
		E	U	N
C: ***E-assessment tasks must be reliable. This requires the following considerations:***		**16**	**1**	**0**
C1	When similar students do the same e-assessment tasks under similar conditions, they should obtain similar results.	**14**	**3**	**0**

Rating scale: E=Essential feature U=Useful feature N=Not necessary				
		E	U	N
C: *E-assessment tasks must be reliable. This requires the following considerations:*		**16**	**1**	**0**
C2	The marking of e-assessment tasks by assessors should be consistent.	**14**	**3**	**0**
C3	The automated marking of e-assessment tasks by the system should be consistent.	**14**	**3**	**0**
C4	The e-assessment tasks should be well aligned with the relevant learning outcomes, assessment criteria, and the teaching/learning activities being used.	**11**	**6**	**0**
C5	The types of e-assessment tasks should frequently be varied and/or alternated.	**10**	**7**	**0**
Verbatim comment from a participant regarding the reliability of e-assessment tasks EP11: "Quality assurance is paramount for this."				

Participant EP11 mentioned that quality assurance is paramount in the reliability of e-assessment tasks. The concept of quality assurance implies that there should be consistency in the marking of e-assessment tasks, the assessment criteria, the relevant learning outcomes, the teaching/learning activities, and the students' e-assessment results. This means that the features mentioned in this section of the framework (C1 to C5) ensure quality assurance (see 2.6.2.3; 2.6.2.5; 3.3.6.2; 4.7.2; 6.5.1.16; 6.5.2.19; 6.5.2.20). The comment made by EP16 ("E-assessment requires moderation and quality assurance") regarding lecturers' prior experience and knowledge of student assessment (see 7.4.2; Table 7.10) was important because it ensures that all the e-assessment tasks designed by assessors are of high quality (see 3.2.8.9; 3.2.9.3; 3.3.4; 3.3.12; 4.7.3; 6.5.1.5; 6.5.1.18; 6.5.1.19). However, since the second part of the comment ("…and quality assurance") corresponds with that of participant EP11 ("Quality assurance is paramount for this") in this section, only the first part of the comment ("E-assessment requires moderation…") was added as an additional feature in the final framework.

7.4.12.4 Validity

All the features regarding the validity of e-assessment tasks were viewed either "essential" or "useful" by all the participants [100%, (17)]. None of the participants made comments or suggestions regarding the validity of e-assessment tasks. All the features were therefore retained in the final framework (see 2.6.2.2; 2.6.2.5; 3.3.6.1; 4.7.2; 6.5.1.16; 6.5.2.18).

Table 7.32: Principles of good e-assessment: Validity (*n=17*)

Rating scale: E=Essential feature U=Useful feature N=Not necessary				
		E	**U**	**N**
D: *The e-assessment tasks must be valid. This requires the following considerations:*		**14**	**3**	**0**
D1	The e-assessment task should assess only the content the students were required to study.	**12**	**5**	**0**
D2	The e-assessment task should only assess the achievement of the relevant, prescribed learning outcome(s).	**14**	**3**	**0**
Verbatim comment from a participant regarding the validity of e-assessment tasks None				

7.5 CONCLUSION

This chapter reported on the compilation of a preliminary framework that may assist in implementing e-assessment in the teaching and learning of IT at CTI. The framework was compiled from the findings obtained from the literature review and from the participant views in the first round of data collection (the lecturer and student questionnaires and focus group discussions). The preliminary framework was evaluated by an expert panel which completed a questionnaire containing all aspects of the preliminary framework.

The views, comments, and suggestions shared by the expert participants during the second round of data collection provided important information regarding the importance of the features included in the proposed framework, and also enabled me to become aware of the important considerations and features that have either been absent or could be expressed more clearly in the final proposed framework.

In Chapter 8, the final framework with the necessary amendments is presented along with the conclusions, further implications and limitations of the research.

CHAPTER 8

TOWARDS A FRAMEWORK FOR THE IMPLEMENTATION OF E-ASSESSMENT IN THE TEACHING AND LEARNING OF INFORMATION TECHNOLOGY

CONCLUSIONS, IMPLICATIONS AND LIMITATIONS

8.1 INTRODUCTION

The overarching aim of this study was to investigate how lecturers in information technology (IT) at the Computer Training Institute (CTI) could best implement e-assessment in the teaching and learning of the subject. The contributions made by the participants were analysed and interpreted; and these findings were consistently compared and integrated with findings from the literature review. This ultimately enabled me to compile a framework for the implementation of e-assessment in the teaching and learning of IT at CTI.

In this chapter an overview of the study is discussed (a review of the main findings pertaining to the research questions); the final proposed framework follows the overview of the study; and the significance of the study is discussed. Finally, the limitations of the study and implications for further research are discussed.

The areas addressed for conclusion in this study, are shown in Figure 8.1.

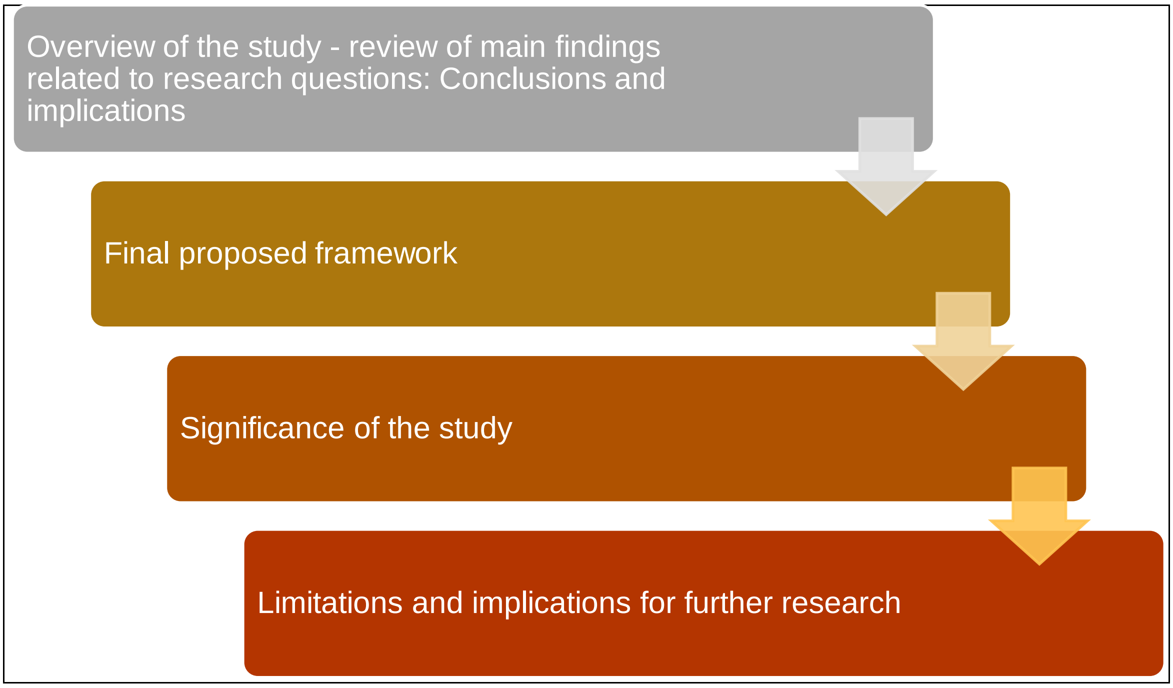

Figure 8.1: Areas addressed in Chapter 8

8.2 CONCLUSIONS

An outline of the study as well as the research questions that steered the study are found in Chapter 1. The primary and secondary research questions of the study provided significant information that resulted in the outcome of the study. Section 8.2 reviews the research questions together with the main findings (conclusions) pertaining to each question in order to ultimately provide final conclusions. The implications of the research findings are explained in section 8.3.

8.2.1 How does the literature portray, in general, the implementation of e-assessment in the teaching and learning of IT as a subject/discipline in the context of higher education?

The aim of this research question was to gain an understanding of the concept of e-assessment in the teaching and learning of IT. Furthermore, I aimed to explore the work (literature) that has been done by researchers both locally and internationally in order to obtain rich information that would be contextualised in my research study. In this study, Chapters 2, 3, and 4 responded to secondary research question one.

Chapter 2 (How students learn: implications for student assessment in higher education) was organised in two parts, namely how students learn, and assessment in higher education respectively. This chapter commenced by discussing how students learn. In this section, concepts such as student learning approaches, active learning, authentic learning, student engagement, and high-impact educational practices were discussed.

Through the literature review on how students learn, I found that a deep approach to learning (see 2.2.4), active learning (see 2.3), student engagement (see 2.4), and high-impact practices (HIPs) (see 2.5) are closely related. In other words, they work hand in hand. It was found that the successful implementation of HIPs by institutions will promote active learning, student engagement, and consequently improve students' learning (see 2.5.3). Furthermore, students who are actively engaged in the learning process are likely to apply a deep learning approach (see 2.2.4.1, 2.2.5.1). On the other hand, it was found that in situations where students are not actively involved in the learning process they tend to apply a surface learning approach (see 2.2.3.1). Thus, students apply a specific learning approach based on how they are involved in the learning process. I also found that if HIPs are effectively integrated into the students' curriculum, then students will apply a deep learning approach because HIPs help them to be actively engaged in the learning process (see 2.5.3). I came to the realisation that for students to apply both deep and strategic learning approaches they need to be involved in active learning activities (such as exploratory writing, and small-group discussions) as well as a variety of teaching-learning activities (TLAs) and assessment tasks (ATs) (see 2.3.2.1; 2.3.2.2). Based on the concepts explored on how students learn, I concluded that although HIPs have a positive impact on all students (see 2.5.1; 2.5.3), academic staff need to be adequately trained and supported by their institutions on how to effectively use these practices in the assessment process in order for students to apply an appropriate learning approach and subsequently improve their own learning.

With regards to assessment in higher education, topics such as the importance of assessment for students, lecturers, and institutions; principles of good assessment; the constructive alignment of learning outcomes, teaching-learning activities (TLAs), and assessment tasks; assessment and evidence; lecturers' role in assessment; forms of assessment; assessment *of* learning (summative assessment); assessment *for* learning (formative assessment), and assessment *as* learning (self- and peer assessment); and assessment standards were discussed.

It was found that assessment is a crucial concept in higher education institutions and that it requires the effort of all stakeholders (such as administrators, lecturers, and students) in an institution to implement an effective assessment system (see 2.6).The three main forms of assessment were discussed, namely: assessment *of* learning (summative assessment), assessment *for* learning (formative assessment), and assessment *as* learning (self- and peer assessment). It was found that in assessment *of* learning, decisions on students' performance are made solely by the lecturer or assessor (see 2.9.1) and it verifies students' level of understanding and knowledge within the learning process at a particular point in time, and whether or not they meet the relevant learning outcomes (see 2.9.1). What also became evident was that because decisions are solely made by assessors in summative assessment (see 2.9.1; 2.9.1.1), concepts such as age, gender, race, ethnicity, inter-personal relationships, and religion should not influence lecturers' decision in assessment *of* learning.

It was found that assessment *for* learning does not involve only the assessor but also the students, parents, guardians, friends, relatives, etc. (see 2.9.2.1.4; 2.9.2.3; 2.9.2.4). Another very important concept that I found about formative assessment was the absolute significance of constructive feedback. Assessors are expected to provide constructive feedback to students on what they did wrong and what they did correctly, and how they can improve subsequent assessment tasks. I realised that if feedback is not constructive or not provided at all, then the purpose of formative assessment is forfeited (see 2.9.2.1.3). Regarding assessment *as* learning, I found that students are the main stakeholders and they need to be empowered to devise and apply methods that will enable them to take responsibility of their own learning, and monitor their own learning as well as that of their peers (see 2.9.3; 2.9.3.1). It was therefore clear that in assessment *as* learning, students can reflect on their own work and on that of their peers, and make the necessary changes when necessary (see 2.9.3; 2.9.3.1; 2.9.3.2).

Another important construct that I explored was the principles of good assessment (fairness, reliability, practicability/feasibility, and validity) (see 2.6.2.1 to 2.6.2.5). I found that assessment will be credible if lecturers apply the principles of good assessment in their assessment tasks (SAQA, 2001:16-17). It was evident that assessment tasks which apply the principles of good assessment (see 2.6.2.1 to 2.6.2.5) enable students to apply a deep learning approach (see 2.2.4). Lecturers' teaching will also improve if they consider and balance these principles of good assessment. It will, however, require more knowledge and understanding from lecturers to carefully design and implement assessments. Institutions should therefore ensure that their lecturers create assessments that are appropriate and ethical. This is only possible if institutions put appropriate assessment policies and procedures in place (see 2.6).

Based on the exploration of assessment in higher education, I concluded that a mixture or a variety of forms of assessment should be used to assess students since a single form of assessment does not truly reflect what a student has learned. Regarding the principles of good assessment, institutions need to play an important role by putting in place appropriate assessment policies and procedures before their assessors' design and implement appropriate assessment tasks (assessment tasks that are based on the principles of good assessment). In summary, I concluded that students apply a specific learning approach based on how assessment tasks are designed by the assessors (see 2.2.3; 2.2.4; 2.2.5; 2.2.6.3; 2.5.2; 2.6.2).

Chapter 3 (e-learning and e-assessment in higher education) was also demarcated into two sections, namely e-learning and e-assessment in higher education. With regards to e-learning in higher education, topics that were explored included the origin of e-learning; an overview of e-learning; modes or types of e-learning; the e-learning platform and environment; e-learning and student performance; advantages and disadvantages of e-learning; enabling factors and barriers to e-learning; critical success factors for e-learning implementation; e-learning and student motivation; and evaluating the effects of e-learning. The section commenced with how e-learning originated and it was confirmed that the term "e-learning" was first used by Eliot Masie (see 3.2.1). I further analysed different definitions of e-learning. From the analysis, I deduced my own definition of e-learning (for the purpose of this study) as the process of delivering teaching and learning information and communication through a networked or standalone computer and/or other storage devices such as CD-ROMs, DVDs, satellites, etc. (see 3.2.2).

It was found that e-learning enables students to take responsibility of their own learning (to be independent learners) and become lifelong learners (due to the absence of unnecessary barriers) (see 3.2.6). It was evident during the literature review that authentic and/or real-world scenarios could be assessed by assessors on an e-learning platform (see 3.3.4). It was also found that assessors had to be knowledgeable about how the e-learning system works to enable them to assist students who may encounter challenges with the system (see 3.2.9.3). A very important concept that I noted was that since e-learning involves technology, assessors need to also change their “traditional” way of assessing their students (see 3.2.8.10). However, what also became evident was that the successful implementation of e-learning does not only depend on the assessors’ knowledge of the technology but also their willingness to change, willingness to learn, willingness to use new methods, and their motivation (see 3.2.8.10; 3.2.9). The literature provided strong evidence that assessors need to be trained and supported by the institution on how to design assessment tasks on an online platform, and that such training should include teaching practice; learning approaches; pedagogy related to the online environment; Internet copyright law; management and moderation of online classes; quality assurance processes; and a critical approach to technology, learning designs, and formative evaluation approaches (see 3.2.12; Samarawickrema & Stacey, 2007:330).

I found that institutions that plan to offer online courses need to determine whether or not the course will be feasible online; and determine the mode that will be used to offer the course as well as the availability of resources (see 3.2.9). Pertaining to e-learning in higher education, I came to the conclusion that students will be motivated to do e-assessment if e-learning as an umbrella process is effectively implemented.

The second part of Chapter 3 explored e-assessment (as opposed to conventional assessment) in higher education and constructs such as e-assessment feedback; compatibility and flexibility of e-assessment; benefits and challenges of e-assessment; components and requirements for e-assessment.

It was found that e-assessment is a component of e-learning and that the delivery platforms of e-assessment resonate with the modes of e-learning and e-learning platform/environment (see 3.2.3; 3.2.4; 3.3.3). There is a clear relationship between e-assessment and e-learning, for instance the way in which activities are delivered (either online or offline) (see 3.2.3; 3.3.4). It was also evident that different formats of e-assessment tasks (such as audio and/or video recordings) can be used on e-learning platforms such as Moodle, Blackboard etc. (see 3.2.4.1; 3.3.3; 3.3.4). In summary of e-assessment, I realised that institutions need to effectively train their lecturers to use the system that is provided for designing quality e-assessment tasks. Lecturers should show an interest in using the system, and students should be appropriately motivated to use the system. Regardless of the mode (online and/or offline) through which an e-assessment task takes place, assessors need to ensure that all the principles of good e-assessment (as applicable to conventional assessment) (see 2.6.2.1 to 2.6.2.5; 3.3.6.1 to 3.3.6.4) are adhered to.

In Chapter 4 (Teaching, learning and assessment of Information Technology: Towards e-assessment in IT), I explored studies pertaining to the teaching, learning, and assessment in information technology as a subject/discipline. The discussion in Chapter 4 focused on the definition of IT; curriculum design in IT; principles for IT curriculum design; teaching methods in IT; challenges in the teaching of IT; students' reasons for succeeding and/or failing in the learning of IT; ways of enhancing students' creative thinking skills in the learning of IT; the role of lecturers and students in the teaching and learning of IT; assessment design in IT, and forms of assessment in IT. Chapter 4 contained most of the elements that were discussed in Chapters 2 and 3 but these were specifically applied to IT as a discipline. To avoid unnecessary repetition of information, only the concepts that have not been mentioned will be discussed here.

It was found that employers require IT graduates who have the required skills and practical experience; and as such IT curriculum designers need to design a curriculum that includes practical IT teaching and learning activities (see 4.2; 4.3). What also became evident was that for IT students to be successful in their learning of IT, they need to possess the qualities usually required of an IT student, namely: self-discipline, self-responsibility, self-confidence, and self-motivation (see 4.5.1). Furthermore, other studies encouraged institutions to provide professional training for their IT lecturers on how to effectively use e-learning/e-assessment platforms and/or tools in creating opportunities for active, engaged, and deep learning (see 2.2.4; 4.7.1). Institutions were also encouraged to guide and help their students as to how the e-learning/e-assessment system works and how they can perform their e-learning and e-assessment tasks effectively. It was evident that e-assessment tasks could assess both the lower and higher order cognitive skills of students (see 4.7.2). Examples of e-assessment tasks in IT found in the literature included semester examinations, tests, assignments, and portfolios (see 4.7.2). I also found that simulations, practical demonstrations, collaborative learning, and computer laboratory work were examples of IT teaching-learning activities (TLAs) that can be implemented through e-assessment (see 4.4.1).

In conclusion, I realised that institutions could successfully implement an e-assessment system in IT if their e-assessment system has an appropriate delivery system; a control mechanism; a system feedback facility; stability and speed; security; a reporting mechanism; and support and training for both students and lecturers (see 3.3.12.1 to 3.3.12.11; 4.9).

8.2.2 How do IT lecturers and IT students at CTI experience and/or perceive the role of e-assessment in their teaching and their own learning respectively?

In Chapter 5, the research design and the methodology used to answer the primary and secondary research questions were discussed. I began Chapter 5 by discussing the theoretical and paradigmatic framework for the study. The function and purpose of the research pointed towards applied research (see 5.2.1). The theoretical and conceptual framework for the study was informed by existing/contemporary theories and conceptions pertaining to student learning, assessment *of/for/as* learning, e-learning/blended learning, and e-assessment in the teaching and learning of IT in higher education (HE) (see 5.2.1).

The study falls within the ambit of higher education studies and overlaps with the following of Tight's (2012:9) key themes in higher education research: course design (which includes assessment), teaching and learning, and student experience in higher education (see 5.2.1). In this study, I was guided by the constructivist research paradigm when collecting, analysing, and reporting the data gathered from the relevant literature as well as the empirical research (see 5.2.1). I then clarified the qualitative research approach and the four main aspects that are important in qualitative research, namely participants' understanding of their perception/ experience; researcher as the primary instrument for data collection; inductive nature of data analysis; and results which are captured in text format (see 5.2.2.1 to 5.2.2.4). I finally typified the research design as a qualitative, intrinsic single case study research design with limited quantitative enhancement (see 5.3).

The participants in the first round of data collection (questionnaire surveys and focus group interviews) and second round of data collection (expert survey) were purposefully selected for this study, based on their expertise and understanding of the research problem. I also requested a few expert participants to refer me to other experts in any of the relevant fields who could provide me with rich information, which resulted in snowball sampling (see 5.3.1.1 [c]).

In the first round of data collection (questionnaire surveys and focus group interviews), online questionnaires with mainly open-ended questions, were used for the collection of data. The focus group interviews were semi-structured and allowed the participants the freedom to participate freely without being under any pressure. During the second round of data collection (online expert survey), both closed and open-ended questions were used. The online questionnaire was chosen because it gave all the selected experts (those who were far and near) to participate in the survey in their own time and at their own locations (see 5.3.1.1 [d] [iii]). The initial questionnaires were structured based on the literature review that was discussed in Chapters 2 to 4 (see Appendix B). The purpose of the initial questionnaires and the focus group interviews was to obtain valuable information from the CTI IT lecturers and IT students. The qualitative data obtained from these questionnaires and interview schedules were analysed by means of coding, reading, memoing, masking participants' identities, searching for patterns, and categorising data into appropriate themes and subthemes (see 5.3.2; Chapter 6).

In responding to secondary research questions 2 and 3, the findings of the data analysis of the first round of data collection were reported in Chapter 6. These findings were then compared and converged (as outlined in Chapter 7) in order to compile a preliminary framework that was eventually evaluated by the selected expert during the second round of data collection. The details of the proposed framework are attended to in section 8.3 (the implications of the research findings).

8.3 IMPLICATIONS OF THE RESEARCH FINDINGS

To answer the fourth secondary research question and thus also the primary research question in full, some implications of the research findings of the study need to be highlighted.

8.3.1 What would be the best way to implement e-assessment in the teaching and learning of IT as a subject/discipline at CTI?

I compiled a preliminary framework for the implementation of e-assessment in the teaching and learning of IT at CTI by integrating the data obtained from the literature review and the findings from the lecturer and student questionnaire surveys and focus group interviews (see Chapter 6; 7.3).

During the second round of data collection, an expert panel was purposefully selected based on their experience, knowledge, and nature of expertise in the relevant areas in order to obtain rich information pertaining to the importance/usefulness of the suggested features. The expert panel was required to complete an online questionnaire in order to evaluate the feasibility of the proposed framework and make suggestions for possible amendments. They were asked to rate each feature and sub-feature of the framework as either "essential," "useful" or "not necessary." The online questionnaire included both closed and open-ended questions, and as such the expert participants had the opportunity to provide their comments and suggestions (see 5.3.1.1 [c] and [d]; 7.2; 7.3; 7.4). The data from the expert panel were analysed and interpreted, after which applicable adaptations were made to the preliminary framework (see 7.4) before the final proposed and validated framework could be presented, as it is done in section 8.4 of this chapter. The next section discusses my response to the primary research question of this study.

8.3.2 How could CTI lecturers implement e-assessment in the teaching and learning of IT?

In response to the primary research question, a final framework is provided in section 8.4 based on the convergence of the findings of the literature review and empirical research that took place during the course of this study.

The final proposed framework illuminates the features and sub-features of e-assessment that will help CTI IT lecturers to effectively implement e-assessment in the teaching and learning of IT.

8.4 FRAMEWORK FOR THE IMPLEMENTATION OF E-ASSESSMENT IN THE TEACHING AND LEARNING OF INFORMATION TECHNOLOGY AT CTI

The features of the final proposed and validated framework are presented below (8.4.1 to 8.4.12). Please note that the final framework contains the adapted features of the proposed framework in Chapter 7. This means that the features and sub-features will be somewhat different from those reported in Chapter 7.

8.4.1 Characteristics and/or requirements for the successful implementation of e-assessment

The characteristics and/or requirements that may ensure the successful implementation of e-assessment are shown in Table 8.1. The features of the characteristics and/or requirements for the successful implementation of e-assessment were all evaluated and validated by the expert panel. The rationale behind the inclusion of these features is based on the fact that when implementing e-assessment, there is the need to ensure that all the necessary requirements are in place as they form the basis for successful e-assessment implementation. The appropriate requirements will ensure the sustainability of e-assessment. All the identified features were derived from the convergence of both the literature review and participant views from both rounds of data collection (see 3.3.12.1 to 3.3.12.11; 6.5.1.3; 6.5.1.8; 6.5.2.22; 6.5.2.23; 7.4.1).

Table 8.1: Characteristics and/or requirements for the successful implementation of e-assessment

A: The delivery system for e-assessment should be appropriate. This requires the following considerations:	
A1	The IT server must be in place.
A2	The delivery system should have stable Internet connectivity.
A3	Students should be able to access e-assessment tasks on any browser and on any operating system (there should be interoperability and compatibility).
A4	The system should be able to randomise questions/tasks.
A5	The system should be able to award marks automatically for students' answers.
B: The control mechanisms for e-assessment should be appropriate. This requires the following considerations:	
B1	The e-assessment system should enable an assessor to set a time limit (duration limit) for the completion of any e-assessment task.
B2	The e-assessment system should allow a cut-off time/date for access to e-assessment tasks after deadline submission dates.
B3	The e-assessment system should allow candidates to revert to previous questions/tasks and make amendments.
B4	The e-assessment system should limit the number of times a student can re-attempt a task.
B5	The e-assessment system should allow switching between synchronous and asynchronous modes of e-assessment.
C: The system feedback for e-assessment should be appropriate. This requires the following considerations:	
C1	The e-assessment system should allow assessors to turn feedback on an e-assessment task on or off.
C2	The e-assessment system should be programmed to provide appropriate feedback when an answer is correct or incorrect.
C3	The e-assessment system should allow assessors to provide feedback per question.
D: The stability and speed of the e-assessment system should be appropriate. This requires the following considerations:	
D1	The e-assessment system should be stable while the assessor is compiling the task.

D2	When students are (simultaneously) completing the e-assessment task the system should remain stable.
D3	In case of a power failure when students are completing the e-assessment tasks, there should be an alternative/emergency power source in the relevant computer laboratory and server room.
D4	There should be a means of saving answers so that if there is a disruption such as a power failure, students will be able to continue from where they were interrupted.
D5	The delivery of relevant tests, videos, graphics, and e-assessment tasks from the server to the student's computer should be fast and not be delayed.
E: The security of e-assessment should be appropriate. This requires the following considerations:	
E1	Only students who are registered for the module should be able to access an e-assessment task.
E2	The e-assessment system should allow for the e-assessment task to be scheduled for a pre-specified date and time (it should allow a synchronous mode, if required).
E3	The e-assessment system must allow assessors to set the number of times students will be allowed to access an e-assessment task.
E4	The time a student logs on and off, the system/e-assessment task should be recorded and made available for the lecturer to monitor.
E5	Before an e-assessment task is uploaded and ready, the student's login and password should be operational.
E6	Students should be authenticated (by using their own unique usernames and passwords, random password or biometrics) when accessing an e-assessment task.
F: The recording and reporting of e-assessment results should be appropriate. This requires the following considerations:	
F1	The e-assessment system must be able to download, report, and export data such as student numbers, names, and marks into Excel, Word or any other relevant text format.
F2	The e-assessment system must be able to record, calculate, and report results per topic per student.
F3	The e-assessment system must be able to report an individual student's average performance or achievement.
F4	The e-assessment system must be able to report the average time spent by a student to complete an e-assessment task.

F5	Item analysis reports should be available to allow assessors to continuously monitor and evaluate their questions/items in the question bank.
G: Appropriate support and training opportunities about the e-assessment system should be available for staff and students. This requires the following considerations:	
G1	Technical support must always be available for lecturers and students in the institution.
G2	A mobile application (e.g., Moodle application) needs to be used for the e-assessment system to ensure easy access for all.
G3	Proper and adequate training (e.g., video tutorials) should be given to both students and staff to enable them to use and benefit fully from the implementation of e-assessment.
G4	In the event of a technical problem, there should be a prompt response by the technical support team.
G5	A legal service agreement should be in place.
G6	IT administrators need to ensure that there are proper add-ons and no restrictive modes of capturing typed information (the e-assessment should allow lecturers and students to type mathematical formulas and symbols).
G7	The necessary technological infrastructure (such as computers, Internet connections, etc.) should be available for all students.
G8	The required resources (physical, human, and financial resources) should be readily available.
H: An evaluation of the e-assessment system should be in place. This requires the following considerations:	
H1	An institution should first implement the e-assessment system on their network for pilot testing.
H2	An institution should obtain permission to use the e-assessment system in a "live" test/assessment situation for a specified period of time.
H3	Evaluation of the e-assessment system should be done by consulting different stakeholders, e.g., students, lecturers, ICT staff, and other relevant stakeholders.
H4	All the relevant e-assessment policies should be made known and be clear to lecturers, students, and all other participants.
H5	The institution should have an appropriate e-assessment policy that integrates pedagogical and practical aims.
H6	There must be policies and procedures in place to ensure reliability and validity of e-assessment.

8.4.2 Lecturers' prior experience and knowledge of student assessment

The features pertaining to lecturers' prior experience and knowledge of student assessment are shown in Table 8.2. All the features were evaluated and validated by the expert panel. The rationale behind the inclusion of these features is that assessment is an important aspect of the teaching and learning process, and since e-assessment is a leap from traditional assessment to the use of technology in students' assessment it is crucial for lecturers to have prior experience and knowledge of student assessment in order to appropriately apply this on the e-assessment platform. All the identified features were derived from the convergence of both the literature review and participant views from both rounds of data collection (see 2.6; 2.9.2.5; 3.2.3.4; 3.3.4; 4.7.1; 6.5.1.19; 7.4.2).

Table 8.2: Lecturers' prior experience and knowledge of student assessment

A: Lecturers who are assessors need to have prior experience and knowledge of student assessment. This requires the following considerations:	
A1	Lecturers (assessors) need to design e-assessment tasks of which the contexts are related to the students' socio-economic backgrounds (the tasks must be relevant).
A2	Lecturers (assessors) should have prior experience and knowledge of information technology or e-learning.
A3	Lecturers (assessors) require prior experience of change in education to enable them to adapt to the change towards e-assessment.
A4	Lecturers (assessors) should have the knowledge and skills required for designing and implementing quality e-assessment tasks.
A5	Lecturers (assessors) should have knowledge of how to make appropriate use of action verbs (e.g., according to Bloom's Taxonomy) in formulating items and questions.

8.4.3 Using IT students' e-assessment results for different teaching and learning purposes

The features pertaining to the use of IT students' e-assessment results for different teaching and learning purposes are depicted in Table 8.3. All the features were evaluated and validated by the expert panel. The rationale behind the inclusion of these features is that lecturers need to know the reason (purpose) behind the e-assessment tasks that they provide for their students. If lecturers become aware of the purpose of e-assessment they will be able to develop appropriate e-assessment tasks, which will ultimately enhance their teaching and students' learning. All the identified features were derived from the convergence/integration of both the literature review and participant views from both rounds of data collection (see 2.6; 2.6.1; 6.5.1.17; 7.4.3).

Table 8.3: Using IT students' e-assessment results for different teaching and learning purposes

A: Students' e-assessment results should be used for different purposes, for example:	
A1	Lecturers should use e-assessment results to provide students with constructive feedback about their learning (feedback on their performance and progress).
A2	Students' e-assessment results should enable lecturers to assess their students' progress and performance.
A3	Based on the students' e-assessment results, lecturers should evaluate and enhance the efficiency of their own methods of teaching.
A4	Among others, the efficiency of the curriculum/programme should be evaluated and enhanced based on the students' e-assessment results.

8.4.4 Setting deadline dates for the completion/submission of e-assessment tasks

The features pertaining to setting deadline dates for the completion/submission of e-assessment tasks are depicted in Table 8.4. All the features were evaluated and validated by the expert panel. These features were included because when lecturers set deadline dates for the completion/submission of e-assessment tasks, students will be able to manage their time well, take responsibility for their own learning, and submit e-assessment tasks on time. Thus, students' time management skills will be improved. Lecturers will also gain knowledge of how to apply deadline dates on e-assessment platforms. All the features were compiled from the convergence of both the literature review and participant views from both rounds of data collection (see 2.2.3.1; 2.2.3.2; 2.4.7; 3.2.10.2; 3.3.9; 3.3.12.2; 3.3.12.8; 4.6.1; 4.6.2.2; 6.5.1.9; 7.4.4).

Table 8.4: Setting deadline dates for the completion/submission of e-assessment tasks

A: Deadlines should be set for the submission of e-assessment tasks. This should be done by considering the following:	
A1	Deadlines are necessary to teach students how to effectively manage time, which is a requirement for employability.
A2	Deadlines force students to complete e-assessment tasks on time, because they know that the link for submission will not be available once the deadline lapses.
A3	Deadlines for completion of e-assessment tasks should be reasonable. For example, unforeseen circumstances (such as server failure or inability to upload e-assessment tasks on the platform) must be taken into account.
A4	Deadlines should be appropriate for the type assessment task (e.g., a formative or informal assessment may be open for a longer period of time than, for instance, an e-examination).
A5	Deadlines should be set at intervals, with a warning a few days before the cut-off date/time.

8.4.5 Setting duration limits for the completion of e-assessment tasks

The features pertaining to the setting of duration limits for the completion of e-assessment tasks are shown in Table 8.5, and were validated by the expert panel. The features were included in the framework because they ensure that students take responsibility for their own learning; and improve their time management skills, which is a requisite skill for the working environment. It will also enable lecturers to know how to apply appropriate duration limits for the completion of e-assessment tasks on e-assessment platforms. These features were derived based on the convergence of the literature review and the views and/or experiences of participants during both rounds of data collection (see 2.2.3.1; 2.2.3.2; 2.4.7; 3.2.10.2; 3.3.9; 3.3.12.2; 3.3.12.8; 4.6.1; 4.6.2.2; 6.5.1.10; 7.4.5).

Table 8.5: Setting duration limits for the completion of e-assessment tasks

A: Setting duration (time) limits for the completion of e-assessment tasks is necessary, but the following should be considered:	
A1	Duration limits prepare students for the working environment (to perform tasks within a prescribed period).
A2	Duration limits should motivate students to set fixed targets for the achievement of their tasks.
A3	Duration limits work well on an e-assessment platform because students are forced to complete the tasks on time, knowing that they will not be able to continue with

A: Setting duration (time) limits for the completion of e-assessment tasks is necessary, but the following should be considered:	
	the tasks once the duration limit expires.
A4	Duration limits must suit the complexity of the e-assessment task.
A5	Duration limits must suit the types of questions in the e-assessment tasks.
A6	Duration limits for e-assessment tasks should be reasonable, in that the assessor needs to make provision for unforeseen circumstances (e.g., technical problems such as a slow Internet connection, unreliable computer software or hardware, etc.).
A7	The computer and IT skills levels of the students should be firmly established before setting duration limits for e-assessment tasks.

8.4.6 Relationship between IT students' e-assessment marks and how and what they have learned

The features regarding the relationship between IT students' e-assessment marks and how and what they have learned are shown in Table 8.6, and were validated by the expert panel. The features were included in the framework because it will enable the lecturers to implement e-assessment tasks that are appropriate, practical, and will actively engage their students. Thus, e-assessment will be effective if students are motivated to do them; however, students are usually motivated when the e-assessment tasks are also engaging and interesting. These features will therefore assist lecturers in providing appropriate e-assessment tasks and applying teaching methods which will ultimately have a positive influence on their students' learning. These features were based on the convergence of the literature review and the views and/or experiences of participants during both rounds of data collection (see 2.2.3; 2.2.4; 2.2.5.1; 2.2.6.2; 2.4.7; 2.4.10.2; 2.9.1; 2.9.1.4; 2.10.2; 4.9; 6.5.1.11; 7.4.6).

Table 8.6: Relationship between IT students' e-assessment marks, and how and what they have learned

A: There is a need for a consistent relationship between IT students' e-assessment marks and how and what they have learned. This involves the following:	
A1	Students should achieve good e-assessment grades when they apply a deep approach to learning/are actively engaged.
A2	Students should not achieve good e-assessment marks if they merely recall what they have learned (if they applied a surface learning approach).

A3	**The marks students obtain for e-assessment tasks should be a reflection of the following:**
A3.1	The quality of lecturers' teaching.
A3.2	The way in which the e-assessment tasks are formulated (whether the assessor used appropriate action verbs that represent the appropriate cognitive levels in Bloom's Taxonomy).
A3.3	The assessor's level of leniency or strictness during marking.
A3.4	The leniency or strictness built into an automated marking tool.
A3.5	Students' interest in the IT module.

8.4.7 Students' knowledge regarding what they will be assessed on

The features relevant to students' knowledge regarding the content that they will be assessed on are shown in Table 8.7. These features were evaluated and validated by the expert panel. The features were included in the framework because they will help lecturers to provide their students with the appropriate content for their e-assessment tasks without leaving out important concepts. Thus, lecturers will be able to apply constructive alignment in their e-assessment tasks, as well as their teaching. Lecturers will also be empowered to design fair and valid e-assessment tasks. All the identified features were obtained from the convergence of the literature review and participant views from both rounds of data collection (see 2.6.2.2; 2.7.3.3; 3.2.10.2; 6.5.1.12; 7.4.7).

Table 8.7: Students' knowledge regarding what they will be assessed on

A: Informing IT students in advance of what (the content) they will be assessed on, is important. The following also need to be considered:	
A1	Providing students in advance with information about the content that will be assessed, is a principle of good e-assessment.
A2	The e-assessment task should assess students' mastery of a representative sample of the content being assessed.
A3	The lecturer should not provide students with a reduced "scope" of content (a reduced sample of content).
A4	**Besides informing students in advance of the content that will be assessed, the lecturer may also do the following:**
A4.1	Discuss/make available previous examination papers.

A4.2	Discuss/make available a memorandum for the task.
A4.3	Design and discuss mock tests or examination papers with the students.

8.4.8 Students' knowledge regarding how they will be assessed

The features of students' knowledge regarding how they will be assessed (what the e-assessment criteria will be) are shown in Table 8.8. These features were evaluated and validated by the expert panel. The rationale behind the inclusion of these features is that students will be able to determine and/or focus on their required competencies. Furthermore, the inclusion of these features will help lecturers to develop e-assessment tasks that are reliable and valid. All the features were obtained from the convergence of the literature review and participant views from both rounds of data collection (see 2.6.2.2; 2.6.2.3; 2.9.1.3; 2.9.2.3; 3.3.6.3; 6.5.1.13; 7.4.8).

Table 8.8: Students' knowledge regarding how they will be assessed

A: Informing IT students in advance of how they will be assessed (what the e-assessment criteria will be) is important. However, the following also need to be considered:	
A1	Students will be made aware in advance of the competencies that they will be required to demonstrate through the e-assessment task.
A2	If students are informed in advance of how they will be assessed, they will be better motivated to prepare adequately.
A3	If students are informed in advance of how they will be assessed, they will become aware of the alignment between teaching/learning activities, e-assessment tasks and the relevant learning outcome(s) (the constructive alignment of e-assessment tasks).
A4	Informing students in advance of how they will be assessed should include how marks will be awarded (what information will be required and what will not, etc.).

8.4.9 Feedback to IT students about their performance in e-assessment tasks

The features regarding the feedback to IT students are shown in Table 8.9 and were validated by the expert panel. The features were included in the framework because it will enable lecturers to know how to provide constructive feedback to their students through an e-assessment platform. These features will expose lecturers to the capability of the e-assessment platform in delivering timely and constructive feedback that will enhance student learning. Students will be empowered to determine whether or not they have been successful in their learning. In a nutshell, these features will enable lecturers to provide constructive feedback that will prepare their students for the world of work, because constructive feedback helps students to take responsibility for their own learning. These features were derived based on the convergence of the literature review and the views and/or experiences of participants during both rounds of data collection (see 2.9.1.4; 2.9.2; 2.9.2.1.3; 2.9.3.1; 3.2.3.4; 3.2.9.10; 3.3.7; 3.3.12.3; 4.7.2; 6.5.1.14; 6.5.1.15; 6.5.2.15; 6.5.2.16; 7.4.9).

Table 8.9: Feedback to IT students about their performance in e-assessment tasks

A: Providing constructive feedback on IT students' performance in their e-assessment tasks is important. However, the following should also be considered:	
A1	Automated feedback on e-assessment tasks should inform students of the competency levels at which they performed.
A2	Automated feedback on e-assessment tasks should be timely (prompt) in order for it to be effective.
A3	Feedback provided by lecturers on e-assessment tasks should be timely (prompt) in order for it to be effective.
A4	Automated feedback on e-assessment tasks should be detailed so that the students will have a clear understanding of what they did correctly or incorrectly.
A5	Lecturer's feedback on e-assessment tasks should be detailed so that the students will have a clear understanding of what they did correctly or incorrectly.
A6	Automated feedback on e-assessment tasks must be constructive and/or motivating in order for the students to consider and apply the feedback.
A7	The lecturer's feedback must be constructive and/or motivating in order for the students to consider and apply the feedback.
A8	Automated feedback on e-assessment tasks should include the general performance of students.
A9	The lecturers' feedback on e-assessment tasks should include the general performance of students.

8.4.10 Forms of e-assessment in higher education

The features regarding the different forms of e-assessment are depicted in Table 8.10, and were validated by the expert panel. The features were included in the framework because it will help lecturers to effectively assess their students through all these forms of e-assessment, which will ultimately improve the lecturers' teaching and the IT students' learning. These features were compiled based on the convergence of the literature review and the views and/or experiences of participants during both rounds of data collection (see 2.9; 2.9.1; 2.9.2; 2.9.3; 3.2.9.10; 3.2.9.11; 4.6.2; 6.5.1.6; 6.5.2.4; 6.5.2.5; 6.5.2.6; 6.5.2.7; 6.5.2.8; 7.4.10).

Table 8.10: Forms of e-assessment in higher education

A: Formative e-assessment is important, but the following should also be taken into account:	
A1	Lecturers may design formative e-assessment tasks that will assist in preparing students for forthcoming e-assessment tasks that are awarded marks (summative e-assessment tasks, such as an examination or test paper).
A2	E-assessment tasks should be followed up in order to provide an opportunity for students to ask questions and seek clarifications.
A3	Questions and instructions in formative e-assessment tasks should motivate students to make an extra effort (e.g., motivate them to do some extra reading and research).
A4	It is not necessary to award marks for formative e-assessment tasks, but it is possible to award marks in order to motivate the students.
A5	Some summative e-assessment tasks may also be used for formative purposes (if feedback is provided to the student about his/her performance in the e-assessment task, it is also used formatively).
A6	Formative e-assessment tasks should be used for providing feedback to the lecturer on how well he/she is teaching.
A7	Formative e-assessment tasks should be used for providing feedback to the lecturer on how well the student is learning (how well the student performs and progresses).
A8	Feedback on formative e-assessment tasks should be prompt, continuous, and constructive (continuously show the student the way forward in the learning process).
A9	If problem-solving scenarios are included in formative e-assessment tasks, they may assist in preparing students for the world of work.
A10	If practical tasks are used as formative e-assessment tasks, they may assist in preparing students for the world of work.
A11	**The types of formative e-assessment tasks that will best improve student learning include:**
A11.1	Online presentations.
A11.2	E-group discussions and e-activities.
A11.3	E-journal or e-article reviews.
A11.4	Online question-and-answer sessions.

A11.5	Online discussions between students and lecturers.
A11.6	Online quizzes.
A11.7	Video chats between students and lecturers.
B: Summative e-assessment is important, but should take the following into account:	
B1	Summative e-assessment tasks should require some research in order to add value to students' learning.
B2	Lecturers should conduct summative e-assessment after completing a section or chapter of work, a module, and/or at the end of a semester to determine how their students are learning (how they are performing and progressing).
B3	If constructive feedback is provided after summative e-assessment tasks have been done, some students will learn to take the feedback into consideration and not only focus on the marks obtained.
B4	If problem-solving scenarios are included in summative e-assessment tasks, they may assist in preparing students for the world of work.
B5	If practical tasks are used as summative e-assessment tasks, they may assist in preparing students for the world of work.
B6	**The types of summative e-assessment tasks that will best improve student learning include:**
B6.1	Online research reports (e.g., academic assignments) for undergraduate students.
B6.2	E-tests.
B6.3	E-examinations.
B6.4	E-portfolios.
B6.5	Online presentations.
B6.6	E-project reports.
B6.7	Online discussions.
C: Peer e-assessment is important, but should take the following into account:	
C1	Lecturers may divide students into small groups and require group members (peers) to assess one another.
C2	Peer e-assessment tasks will motivate students to share ideas and learn from one another.
C3	Peer e-assessment tasks can be used very effectively during group work.
C4	Peer e-assessment tasks should be planned in such a way that they elicit students'

	creative questioning of topics.
C5	Peer e-assessment requires peer assessors to identify their peers' mistakes.
C6	Peer e-assessment requires peer assessors to identify their peers' strengths.
C7	Peer e-assessment feedback should assist students to identify their own mistakes.
C8	Peer e-assessment feedback should assist students to identify their own strengths.
C9	If more able students have to give feedback to less able peers, they will also benefit since they have to explain procedures to less able students.
C10	Peer e-assessment will make students feel that they own the assessment process.
C11	Peer e-assessment will motivate peers to explain their decisions and/or answers to one another.
C12	Peer assessors may be selected randomly in order to avoid unfair or biased assessment among peers, where possible.
C13	Peer e-assessment can be used at the end of any learning period.
C14	Peer e-assessment usually works well if short questions and answers are used.
C15	Peers' feedback on e-assessment tasks will motivate student engagement.
C16	**The types of peer e-assessment tasks that will best improve student learning include:**
C16.1	Peers' e-assignments (undergraduate research reports).
C16.2	E-tests.
C16.3	Online academic essays.
C16.4	Online presentations.
D: Self e-assessment is important, but the following should also be taken into account:	
D1	Self e-assessment tasks should contain questions and/or instructions that enable students to evaluate their own level of understanding of a specific topic or content.
D2	Self e-assessment questions and/or instructions should enable students to evaluate their own knowledge of specific topics or content.
D3	Self e-assessment tasks should help students to identify their own weaknesses.
D4	Self e-assessment tasks should help students to identify their own strengths.
D5	Self e-assessment can prepare students for forthcoming assessment tasks that are awarded marks (summative e-assessment tasks such as examinations, tests, etc.).

D6	Self e-assessment tasks should encourage students to think critically about their own work.
D7	Self e-assessment tasks should be aimed at empowering students in their own learning processes.
D8	There should be self e-assessment resources where students can access and choose the self-e-assessment options that they want.
D9	**The types of self e-assessment tasks that will best improve student learning include:**
D9.1	E-assignments (e.g., research reports).
D9.2	E-tests.
D9.3	Online academic essays.
D9.4	Online presentations.
E: Diagnostic e-assessment is important, but the following should be considered:	
E1	Diagnostic e-assessment should be used to determine what students understand or do not understand at a specific point in time.
E2	Diagnostic e-assessment can help lecturers to plan meaningful and efficient teaching methods.
E3	Diagnostic e-assessment can also be used as baseline assessment (assessment done at the beginning of a module to establish what the students' knowledge and levels of understanding are).
E4	**The types of diagnostic e-assessment tasks that will best improve student learning include:**
E4.1	Online activities/exercises.
E4.2	Online chapter/unit pre-tests.

8.4.11 Types of assessment tasks that may be used in e-assessment

Table 8.11 depicts the features pertaining to the types of assessment tasks that may be used in e-assessment. All the features were evaluated and validated by the expert panel. These features were included in the framework because lecturers need to know the types of assessment tasks that may be used in e-assessment, and how they can implement those tasks on an e-assessment platform. These features provide lecturers with the different ways that e-assessment tasks can be conducted effectively in order to improve their teaching as well as their students' learning. In other words, the features will enable lecturers to design e-assessment tasks that involve practical demonstrations as well as simulations that will assess the students higher order thinking and provide them with the necessary skills. Thus, lecturers will design e-assessment tasks that are based on authentic learning. Findings from the literature review as well as the views from participants in both rounds of data collection were converged to compile the features (see 2.9.1; 2.9.2; 2.9.3; 3.2.4.1; 3.3.3; 3.3.4; 4.6.1; 4.6.2; 4.7.2; 6.5.1.7; 6.5.2.10; 7.4.11).

Table 8.11: Types of assessment tasks that may be used in e-assessment

A: Presentations in the context of e-assessment is important, but the following should also be considered:	
A1	Students should be able to upload their presentation slides on the e-assessment platform.
A2	Students should be given the opportunity to ask the online presenters some questions for clarity so that they can learn from one another.
A3	If possible, students should be able to upload videos of themselves making their presentations.
B: Short-answer questions can be used in e-assessment, but require the following considerations:	
B1	Lecturers should design short-answer questions in a way that requires students to think critically.
B2	Lecturers should design short-answer questions that focus on higher cognitive levels.
B3	Short-answer questions should be alternated with long-answer questions.
B4	Short-answer questions should have specific answers.
B5	Lecturers need to design short-answer questions or tasks that will discourage students from merely memorising and regurgitating knowledge.
C: E-tests and e-examinations may be used, but the following should also be considered:	
C1	Lecturers should ensure that the e-test or e-examination paper assesses students' competence pertaining to what they have learned after a particular learning period (use them as summative assessments).
C2	If e-tests and e-examinations are appropriately developed, they can also be used to prepare students for the real world (by including IT industry-related/authentic tasks/questions).
C3	E-tests and e-examinations must be followed up with constructive feedback so that students will be able to identify their own problems/mistakes.

C4	E-tests and e-examinations should be used to determine students' performance at a particular point in time.
C5	E-examinations should be written at the end of a semester or year course (for summative purposes).
C6	E-tests should be written upon completion of a unit, section, or chapter (for summative purposes).
C7	E-tests can be written for formative purposes if they provide continuous and constructive feedback for students.
D: E-assignments may be used, but the following should be considered:	
D1	E-assignments should include practical tutorials in order to develop students' practical experience in IT.
D2	E-assignments should be aimed at developing students' skills in IT.
D3	Students' research skills will be improved if the e-assignment instructions and/or questions encourage them to read about and apply relevant information/knowledge/skills.
D4	Lecturers should set e-assignments in advance (at the beginning of the semester or the year, and not later).
E: E-group projects may be used after considering the following:	
E1	Lecturers need to design e-group projects in such a way that they will enable students to acquire practical experience in IT.
E2	Lecturers need to design e-group projects in such a way that they will enable students to acquire the necessary skills in IT.
E3	E-group projects should encourage students to apply what they have learned practically in an authentic context.
E4	Members of groups doing e-group projects should be heterogeneous in order for the students to learn from one another and share ideas.
E5	E-group projects must be designed in advance, namely in the beginning of the semester or the year, and not later.
E6	Peer assessment can be used in e-group projects.
E7	Lecturers need to ensure that all the students doing an e-group project participate fully.
E8	During e-group projects, lecturers should be available for consultation either asynchronously or synchronously.

F: Case studies may be used in e-assessment after considering the following:	
F1	E-case studies must require students to think critically.
F2	E-case studies must require students to apply higher cognitive skills.
F3	E-case studies must require students to devise solutions to real-world problems.
F4	E-case studies should be IT related.

8.4.12 Principles of good e-assessment

Table 8.12 shows the features pertaining to the principles of good e-assessment. All the features were evaluated and validated by the expert panel. These features were included in the framework because lecturers can use it as a tool to design credible e-assessment tasks (credibility = fairness + validity + reliability + practicability) (see 2.6.2.5). The features will ensure that credible assessment is supported, which in turn will improve students' learning because it can motivate them to be honest about their own learning, and to apply a deep learning approach (see 2.2.4). Lecturers' teaching will also be improved if they consider and balance these principles of good assessment. Findings from the literature review as well as the views from participants in both rounds of data collection were converged to compile the features (see 2.6.2; 2.6.2.1 to 2.6.2.5; 3.3.6; 3.3.6.1 to 3.3.6.4; 4.7.2; 6.5.1.16; 6.5.2.17; 6.5.2.18; 6.5.2.19; 6.5.2.20; 7.4.12).

Table 8.12: Principles of good e-assessment

A: E-assessment always needs to be fair, and should consider the following:	
A1	The content that is assessed through the e-assessment task should fall within the scope of the relevant IT module's curriculum.
A2	The e-assessment task does not favour/benefit only certain students.
A3	The marking of the e-assessment tasks by the assessor should be consistent.
A4	The automated marking of the e-assessment tasks by the system should be consistent.
A5	The assessor who sets and/or marks the e-assessment task should be adequately trained to create e-assessment tasks.
A6	The assessor who marks the e-assessment task should award marks for the different steps that students must follow in order to arrive at the final answer.
A7	The e-assessment task should include both higher order questions/tasks and lower order questions/tasks, particularly if the platform selects questions at random.

A8	Students' prior knowledge and understanding should be considered when designing/selecting e-assessment tasks.
A9	Students' levels of technology experience should be considered when designing/selecting e-assessment tasks for students.
B: All e-assessment tasks must be practicable/feasible, and the following must be considered:	
B1	The e-assessment environment should be conducive to learning (e.g., it should not cause unnecessary pressure, etc.).
B2	Lecturers (assessors) should be trained on how to insert complicated texts such as formulae and symbols that are required in some IT modules (e.g., programming, mathematics, etc.).
B3	If possible, lecturers (assessors) could be trained with video tutorials.
B4	If possible, students should be trained on how to insert complicated texts such as formulae and symbols that are required in some IT modules (e.g., programming, mathematics, etc.).
B5	Students could be trained with video tutorials (if possible).
B6	Students should not be overloaded with e-assessment tasks to perform.
B7	Lecturers' (assessors') marking load should be manageable.
C: E-assessment tasks must be reliable. This requires the following considerations:	
C1	When similar students do the same e-assessment tasks under similar conditions, they should obtain similar results.
C2	The marking of e-assessment tasks by assessors should be consistent.
C3	The automated marking of e-assessment tasks by the system should be consistent.
C4	The e-assessment tasks should be well aligned with the relevant learning outcomes, assessment criteria, and the teaching/learning activities being used.
C5	The types of e-assessment tasks should frequently be varied and/or alternated.
C6	E-assessment requires moderation.
D: The e-assessment tasks must be valid. This requires the following considerations:	
D1	The e-assessment task should assess only the content the students were required to study.
D2	The e-assessment task should only assess the achievement of the relevant, prescribed learning outcome(s).

8.5 SIGNIFICANCE OF THE STUDY

The significance of this study is established in the compilation of a framework for the implementation of e-assessment in the teaching and learning of information technology at CTI.

The framework was not only compiled by using information on how students learn (the implications for student assessment in higher education (see Chapter 2); e-learning and e-assessment in higher education environment (see Chapter 3); and teaching, learning, and assessment of information technology (towards e-assessment in IT) (see Chapter 4), but was also informed by participants who had relevant experience and knowledge in the higher education environment (see Chapter 6). The features of the framework were also evaluated and validated by experts on teaching and learning, IT as a discipline, ICTs in education, assessment, e-assessment and e-learning in higher education (see Chapter 7).

The suggestions that I made were not only based on good theoretical foundations, but can also assist lecturers and students to effectively implement e-assessment in their teaching and learning respectively. Due to the generic features of the framework it would not only provide significant guidelines for IT lecturers at CTI, but could also serve as a vantage point for other lecturers at CTI and at other higher education institutions who wish to explore the benefits and possible implementation of e-assessment in the teaching and learning of their respective disciplines. It is expected that the framework that emerged from the study will motivate the relevant institution to further discuss concerns such as appropriate infrastructure, resources, and policies pertaining to implementing e-assessment in the teaching and learning of IT.

The motivation of the framework lies in an asset-based method where the investigation of current effective practices of e-assessment is encouraged and lecturers, students, and institutions can learn from each other by identifying the strengths and areas of improvement in the e-assessment system.

8.6 LIMITATIONS

Although it was not my intention to generalise the findings in this study and interpret the demographic characteristics of the participants, a more equal distribution in terms of gender of the participants in the study could have improved the quality and trustworthiness of the data (see 6.4; 7.2).

Although the participants were selected purposefully, I made personal contact (telephonically) with some of the participants who agreed to participate in the online survey. However, despite several follow-ups and/or reminders, not all the participants responded to the survey. It was difficult for me to manage the sample size and response rate due to the data-collection method I used in the study (see 5.3.1.1 [c]; 6.4.1).

8.7 IMPLICATIONS FOR FURTHER RESEARCH

When similar research is conducted on a larger quantitative and qualitative scale, it may produce more generalisable results, and may help to further validate the findings of this study.

Some of the results could be explored further, such as characteristics and/or requirements for the successful implementation of e-assessment in the teaching and learning of IT at CTI.

If similar questions (such as those probed in the first round of data collection to the IT lecturers and IT students) (see Appendix B) were to be asked, it may help lecturers and students at CTI to effectively implement e-assessment in their teaching and learning of IT respectively (it may serve as a quality assurance mechanism).

If the relevant institution indeed makes use of the framework, it will provide opportunities for further research into the effectiveness of the application of the features included in the framework, and may ultimately lead to further improvement of approaches taken to implement e-assessment in the teaching and learning of IT at CTI.

If the framework is applied, evaluated, and monitored in other disciplines/faculties the outcome may produce significant information about the generalisability of the features of the framework.

8.8 CONCLUSION

This study has been an interesting, inspiring, and a profound educational experience for me. I have gained personal experience, growth, and a good understanding of e-assessment in the teaching and learning of IT, as well as how students learn in higher education. My expectation is that further research will be conducted on this topic, encourage institutional discussion, and be valuable to both lecturers and students in their teaching and learning respectively.

Furthermore, I trust that the features/components provided in the framework will not be seen as prescriptive or as intimidating measures to be firmly used, but rather as a tool that allows for the effective use of e-assessment that will subsequently enhance IT lecturers' teaching and IT students' learning at CTI.

A single table containing the final proposed framework for the implementation of e-assessment in the teaching and learning of information technology at CTI can be found in Appendix F.

LIST OF REFERENCES

Abaidoo, N. & Arkorful, V. (2014). The role of e-learning, the advantages and disadvantages of its adoption in higher education. *International Journal of Education and Research,* 2(12):397-410.

Agnihotri, A. & Agnihotri, S. (2013). Implementation of e-learning technologies in the classroom and the assessment of the medical students' attitude towards e-learning: A pilot study. *Indian Journal of Forensic Medicine and Pathology,* 6(4):212-216.

Algahtani, A.F. (2011). *Evaluating the Effectiveness of the E-learning Experience in Some Universities in Saudi Arabia from Male Students' Perceptions*. Durham theses, Durham University. http://etheses.dur.ac.uk/3215/1/Abdullah'sThesis.pdf?DDD29+ (Accessed on 24 July 2015).

Al-Halabi, S. & Al-Hawari, M. (2010). The preliminary investigation of the factors that influence the e-learning adoption in higher education institutes: Jordan case study. *International Journal of Distance Education Technologies*, 8(4):1.

Al-Harbi, K.A.S. (2011). E-learning in the Saudi tertiary education: Potential and challenges. *Applied Computing and Informatics*, 9(1):31-46.

Al-Hujran, O., Aloudat, A., Al-Hennawi, H. & Ismail, H. (2013). Challenges to e-learning success: the student perspective. *International Conference on Education, Business and Education.* http://www.academia.edu/4615749/Challenges_to_E-learning_Success_The_ Student_Perspective (Accessed on 21 July 2015).

Ali, G.E. & Magalhaes, R. (2008). Barriers to implementing e-learning: a Kuwaiti case study. *International Journal of Training and Development*, 12(1).

Alkhateeb, F., Almaghayreh, E., Aljawarneh, S., Muhsin, Z. & Nsour, A. (2010). *E-learning tools and technologies in education: A perspective*. http://people.math.sfu.ca/~vjungic/ shadi.pdf (Accessed on 21 July 2015).

Ally, M. (2004). Foundations of educational theory for online learning. In T.Anderson, *Theory and practice of online learning.* Athabasca University. http://cde.athabascau.ca/ online_book/pdf/TPOL_chp01.pdf (Accessed on 5 October 2015).

Al-Yahya, M., George, R. & Alfaries, A. (2015). Ontologies in e-learning: Review of the literature. *International Journal of Software Engineering and its Applications,* 9(2):67-84.

Ambrose, S.A., Bridges, M.W., Lovett, M.C., DiPietro, M. & Norman, M.K. (2010). *How learning works: Seven research-based principles for smart teaching.* San Francisco, CA: Jossey-Bass.

Anderson, D. & Bums, S. (2013). One-minute paper: Student perception of learning gains. *College Student Journal,* 47:219-227.

Anderson, J. & McCormick, R. (2005). *Ten pedagogic principles for e-learning.* http://www.itslearning.net/Websites/itstest/Images/Documents/Ten_Pedagogic_Principles_for_E-learning.pdf (Accessed 21 July 2015).

Anderson, T. (2008). *The theory and practice of online learning*. 2nd ed. Athabasca University: AU Press. http://ufdcimages.uflib.ufl.edu/AA/00/01/17/00/00001/99Z_Anderson_2008-Theory_and_Practice_of_Online_Learning.pdf (Accessed on 14 August 2015).

Andrade, H. & Du, Y. (2007). Student responses to criteria-referenced self-Assessment. *Assessment and Evaluation in Higher Education*, 32(2)159-181. https://theeffectiveeducator.wikispaces.com/file/view/Andrade+%26+Du--+Self+Assessment (Accessed on 20 July 2016).

Andrews, J. & Higson, H. (2008). Graduate employability, 'soft skills' versus 'hard' business knowledge. *Higher education in Europe,* 33(4):411-422. http://www.immagic.com/eLibrary/ARCHIVES/GENERAL/JOURNALS/H081200A.pdf (Accessed on 10 August 2015).

Angelo, T. (1995). Reassessing and defining assessment. *AAHE Bulletin*, 48(2):7-9.

Astin, A.W. (1984). Student involvement: A developmental theory for higher education. *Journal of College Student Development*, 25:297-308.

Australian Skills Quality Authority (ASQA). (2015). *Guide to developing assessment tools.* http://www.asqa.gov.au/verve/_resources/Guide_to_developing_assessment_tools.pdf (Accessed on 18 February 2016).

Baartman, L.K.J., Bastiaens, T.J., Kirschner, P.A. & Vleuten, C. (2007). Evaluating assessment quality in competence-based education: A qualitative comparison of two frameworks. *Educational Research Review*, 2:114-129.

Babbie, E. (2013). *The practice of social research.* 13th ed. Wadsworth: Cengage Learning.

Banta, T.W. (2003). *Portfolio assessment uses, cases, scoring, and impact: Assessment update collections.* San Francisco, CA: Jossey-Bass.

Barrette, C. (2000). *Preparing teachers for IT: Process, timeline, and outcomes*. http://elearnmap.ipgkti.edu.my/resource/edu3053/sumber/tek-pdk/Artikel/Preparing%20 teachers%20for%20IT.htm (Accessed on 30 September 2015).

Barker, K. & Wendel, T. (2001). *E-Learning: Studying Canada's Virtual Secondary Schools.* Kelowna, BC: Society for the Advancement of Excellence in Education. http://www.citeulike.org/group/572/article/365169 (Accessed 10 June 2015).

Barkley, E.F. (2010). *Student engagement techniques: a handbook for college faculty*. 1st ed. San Francisco, CA: Jossey-Bass.

Bartholomew, K.W. (2004). Computer literacy: Is the emperor still exposed after all these years? *Journal of Computing Sciences in Colleges,* 20(1):323-331.

Bassendowski, S.L. & Petrucka, P. (2013). Are 20th-century methods of teaching applicable in the 21st century? *British Journal of Educational Technology,* 44(4):665-667.

Bean, J.C. (2011). *Engaging ideas: The professor's guide to integrating writing, critical thinking, and active learning in the classroom.* 2nd ed. San Francisco, CA: Jossey-Bass.

Beattie, V., Collins, B. & McInnes B. (1997). Deep and surface learning: A simple or simplistic dichotomy? *Accounting Education*, 6(1):1-12.

Benchicou, S., Aichouni, M. & Nehari, D. (2010). E-learning in engineering education: a theoretical and empirical study of the Algerian higher education institution. *European Journal of Engineering Education,* 35(3):325-343.

Bender, E., Hubwieser, P., Schaper, N., Margaritis, M., Berges, M., Ohrndorf, L., Magenheim, J. & Schubert, S. (2015). Towards a Competency Model for Teaching Computer Science. *Peabody Journal of Education,* 90(4):519-532.

Bender, E., Schaper, N., Caspersen, M.E., Margaritis, M. & Hubwieser, P. (2015). Identifying and formulating teachers' beliefs and motivational orientations for computer science teacher education. *Studies in Higher Education*. http://www.cs.au.dk/~mec/publications/journal/46--bender.pdf (Accessed on 30 September 2015).

Bennett, R.E. (1998). *Reinventing assessment: Speculations on the future of large-scale educational testing.* Princeton, NJ: Educational Testing Service Policy Information Centre. https://www.ets.org/Media/Research/pdf/PICREINVENT.pdf (Accessed on 5 July 2015).

Bennett, R.E. (2011). Formative Assessment: A Critical Review. *Assessment in Education: Principles, Policy & Practice*, 18(1):5-25.

Bensimon, E.M. (2009) Foreword. In: Harper, S.R. & Quaye, S.J. (eds). *Student Engagement in Higher Education*. New York and London: Routledge, pp. 21-26.

Benson, A.D. (2003). Assessing participant learning in online environment. *New Directions for Adult and Continuing Education,* 100:69-78.

Berenson, S.B., Slaten, K.M., Williams, L. & Ho, C. (2004). Voices of women in a software engineering course: reflections on collaboration. *ACM Journal on Educational Resources in Computing,* 4(1):3.

Berglund, A., Eckerdal, A., Pears, A., East, P., Kinnunen, P., Malmi, L., McCartney, R., Moström, J-E., Murphy, L., Ratcliffe, M., Schulte, C., Simoni, B., Stamouli, I. & Thomas, L. (2009). Learning computer science: perceptions, actions and roles. *European Journal of Engineering Education,* 34(4):327-338.

Bharuthram, S. & Kies, C. (2013). Introducing e-learning in a South African higher education institution: challenges arising from an intervention and possible responses. *British journal of educational technology,* 44(3):410-420.

Bhuasiri, W., Xaymoungkhoun, O., Zo, H., Rho, J.J. & Ciganek, A.P. (2012). Critical success factors for e-learning in developing countries: A comparative analysis between ICT experts and faculty. *Computers & Education*, 58(2):843-855.

Biggs, J. (1976). Wanted: A new discipline. *Australian Psychologist,* 11(1):43-52.

Biggs, J. (1987). *Student approaches to learning and studying.* Melbourne: Australian Council for Educational Research.

Biggs, J. & Tang, C. (2007). *Teaching for quality learning at university: what the student does*. 3rd ed. Berkshire: Open University Press.

Biggs, J. & Tang, C. (2011). *Teaching for quality learning at university: what the student does*. 4th ed. Berkshire: Open University Press.

Biggs, J., Kember, D. & Leung, D. (2001). The revised two-factor study process questionnaire: R-SPQ-2F. *British Journal of Educational Psychology*, 71(1):133-149.

Bishop-Clark, C., Courte, J. & Howard, E.V. (2006). Programming in pairs with Alice to improve confidence, enjoyment, and achievement. *Journal of Educational Computing Research*, 34:213-228.

Black, P., Harrison, C., Lee, C., Marshall, B. & Wiliam, D. (2004). Working inside the black box. *Phi Delta Kappan*, 86(1):9-21. http://datause.cse.ucla.edu/DOCS/pb_wor_2004.pdf (Accessed on 28 August 2015).

Black, P. & Wiliam, D. (1998a). Assessment and classroom learning. *Assessment in Education*, 5:7-71.

Black, P. & Wiliam, D. (1998b). Inside the black box: raising standards through classroom assessment. *Phi Delta Kappan*, 80:139-148. http://www.spd.dcu.ie/site/teaching_today/ documents/raisingstandardsthroughclassroomassessment.pdf (Accessed on 29 August 2015).

Black, P. & Wiliam, D. (2010). Inside the black box: Raising standards through classroom assessment: formative assessment is an essential component of classroom work and can raise student achievement. *Phi Delta Kappan*, 92(1):81-90. http://pdk.sagepub.com/ content/92/1/81.full.pdf+html (Accessed on 29 August 2015).

Bonwell, C.C. & Elson, J.A. (1991). Active learning: Creating excitement in the classroom*,* Washington, DC: *ASHE-ERIC Higher Education.*

Boud, D. (1995). Assessment and learning: contradictory or complementary? In Knight, P. (ed). London: Kogan Page. http://www.teacamp.eu/moodle2/pluginfile.php/1791/mod_ resource/content/1/UA/Assessment_and_learning_contradictory_or_complementary.pdf (Accessed on 1 July 2015).

Bourner, T. & Flowers, S. (1997). Teaching and learning methods in higher education: A glimpse of the future. *Reflections on Higher Education,* 9:77-102.

Boyle, A. & Hutchison, D. (2009). Sophisticated tasks in e-assessment: what are they and what are their benefits? *Assessment & Evaluation in Higher Education,* 34(3):305-319.

Brent, R. & Felder, R.M. (2005). Understanding student differences. *Journal of Engineering Education,* 94(1):57-72. http://www4.ncsu.edu/unity/lockers/users/f/felder/public/Papers/ Under standing_Differences.pdf (Accessed on 20 July 2016).

Brink, R. & Lautenbach, G. (2011). Electronic assessment in higher education. *Educational Studies,* 37(5):503-512.

Brophy, J. E. (2004). *Motivating students to learn*. Mahwah, NJ: Erlbaum.

Brownell, J.E. & Swaner, L.E. (2009). High-Impact Practices: Applying the Learning Outcomes Literature to the Development of Successful Campus Programs. https://www.uwosh.edu/grants/cetl1/archive/general-education-best-practice-resources/documents/High-Impact-Practices-Applying-the-Learning-Outcomes-Litarature-to-the-Development-of-Successful-Campus-Programs.pdf (Accessed on 20 July 2016).

Brownell, J.E. & Swaner, L.E. (2010). *Five High-Impact Practices: Research on Learning Outcomes, Completion, and Quality*. https://www.cuny.edu/about/administration/offices/ue/cue/ResearchonHighImpactPracticesAACU2010.pdf (Accessed on 20 July 2016).

Brown, D., Cromby, J. & Standen, P. (2001). The effective use of virtual environments in the education and rehabilitation of students with intellectual disabilities. *British Journal of Educational Technology,* 32(3):289-299.

Buchanan, T. (2000). The efficacy of a World Wide Web mediated formative assessment. *Journal of Computer Assisted Learning,* 16:193-200.

Bull, J. (1999). Computer Assisted Assessment: Impact on Higher Education Institutions. *Educational Technology and Society,* 2(3):123-126.

Bull, J. & McKenna, C. (2004). *Blueprint for computer‒assisted assessment*. London: Routledge Falmer.

Burgess, L.A. (2003). WebCT as an e-learning tool: A study of technology students' perceptions. *Journal of Technology Education,* 15(1):6-15.

Burns, N. & Grove, S.K. (2005)*. The practise of nursing research; conduct, critique and utilization.* 5th Edition. St Louis: Elsevier/Saunders.

Buyarski, C. & Landis, C. (2014). Using an ePortfolio to assess the outcomes of a first-year seminar: student narrative and authentic assessment. *International Journal of ePortfolio,* 4(1):49-60.

Buzzetto-More, N.A. & Alade, J.A. (2006). Best practices in e-assessment. *Journal of Information Technology Education,* 5:251-269.

Carter, J. & Boyle, R. (2002). Teaching delivery issues – lessons from computer science. *Journal of Information Technology Education,* 1(2):77-89. http://jite.org/documents/Vol1/v1n2p077-089.pdf (Accessed on 30 September 2015).

Caudron, S. (2001). Evaluating e-degrees. *Workforce,* 80(2):44-48.

Cavanagh, M. (2011). Students' experiences of active engagement through learning activities in lectures. *Active Learning in Higher Education,* 12:23-33.

Chalmers, D. & McAusland, W.D.M. (2002). Computer Assisted Assessment. *Journal of Research in Learning Technology,* 13(1):17-19. https://economicsnetwork.ac.uk/handbook/printable/caa_v5.pdf (Accessed on 3 July 2015).

Chang, M.J., Chang, J.C. & Ledesma, M.C. (2005). Beyond Magical Thinking: Doing the Real Work of Diversifying our Institutions. *About Campus*, 10(2):9-16.

Charlesworth, A. (2002). Computer tutor. *PC Advisor,* 177-181.

Charmaz, K. (2006). *Constructing grounded theory: A practical guide through qualitative analysis.* London: Sage.

CHE (Council on Higher Education). (2008). *FAQs: Post-School Education. What is Higher Education?* http://www.che.ac.za/faqs/post_school_education (Accessed on 16 January 2018).

Chickering, A.W. & Gamson, Z.F. (1987) Seven Principles for Good Practice in Undergraduate Education. *AAHE Bulletin*, 39(7):3-7.

Chirwa, L. (2008). A Case Study on the Impact of Automated Assessment in Engineering Mathematics. *Journal of the Higher Education Academy Engineering Subject Centre,* 3(1):13-20.

Chokri, B. (2012). Factors influencing the adoption of the e-learning technology in teaching and learning by students of a university class. *European Scientific Journal,* 8(28):165-190.

Clariana, R.B. & Wallace, P.E. (2002). Paper-based versus computer-based assessment: Key factors associated with the test mode effect. *British Journal of Educational Technology*, 33(5):595-904.

Clarke, S., Lindsay, K., McKenna, C. & New, S. (2004). INQUIRE: a case study in evaluating the potential of online MCQ tests in a discursive subject. *ALT-J,* 12(3):249-260. http://files.eric.ed.gov/fulltext/EJ821511.pdf (Accessed on 1 July 2015).

Clarke, C. (2003). *Towards a Unified e-Learning Strategy*:DfES Publications, 2003. https://www.education.gov.uk/consultations/downloadableDocs/towards%20a%20unified%20e-learning%20strategy.pdf (Accessed 23 July 2015).

Clelia, P-B., Jose-Javier, B-A., Angela, R-B., Natalia, P-G., Rodrigo, S-G. & Fabian, C-B. (2014). Student engagement and academic performance in the Colombian university context. *E-Journal of Educational Research, Assessment and Evaluation*, 20(2):1-19.

Clements, M.D. & and Cord, B.A. (2013). Assessment Guiding Learning: Developing Graduate Qualities in an Experiential Learning Programme. *Assessment & Evaluation in Higher Education,* 38(1):114-124.

Coates, H. (2005). The Value of Student Engagement for Higher Education Quality Assurance. *Quality in Higher Education*, 11(1):25036.

Coates, H. (2007). A Model of Online and General Campus-Based Student Engagement. *Assessment and Evaluation in Higher Education*, 32(2):121-141.

Coates, H. (2009). *Engaging Students for Success - 2008 Australasian Survey of Student Engagement.* Victoria, Australia: Australian Council for Educational Research.

Coates, H. (2010). Development of the Australasian Survey of Student Engagement (AUSSE). *Higher Education,* 60(1):1-17.

Cohen, L., Manion, L. & Morrison, K. (2007). *Research Methods in Education.* 6th ed. Oxon: Routledge.

Coldwell, J. (2003). Mapping Pedagogy to Technology – A Simple Model. In Advances in Web-Based Learning - ICWL 2003 Vol. 2783 / 2003. *Springer-Verlag GmbH*, 180-192.

Community College Survey of Student Engagement (CCSSE). (2003). *CCSSE benchmarks of effective educational practice.* http://www.southcentral.edu/images/departments/Research PlanningAndGrants/CCSSE_Benchmarks_of_Effective_Educational_Practice_.pdf (Accessed on 20 July 2016).

Conole, G. & Oliver, M. (2007). *Contemporary Perspective in E-learning Research Themes, Methods and Impact on Practice.* London: Routledge.

Conole, G. & Warburton, B. (2005). A review of computer-assisted assessment. *ALT-J, Research in Learning Technology,* 13(1):17-31.

Cooper, T. (1999). Whose academy is it? *New Statesman,* 128(4460):26.

Cooper, J.L. & Robinson, P. (2000). Getting started: Informal small-group strategies in large classes. *New Directions for Teaching and Learning,* 81:17-24.

Copeland, R. (2001). The usual rules apply online. *Times Higher Education Supplement*. https://www.timeshighereducation.co.uk/features/the-usual-rules-apply-online/166183.article (Accessed on 9 June 2015).

Council on Higher Education. Higher Education Quality Committee (CHE HEQC). (2004). ITL No. 5. The Assessment of Student Learning. In CHE HEQC. 2004. *Improving Teaching and Learning (ITL) Resources*, 119-135. http://www.che.ac.za/documents/d000087/ITLResources_no5.pdf (Accessed on 12 February 2007).

Covington, M.V. & Mueller, K.J. (2001). Intrinsic versus extrinsic motivation: an approach/avoidance reformation. *Educational psychology review,* 13(2):157-176. http://www.unco.edu/cebs/psychology/kevinpugh/motivation_project/resources/covington_mueller01.pdf (Accessed on 20 July 2016).

Craven, P. (2009). History and challenges of e-assessment: the “Cambridge Approach” perspective – e-assessment research and development 1989 to 2009. *Cambridge Assessment,* pp. 1-11.

Creswell, J.W. (2009). *Qualitative, Quantitative and Mixed Methods Approaches.* 3rd ed. Lincoln: Sage.

Creswell, J.W. (2013). *Qualitative inquiry and research design: Choosing among five approaches.* 3rd ed. Thousand Oaks: Sage.

Creswell, J.W. (2014). *Research design: Qualitative, quantitative and mixed methods approaches.* 4th ed. Thousand Oaks: Sage.

Crisp, G. (2011). *Teacher's handbook on e-Assessment: A handbook to support teachers in using e-assessment to improve and evidence student learning and outcomes.* San Francisco, California: Creative Commons.

Cummings, H.M. & Vandewater, E.A. (2007). Relation of adolescent video game play to time spent in other activities. *Archives of Paediatric and Adolescence Medicine*, 161(7):684-689. http://uploadi.www.ris.org/editor/1184656998684.pdf (Accessed on 3 October 2015).

Cuthbert, P.F. (2005). The student learning process: Learning styles of learning approaches. *Teaching in Higher Education,* 10(2):235-249.

Dafoulas, G. (2006). E-assessment in information technology education. *Idea Group Publishing,* 1:516-518.

Daly, C., Pachler, N., Mor, Y. & Mellar, H. (2010). Exploring Formative E-Assessment: Using Case Stories and Design Patterns. *Assessment & Evaluation in Higher Education,* 35(5):619-636.

Dalziel, J. (2001). Enhancing Web-based Learning with Computer Assisted Assessment: *Pedagogical and technical consideration in proceedings of the fifth international computer assisted assessment conference*, Loughborough University. http://caaconference.co.uk/ pastConferences/2001/proceedings/i2.pdf (Accessed on 3 July 2015).

Daniels, M., Gal-Ezer, J., Sanders, I. & Teague, G. (1996). *Teaching computer science: experiences from four continents*. http://www.openu.ac.il/personal_sites/download/galezer/ teaching-cs.pdf (Accessed on 30 September 2015).

Davidson, S. & McKenzie, L. (2009). Tertiary assessment & higher education student outcomes: policy, practice & research. https://akoaotearoa.ac.nz/download/ng/file/group-4/n2742-tertiary-assessment--higher-education-student-outcomes---policy-practice--research---summary.pdf (Accessed on 20 August 2015).

Debuse, J.C.W., Lawley, M. & Shibl, R. (2008). Educator's Perceptions of Automated Feedback Systems. *Australian Journal of Educational Technology,* 24(4):374-386.

Delahunty, J. (2012). 'Who am I? Exploring identity in online discussion forums. *International Journal of Educational Research*, 53:407-420.

Denzin, N.K. & Lincoln, Y.S. (2011). Introduction: The discipline and practice of qualitative research. In Denzin, N.K. and Lincoln, Y.S. (eds). *The Sage Handbook of Qualitative Research.* 4th ed Los Angeles: Sage.

Department of Education and Training (2008). Designing assessment tools for quality outcomes in VET. East Perth, Australia. https://www.serviceskills.com.au/sites/default/ files/files/Resources/Foundation%20Skills/Designing-assessment-tools-for-quality-outcomes-in-VET.pdf (Accessed on 18 February 2016).

Dermo, J. (2009). E-assessment and the student learning experience: a survey of student perceptions of e-assessment. *British Journal of Educational Technology*, 40(2):203-214.

Deubel, P. (2003). An Investigation of Behaviorist and Cognitive Approaches to Instructional Multimedia Design. *International Journal of Educational Multimedia and Hypermedia,* 12(1):63-90. http://demariagroup.com/wp-content/uploads/2012/04/Dispelling-the-Myths.pdf (Accessed on 10 August 2015).

De Vos, A.S., Strydom, H., Fouché, C.B & Delport, C.S.L. (2002). *Research at Grass Roots. For the social sciences and human service professions.* 2nd ed. Pretoria: Van Schaik.

DFES (Department for Education and Skills) (2005). White paper 14-19 education and skills. http://www.dfes.gov.uk/publications/14-19educationandskills/ (Accessed 20 June 2015).

Dias, S.B. & Diniz, J.A. (2014). Towards an Enhanced Learning Management System for Blended Learning in Higher Education Incorporating Distinct Learners' Profiles. *Educational Technology & Society*, 17(x):307-319.

Dierick, S. & Dochy, F.J. (2001). New lines in edumetrics: New forms of assessment lead to new assessment criteria. *Studies in Educational Evaluation*, 27:307-329.

Donovan, L. & Green, T.D. (2014). Examining the 21st century classroom: Developing an innovation configuration map. *Journal of Educational Computing Research,* 50(2):167-178.

Doyle, T. (2008). *Helping students learn in a learner-centered environment: A guide to facilitating learning in higher education.* Sterling, VA: Stylus Publishing.

Earl, L. & Katz, S. (2006). Rethinking classroom assessment with purpose in mind: assessment for learning, assessment as learning, assessment of learning. Manitoba Education, Citizenship and Youth publishing. Winnipeg: Manitoba.
http://www.edu.gov.mb.ca/k12/assess/index.html (Accessed on 26 August 2016).

Edgerton, R. (1997). *Higher Education White Paper.* Pew Charitable Trusts.

Ellis, C. (2013). Broadening the scope and increasing the usefulness of learning analytics: The case for assessment analytics. *British Journal of Educational Technology*, 44(4):662-664.

Elton, L. (1987). *Teaching in higher education: appraisal and training*. London: Kogan Page.

Evans, C.J., Kirby, J.R. & Fabrigar, L.R. (2003). Approaches to learning, need for cognition, and strategic flexibility among university students. *British Journal of Educational Psychology,* 73:507-528.

Ezziane, Z. (2007). Information technology literacy: implications on teaching and learning. *Journal of educational technology and society,* 10(3):175-191.

Farrell, T. & Rushby, N. (2016). Assessment and learning technologies: an overview. *British Journal of Educational Technology,* 47(1):106-120.

Felder, R.M. & Brent, R. (1996). Navigating the Bumpy Road to Student-Centered Instruction. *College Teaching,* 44(2):43-47.

Fitzsimons, M. (2014). Engaging students' learning through active learning. *Irish Journal of Academic Practice*, 3(1):1-26.

Fredricks, J.A., Blumenfeld, P.C. & Paris, A.H. (2004). School Engagement: Potential of the Concept, State of the Evidence. *Review of Educational Research*, 74(1):59-109.

Fredrick, T.A. (2008). Facilitating better teamwork: analyzing the challenges and strategies of classroom-based collaboration. *Business Communication Quarterly,* December, 71(4).

Fry, K. (2001). E-Learning markets and providers: Some issues and prospects. *Training and Education*, 43(4):233-239.

Fry, S.W. & Villagomez, A. (2012). Writing-to-learn: Benefits and limitations. *College Teaching,* 60:170-175.

Gibbs, G. (2006). Why Assessment is changing. In *Innovative Assessment in Higher* Bryan, C. & Clegg, K.V. (eds). London: Routledge, pp.11-22.

Gibbs, G. (2007). *Analyzing qualitative data. The SAGE qualitative research kit.* London: Sage.

Gordon, N. (2014). Flexible Pedagogies: technology-enhanced learning. *The Higher Education Academy,* pp. 1-24. https://www.heacademy.ac.uk/sites/default/files/resources/TEL_report_0.pdf (Accessed 3 July 2015).

Govindasamy, T. (2002). Successful implementation of e-Learning Pedagogical considerations. *Internet and Higher Education,* 4:287-299.

Graham, C.R., Tripp, T.R., Seawright, L. & Joeckel, G.L. (2007). Empowering or Compelling Reluctant Participators Using Audience Response Systems. *Active Learning in Higher Education*, 8(3):233-258.

Grandon, E., Alshare, O. & Kwan, O. (2005). Factors influencing student intention to adopt online classes: A cross-cultural study. *Journal of Computing Sciences in Colleges,* 20(4):46-56.

Grant, D., Malloy, A. & Murphy, M. (2009). A comparison of student perceptions of their computer skills to their actual abilities. *Journal of Information Technology Education,* 8:141-160.http://www.jite.org/documents/Vol8/JITEv8p141-160Grant428.pdf (Accessed on 30 September 2015).

Greenagel, F.L. (2002). The illusion of e-learning: why we're missing out on the promise of technology. http://www.guidedlearning.com/illusions.pdf. (Accessed 10 May 2015).

Guba, E.G. & Lincoln, Y.S. (1989). *Fourth generation evaluation*. Newbury Park: Sage.

Guba, E.G. & Lincoln, Y.S. (1994). Competing paradigms in qualitative research. In Denzin, N.K. & Lincoln, Y.S. (eds). *Handbook of Qualitative Research.* Thousand Oaks: Sage.

GuildHE (2015). *Making student engagement a reality: turning theory into practice*. http://www.guildhe.ac.uk/wp-content/uploads/2015/11/6472-Guild-HE-Student-Engagement-Report-36pp.pdf (Accessed on 20 July 2016).

Gulikers, J.T.M., Bastiaens, T.J. & Kirschner, P.A. (2004). A five dimensional framework for authentic assessment. *Educational Technology Research and Design*, 53:67-87.

Gunasekaran, A., McNeil, R.D. & Shaul, D. (2002). E-learning: research and applications. *Industrial and Commercial Training,* 34(2):44-53.

Guzdial, M. & Soloway, E. (2002). Log on education: teaching the Nintendo generation to program. *Communications of the ACM*, 45(4):17-21. http://0-web.b.ebscohost.com. wagtail.ufs.ac.za/ehost/pdfviewer/pdfviewer?vid=6&sid=59adea5f-9ea2-499d-a0a0-36f20d57027d%40sessionmgr110&hid=123 (Accessed on 5 October 2015).

Haggis, T. (2003). Constructing images of ourselves? A critical investigation into ‘approaches to learning’ research in higher education. *British Educational Research Journal,* 29(1):89-104.

Halff, H. M. (2008). *Curriculum and Instruction in automated tutors.* Hillsdale, NJ: Lawrence Erlbaum and associates publishers. pp. 79-80.

Hamann, K., Pollock, P.H. & Wilson, B.M. (2012). Assessing student perceptions of the benefits of discussions in small-group, large-class, and online learning contexts. *College Teaching,* 60:65-75.

Harlen, W. (2007). Holding up a mirror to classroom practice. *Primary Science Review*, 100:29-31. http://eric.ed.gov/?id=EJ912370 (Accessed on 20 July 2016).

Harper, S.R. & Quaye, S.J. (2009a). Beyond Sameness, with Engagement and Outcomes for All. In: *Student Engagement in Higher Education*. New York and London: Routledge, pp. 1-15.

Harrison, C. & Harlen, W. (2006*). Children's self- and peer assessment*. In: Harlen, W. (ed) ASE Guide to Primary Science Education. Hatfield: Association for Science Education.

Hartley, D. (2000). All aboard the eLearning train. *Training & Development*, 54(7):37-42.

Hassanzadeh, A., Kanaani, F. & Elahi, S. (2012). A model for measuring e-learning systems success in universities. *Expert Systems with Applications,* 39:10959-10966.

Haun, X., Shehane, R. & Ali, A. (2010). Teaching computer science courses in distance learning. *Journal of Instructional Pedagogies,* pp.1-14. http://www.aabri.com/ manuscripts/ 11766.pdf (Accessed on 5 October 2015).

Hawi, N. (2010). Causal attributions of success and failure made by undergraduate students in an introductory-level computer programming course. *Computer and Education,* 54:1127-1136.

Hawkes, M. & Cambre, M. (2000). The cost factor. *Technological Horizons in Education,* 28(1):26-32.

Hemsley, C. (2002). Jones International University's focus on quality eLearning opens doors for students worldwide. *Business Media*, 39(9):26-29.

Hepplestone, S. & Helm, P. (2003). Strategies for coping with unexpected uptake of CBA. *Proceedings of the 7th International Computer Assisted Assessment Conference,* Loughborough, pp. 59-167. http://caaconference.co.uk/pastConferences/2003/procedings/ hepplestone.pdf (Accessed 30 June 2015).

Herdiana, R. & Shafie, A. (2008). Moodle: Tool to Manage Probability and Statistics Course in Universiti Teknologi PETRONAS. In proceedings (ICEE 2008) International Conference on Engineering Education "New Challenges in Engineering Education and Research in the 21st Century," PÉCS-BUDAPEST, HUNGARY.

Heritage, M. (2007). Formative assessment: what do teachers need to know and do? *Phi delta Kappan,* 89(2):140-145. http://easlinstitute.org/wp-content/uploads/Heritage_formative_ assessment.pdf (Accessed 25 August 2015).

Hesse-Biber, S.N. & Leavy, P. (2011). *The practice of qualitative research*. 2nd ed. Thousand Oaks, CA: Sage.

Hiltz, S. & Turoff, M. (2005). Education goes digital: The evolution of online learning and the revolution in higher education. *Communications of the ACM,* 48(10):59-64.

Ho, C., Slaten, K., Williams, L. & Berenson, S. (2004). Examining the impact of pair programming on female students. *NCSU CSC Technical Report.* http://www.researchgate. net/publication/228363502_Examining_the_Impact_of_Pair_Programming_on_Female_Stude nts (Accessed on 30 September 2015).

Hoffman, M.E. & Vance, D.R. (2005). Computer literacy: What students know and from whom they learned it. *Proceedings of the 36th SIGCSE Technical Symposium on Computer Science Education.* St. Louis, Missouri, USA, pp. 356-360.

Holley, D. (2002). Which room is the virtual seminar in please? *Education and Training*, 44(3):112-121.

Holmboe, C., McIver, L. & George, C. (2001). Research agenda for computer science education. 13th workshop of the psychology of programming interest group, Bournemouth, UK. http://www.fing.edu.uy/grupos/nifcc/material/2015/13th-holmboe.pdf
(Accessed on 30 September 2015).

Holmes, B. & Gardner, J. (2006). *E-Learning: Concepts and Practice,* London: Sage.

Holmes, N. (2015). Student perceptions of their learning and engagement in response to the use of a continuous e-assessment in an undergraduate module. *Journal of Assessment & Evaluation in Higher Education*, 40(1):1-14.

Howarth P. (2015). The opportunities and challenges faced in utilizing e-Based assessment. http://www.educationalrc.org/oldconf/old/pdf/Paul%20Howarth%20-%20Beirut%20Presen tation.pdf (Accessed 6 July 2015).

Howie, P. & Bagnall, R. (2012). A critique of the deep and surface approaches to learning model. *Teaching in higher education*, 18(4):389-400.

Hu, S. & Kuh, G.D. (2001). Being (Dis) Engaged in Educationally Purposeful Activities: The Influences of Student and Institutional Characteristics. *Paper presented at the American Educational Research Association Annual Conference.* Seattle, WA, 10-14 April.

Hubwieser, P., Berges, M., Magenheim, J., Schaper, N., Bröker, K., Margaritis, M. & Ohrndorf, L. (2013). Pedagogical content knowledge for computer science in German teacher education curricula. In M. Caspersen, M. Knobelsdorf, & R. Romeike (eds.), *WiPSCE '13, Proceedings of the 8th Workshop in Primary and Secondary Computing Education*, pp. 95-103.

Hwang, W.Y., Shadiev, R., Wang, C.Y. & Huang, Z.H. (2012). A pilot study of cooperative programming learning behaviour and its relationship with students' learning performance. *Computers and Education,* 58:267-1281.

International Labour Organization (ILO) (2004). *Recommendation concerning human resources development: education, training and lifelong learning.* 92nd ILC session, Geneva.

http://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO::P12100_ILO_CODE:R195 (Accessed on 7 August 2015).

Jack, Z. Y Curt, U. (2001). Why blended will win. *Training and Development,* 55(8):54-60.

Jackson, R. & Sorensen, G. (2003). *Introduction to International Relations: Theories and Approaches.* New York: Oxford University Press. www.oup.co.uk/pdf/bt/jacksonsorensen/ch09.pdf (Accessed on 24 December 2014).

JISC (Joint Information Systems Committee). (2004). *Effective Practice with e-Learning.* http://archive.alt.ac.uk/newsletter.alt.ac.uk/www.jisc.ac.uk_/uploaded_documents/ACF5D0.pdf (Accessed on 3 July 2015).

JISC (Joint Information Systems Committee). (2004). *Effective practice with e-learning: A good practice guide in designing for learning*. http://webarchive.nationalarchives.gov.uk/20140702233839/http:/www.jisc.ac.uk/media/documents/publications/effectivepracticeelearning.pdf (Accessed 21 July 2015).

JISC (Joint Information Systems Committee). (2006). *Effective use of VLEs: e-assessment.* www.jiscinfonet.ac.uk (Accessed 10 June 2015).

JISC (Joint Information Systems Committee). (2007). Effective practice with e-assessment: An overview of technologies, policies and practice in further and higher education. http://www.jisc.ac.uk/media/documents/themes/elearning/effpraceassess.pdf
(Accessed 27 June 2015).

Johns, R. (2003). Application of web-based learning in teaching social work law. *Social Work Education*, 22(5):429-443.

Jordan, S. (2011). Using Interactive Computer-based Assessment to Support Beginning Distance Learners of Science. *Open Learning: The Journal of Open, Distance and e-Learning,* 26(2):147-164.

Jordan, S. (2014). *E-assessment for learning? Exploring the potential of computer-marked assessment and computer-generated feedback, from short-answer questions to assessment analytics*. (PhD thesis.) England. Milton Keynes: The Open University.

Jordan, S. & Mitchell, T. (2009). E-Assessment for Learning? The Potential of Short-answer Free-text Questions with Tailored Feedback. *British Journal of Educational Technology,* 40(2):371-385.

Juwah, C., Macfarlane-Dick, D., Matthew, B., Nicol, D., Ross, D. & Smith, B. (2004). Enhancing Student Learning Through Effective Student Feedback. *The Higher Education Academy.* https://www.heacademy.ac.uk/sites/default/files/resources/id353_senlef_guide.pdf (Accessed on 26 August 2015).

Kelleher, C., Pausch, R. & Kiesler, S. (2007). *Storytelling Alice motivates middle school girls to learn computer programming.* In Proceedings of the SIGCHI conference on human factors in computing systems. San Jose, California, USA. http://www.cse.wustl.edu/~ckelleher/StorytellingCHI.pdf (Accessed on 3 October 2015)

Keller, J. (1987). Development and Use of the ARCS Model of Motivational Design. *Journal of Instructional Development,* 10(3):2-10.

Kershaw, A. (1996). People, planning, and process: The acceptance of technological innovation in post-secondary organizations. *Educational Technology*, 44-48.

Khan, B. (2005). *Managing e-learning strategies: Design, Delivery, Implementation and Evaluation*. Hershey, PA: Idea Group Inc.

Kibble, J.D, Kingsbury, J., Ramirez, B.U., Schlegel, W.M. Y Sokolove, P. (2007). Effective use of course management systems to enhance student learning: Experimental Biology. *Physiology Education*, 31:377-379.

Kift, S. & Field, R. (2009). *Intentional First Year Curriculum Design as a Means of Facilitating Student Engagement: Some Exemplars* (Paper presented at 12 Pacific Rim First Year in Higher Education Conference, Townsville, Queensland, 29 June - 1 July 2009). http://www.fyhe.com.au/past_papers/papers09/content/pdf/16D.pdf (Accessed 23 July 2015).

Kilgo, C.A., Sheets, J.K. & Pascarella, E.T. (2011). *Do High-Impact Practices Actually Have High Impact on Student Learning? Some Initial Findings*. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.697.6006&rep=rep1&type=pdf (Accessed on 20 July 2016).

Kinzie, J. (2012). *Fostering student learning and success: the value of high impact practices*. http://www.d.umn.edu/vcaa/sem/kinzieHO2012(3).pdf (Accessed on 20 July 2016).

Knight, P. (2001). A briefing on key concepts: formative and summative, criterion & norm-referenced assessment. Assessment Series No.7: LTSN Generic Center. http://78.158.56.101/archive/palatine/files/938.pdf (Accessed on 28 August 2015).

Knorr, E.M. (2012). *Course Management System (CMS) Evaluation and Strategy at UBC: A Viewpoint from the Faculty of Science*. Department of Computer Science, University of British Columbia.

Komarraju, M. & Karau, S.J. (2008). Relationships between the perceived value of instructional techniques and academic motivation. *Journal of Instructional Psychology,* 3(5):70-82.

Koohang, A. & Durante, A. (2003). Learners' perceptions toward the web-based distance learning activities/assignments portion of an undergraduate hybrid instructional model. *Journal of Informational Technology Education,* 2:105-113. http://www.jite.org/documents/Vol2/v2p105-113-78.pdf (Accessed on 30 August 2015).

Krause, K. (2005). *Understanding and Promoting Student Engagement in University Learning Communities.* Paper presented as keynote address: *Engaged, Inert or Otherwise Occupied? Deconstructing the 21st Century Undergraduate Student* at the James Cook University Symposium 'Sharing Scholarship in Learning and Teaching: Engaging Students'. James Cook University, Townsville/Cairns, Queensland, Australia, 21-22 September.

Krause, K. & Coates, H. (2008). Students' Engagement in First-Year University. *Assessment and Evaluation in Higher Education*. 33(5):493-505.

Kuh, G.D. (2008). High-impact educational practices: What they are, who has access to them, and why they matter. Washington, DC: Association of American Colleges and Universities. https://keycenter.unca.edu/sites/default/files/aacu_high_impact_2008_final.pdf (Accessed on 10 August 2015)

Kuh, G.D. (2009a). What Student Affairs Professionals Need to Know about StudentEngagement. *Journal of College Student Development*. 50(6):683-706.

Kuh, G.D., Cruce, T.M., Shoup, R., Kinzie, J. & Gonyea, R.M. (2008). Unmasking the Effects of Student Engagement on First-Year College Grades and Persistence. *Journal of Higher Education*, 79(5):540-563.

Kuh, G.D., Kinzie, J., Buckley, J.A., Bridges, B.K. & Hayek, J. C. (2007). Piecing together the student success Puzzle research, propositions and recommendations *ASHE Higher Education Report Series,* 32(5). San Francisco: Jossey-Bass. www.interscience.wiley.com (Accessed on 29 May 2015).

Kuh, G.D., Kinzie, J., Schuh, J.H. & Whitt, E.J. (2005). Never Let It Rest: Lessons about Student Success from High-Performing Colleges and Universities. *Change: The Magazine of Higher Learning,* 37(4):44-51.

Kuh, G.D., Palmer, M. & Kish, K. (2003). “The Value of Educationally Purposeful Out of-Class Experiences.” In: Skipper, T.L. & Argo, R. (eds.). *Involvement in Campus Activities and the Retention of First Year College Students. The First-Year Monograph Series,* 36:19-34. Columbia, SC: University of South Carolina, National Resource Center for the First Year Experience and Students in Transition.

Lafuente, M., Remesal, A. & Valdivia, A.M. (2014). Assisting learning in e-assessment: a closer look at educational supports. *Assessment & Evaluation in Higher Education,* 39(4):443-460.

Lapidot, T. & Hazzan, O. (2003). Methods of Teaching a Computer Science Course for Prospective Teachers. *Education in Technology and Science,* 35(4):29-34. http://edu.technion.ac.il/Faculty/OritH/HomePage/MTCS_Course/Lapidot%26Hazzan_Inroads_2003.pdf (Accessed on 27 October 2015).

Laurillard, D. (2002a). Rethinking teaching for the knowledge society. *Educause Review,* 37(1):16-25. https://net.educause.edu/ir/library/pdf/ffpiu017.pdf (Accessed on 30 September 2015).

Laurillard, D. (2002b). *Rethinking University Teaching: A Conversational Framework for the Effective Use of Learning Technologies.* 2nd ed. Routledge.

Lawless, K. & Pellegrino J. (2007). Professional development in integrating technology into teaching and learning: knowns, unkowns, and ways to pursue better questions and answers. *Review of Educational Research,* 77(4):575-614.

Lee, Y-H., Hsieh, Y-C. & Chen, Y-H. (2013). An investigation of employees’ use of e-learning systems: applying the technology acceptance model. *Behaviour & Information Technology,* 32(2):173-189.

Le Grange, L. (2004). E-learning: Some critical thoughts. *South African Journal of Higher Education,* 18(1):87-97.

Liebenberg, J., Mentz, E. & Breed B. (2012). Pair programming and secondary school girls’ enjoyment of programming and the subject Information Technology (IT). *Computer Science Education,* 22(3):219-236.

Lieberman, J. (2000). Online Teaching. *Training & Development*, 37(3):25.

Lindsay, C. & Clarke, S. (2001). Enhancing primary science through self- and paired-assessment. *Primary Science Review*, 68:15-18. http://eric.ed.gov/?id=EJ912370 (Accessed on 20 July 2016).

Lombardi, M.M. (2007). *Authentic Learning for the 21st Century: An Overview.* Educause Learning Initiative.

López-Pérez, M.V, Pérez-López, M.C. & Rodríguez-Ariza, L. (2010). Blended learning in higher education: Students' perceptions and their relation to outcomes. *Computers & Education*, 56:818-826.

Lublin, J. (2003). Deep, surface and strategic approaches to learning. *Centre for teaching and learning: good practice in teaching and learning*. UCD Dublin.

Lumpkin, A., Achen, M.R. & Dodd, K.R. (2015). Student perceptions of active learning. *College Student Journal*, 49(1):121-133.

Lunt, B., Ekstrom, J., Gorka, S., Hislop, G., Kamali, R., Lawson, E., LeBlanc, R., Miller, J. & Reichgelt, H. (2008). Curriculum guidelines for undergraduate degree programs in information technology. *Association for Computing Machinery,* pp. 1-139. https://www.acm.org/education/curricula/IT2008%20Curriculum.pdf (Accessed on 30 September 2015).

Machemer, P.L. & Crawford, P. (2007). Student perceptions of active learning in a large cross-disciplinary classroom. *Active Learning in Higher Education,* 8:9-30.

Mackenzie, D. (2003). Assessment for E−Learning: What are the Features of an ideal E−Assessment System? *CAA Conference Proceedings,* pp. 185-194. https://dspace.lboro.ac.uk/dspace-jspui/bitstream/2134/1914/1/mackenzie03.pdf (Accessed on 1 July 2015).

MacPhee, L., Shelley, E. & Karcz, G. (2003). *How can a course management system (CMS) enhance my online (or face-to-face) course?* Centre for Technology Enhanced Learning.

Malcolm, J. & Zukas M. (2001). Bridging pedagogic gaps: Conceptual discontinuities in higher education. *Teaching in Higher Education*, 6(1):33-42.

Maldonado, U. (2011). E-learning motivation and educational portal acceptance in developing countries. *Online Information Review*, 35(1):66-85.

Mann, S.J. (2001). Alternative Perspectives on the Student Experience: Alienation and Engagement. *Studies in Higher Education*. 26(1):7-19.

Mansson, D.H. (2013). Assessing student learning in intercultural communication: Implementation of three classroom assessment techniques. *College Student Journal,* 47:343-351.

Mapuva, J. & Muyengwa, L. (2009). Conquering the barriers to learning in higher education through e-learning. *International Journal of Teaching and Learning in Higher Education*, 21(2):221-227.

Marcangelo, C. (2010). *The opportunities and challenges of self, peer and group assessment*. https://eprints.mdx.ac.uk/5490/1/HEA_final_chapter_submission_14_feb.pdf (Accessed on 20 July 2016).

Markwell, D. (2007). The Challenge of Student Engagement. *Keynote address at the Teaching and Learning Forum. University of Western Australia, 30-31 January.*

Marton, F. & Säljö, R. (1976a). On qualitative differences in learning: I - Outcome and process. *British Journal of Educational Psychology* 46(1):4-11.

Marton, F. & Säljö, R. (1976b). On qualitative differences in learning: II - Outcome as a function of the learner's conception of the task. *British Journal of Educational Psychology,* 46(2):115-127.

Marton, F. & Säljö, R. (1984). Approaches to learning, In Marton, F., Hounsell , D. & Entwistle, N. (eds). *The Experience of Learning*. Edinburgh: Scottish Academic Press.

McClenney, K.M. (2006). Benchmarking effective educational practices. http://www.accbd.org/articles/index.php/attachments/single/175 (Accessed on 20 July 2016).

McFadzean, E. (2001). Supporting virtual learning groups. Part 1: A pedagogical perspective. *Team Performance Management,* 7 (3, 4):53-62.

McIntosh, D. (2015). *Vendors of learning management and E-learning products.* www.trimeritus.com (Accessed 14 August 2015).

McMillan, J. & Hearn, J. (2008). Student self-assessment: the key to stronger student motivation and higher achievement. http://files.eric.ed.gov/fulltext/EJ815370.pdf (Accessed on 28 August 2015).

McMillan, J. & Schumacher, S. (2006). *Research in education. Evidence-based inquiry*. 6th ed. Boston, USA: Pearson Education, Inc.

McMillan, J. & Schumacher, S. (2010). *Research in education: Evidence-based inquiry.* 7th ed. New Jersey: Pearson.

McNair, B. & Albertine, S. (2012). *Seeking high-quality, high-impact learning: the imperative of faculty development and curricular intentionality*. Washington, DC: Association of American Colleges and Universities. http://www.aacu.org/peerreview/2012/summer/mcnair-albertine (Accessed on 10 August 2015).

McNeil, S.G., Robin, B.R. & Miller, R.M. (2000). Facilitating interaction, communication and collaboration in online courses. *Computers and Geosciences*, 26:699-708.

Merriam, S. (2009). *Qualitative research: A guide to design and implementation*. San Francisco, CA: Jossey-Bass.

Mertens, D.M. (2005). *Research and Evaluation in Education and Psychology*. 2nd ed. London: Sage.

Mertens, D.M. (2010). *Research and evaluation in Education and Psychology*. Washington, DC: Sage.

Michael, K. (2012). Virtual classroom: Reflections of online learning. *Campus-Wide Information Systems*, 29:156-165.

Michailidou, A. & Economides, A. (2003). E-learn: Towards a collaborative educational virtual environment. *Journal of Information Technology Education,* 2:131-152. http://jite.org/documents/Vol2/v2p131-152-92.pdf (Accessed on 5 May 2015).

Miles, M.B. & Huberman, A.M. (1994). An introduction to content analysis. In Miles, M.B. & Huberman, A.M. *Qualitative data analysis: An expanded sourcebook.* 2nd ed. Thousand Oaks: Sage.

Miller, N. (2002). *Alternative forms of formative and summative assessment.* http://www.economicsnetwork.ac.uk/handbook/assessment/welcome (Accessed on 27 August 2015).

Millis, B.J. (2012). IDEA Paper No. 53: Active learning strategies in face-to-face courses. Manhattan, KS: The Idea Center. http://www.theideacenter.org/sites/default/files/paperidea_53.pdf (Accessed on 29 May 2015).

Minch, R.P. & Tabor, S.W. (2003). Networking education for the new economy. *Journal of Information Technology Education,* 2(1):51-60. http://jite.informingscience.org/documents/Vol2/v2p051-059-68.pdf (Accessed on 30 September 2015).

Moore, M. (2000). Is distance teaching more work or less? *The American Journal of Distance Education,* 14(3):6-20.

Moore, M. (2001). Editorial: Surviving as a distance teacher. *The American Journal of Distance Education,* 15(2):1-5.

Morgan, D.L. (2007). Paradigms lost and pragmatism regained: Methodological implications of combining qualitative and quantitative methods. *Journal of Mixed Methods Research,* 1(1):48-76.

Morris, D. (2008). Economics of Scale and Scope in e-learning. *Teaching in Higher Education,* 33(3):331-343.

Motaghian, H., Hassanzadeh, A. & Moghadam, D.K. (2013). Factors affecting university instructors' adoption of web-based learning systems: Case study of Iran. *Computers & Education*, 61:158-167. http://www.uio.no/studier/emner/matnat/ifi/INF3280/v11/MahapatraLai2005EvaluatingEndUserTrainingPrograms.pdf (Accessed on 30 September 2015).

Murray, A. (2015). Academic Libraries and High-Impact Practices for Student Retention: Library Deans' Perspectives. *Libraries and the academy,* 15(3):471-487. https://www.press.jhu.edu/journals/portal_libraries_and_the_academy/portal_pre_print/articles/15.3murray.pdf (Accessed on 20 July 2016).

Naidu, S. (2006). *E-learning: A guidebook of principles, procedures and practices*. 2nd ed. Commonwealth Educational Media Centre for Asia. India. New Delhi. http://cemca.org.in/ckfinder/userfiles/files/e-learning_guidebook.pdf (Accessed on 14 August 2015)

National Survey of Student Engagement (NSSE), (2009b). Using NSSE to Assess and Improve Undergraduate Education: Lessons from the Field. Bloomington, IN: NSSE

Nehme, M. (2010). E-learning and students' motivation. *Legal education review,* 20:223-239. http://www.ler.edu.au/Vol%2020%20PDFs/nehme.pdf (Accessed on 20 July 2015).

Neill, J. (2007). Qualitative versus quantitative research: key points in a classic debate. http://wilderdom.com/research/QualitativeVersusQuantitativeResearch.html (Accessed on 18 December 2017).

Newble, D.J. & Clarke, R.M. (1986). The approaches to studying of students in a traditional and in an innovative problem-based medical school. *Medical Education,* 20:267-273.

Nia, F.S. & Marandi, S. (2014). Digital literacy and netiquette: Awareness and perception in EFL learning context. In S. Jager, L. Bradley, E. J. Meima, & S. Thouësny (eds), *CALL Design: Principles and Practice*; *Proceedings of the 2014 EUROCALL Conference, Groningen, The Netherlands.* https://files.eric.ed.gov/fulltext/ED565094.pdf (Accessed on 14 May 2018).

Nicol, D. (2007). Laying a foundation for lifelong learning: Case studies of e-assessment in large 1st-year classes. *British Journal of Educational Technology,* 38(4):668-678.

Nicol, D.J. & Milligan, C. (2006). Rethinking technology-supported assessment in terms of the seven principles of good feedback practice. In Bryan, C. & Clegg, K. (eds). *Innovative Assessment in Higher Education,* Taylor and Francis Group Ltd. London. http://ewds.strath.ac.uk/REAP/public/Papers/Nicol_Milligan_150905.pdf (Accessed on 1 July 2015).

Nichols, M. (2003). A Theory for E-Learning. *Educational Technology and Society,* 6(2):1-10.

Nicolau, C.T., Nicolaidou, I.A. & Contantinou, C.P. (2005). The e-learning movement as a process of quality improvement in higher education. *Educational Research and Evaluation*, 11(6):605-622.

Nieuwenhuis, J. (2007). Analysing qualitative data. In Maree, K. (ed.). *First steps in research,* pp. 98-122. Pretoria: Van Schaik.

NIU (Northern Illinois University). (2011). *Formative and summative assessment*. https://www.azwestern.edu/learning_services/instruction/assessment/resources/downloads/formative%20and_summative_assessment.pdf (Accessed on 26 August 2015).

Noorbehbahani, F. & Kardan, A.A. (2011). The Automatic Assessment of Free Text Answers using a Modified BLEU Algorithm. *Computers & Education*, 56 (1):337-345.

Noyes, J.M., Garland, K.J. & Robbins, E. (2004). Paper−based versus computer−based assessment − is workload another test mode effect? *British Journal of Educational Technology,* 35(1):111-113.

NSW (New South Wales) Syllabuses. (2012). *Assessment for, as, and of learning*. http://syllabus.bos.nsw.edu.au/support-materials/assessment-for-as-and-of-learning/ (Accessed on 26 August 2015).

Nulty, D.D. (2009). A guide to Peer and Self-Assessment: Approaches and practice strategies for academics. Griffith Institute for Higher Education, Griffith University. https://www.griffith.

edu.au/_data/assets/pdf_file/0016/142108/GuidePeerSelfAssessment-Long.pdf (Accessed on 27 August 2015).

O'Connell, B. (2002). A Poor Grade for ELearning. (Classroom Students Did Better). *Workforce*, 81(7):15.

O'Donoghue, J., Singh, G. & Dorward, L. (2001). Virtual education in universities: A technological imperative. *British Journal of Educational Technology*, 32(5):517-530.

O'Neill, G. & Noonan, E. (2011). *Designing First Year Assessment Strategically*, 1-46. http://www.ucd.ie/t4cms/designifyassess.pdf (Accessed 7 October 2015).

O'Neill, K., Singh, G. & O'Donoghue, J. (2004). Implementing e-learning programmes for higher education: A review of literature. *Journal of information technology education,* 3:314-323.

O'Regan, K. (2003). Emotion and E-Learning. *Journal of Asynchronous Learning Networks,* 7(3):78-92.

O'Reilly, T. (2005). *What is web 2.0: Design Patterns and Business Models for the next generation of software?* http://www.oreilly.com/pub/a/web2/archive/what-is-web-20.html (Accessed on 5 July 2015).

Orsmond, P., Merry, S. & Reiling, K. (2000). The use of student derived marking criteria in peer and self-assessment. *Assessment & Evaluation in Higher Education*, 25(1):21-38.

Osuji, U.S.A. (2012). The use of e-assessments in the Nigerian higher education system. *Turkish Online Journal of Distance Education*, 13(4):140-152.

Owino, O. (2013). *The impact of e-learning on academic performance: A case study of group learning sets*. (Masters' thesis.) University of Nairobi, Nairobi, Kenya.

Park, S.Y. (2009). An analysis of the technology acceptance model in understanding university students' behavioral intention to use e-learning. *Educational technology & Society,* 12(3):150-162.

Parkinson, G. & Drislane, R. (2011). *Qualitative research. In Online Dictionary of the Social Sciences*. http://bitbucket.icaap.org/dict.pl (Accessed on 10 February 2015).

Patton, M.Q. (2002). *Qualitative research and evaluation methods.* 3rd ed. Thousand Oaks: Sage.

Patton, M.Q. & Cochran, M. (2002). *A guide to using qualitative methodology*. 3rd ed. Thousand Oaks, CA: Sage.

Pears, A.N. (2010). Enhancing student engagement in an introductory programming course. In Frontiers in Education Conference (FIE) 2010 IEEE (pp. F1E-1). Washington, DC: IEEE. http://www.fie-conference.org/fie2010/papers/1195.pdf (Accessed on 3 October 2015).

PingSoft (2007). *Hyper Author E-examination System*. http://www.pingsoft.com.cn/english/product/haes.asp (Accessed on 3 July 2015).

Pintrich, P., Marx, R. & Boyle, R. (1993). Beyond Cold Conceptual Change: The Role of Motivational Beliefs and Classroom Contextual Factors in the Process of Conceptual Change. *Review of Educational Research,* 63(2):167-199.

Pituch, K. & Lee, Y-K. (2006). The influence of system characteristics on e-learning use. *Computers & Education*, 47:222–244.

Polit, D.F. & Beck, C.T. (2009). *Essentials of nursing research. Appraising evidence for nursing practice.* 7th ed. Tokyo: Wolter Kluwer Health / Lippencott Williams & Wilkins.

Porter, W.W., Graham, C.R., Spring, K.A. & Welch, K.R. (2014). Blended learning in higher education: Institutional adoption and implementation. *Computers & Education*, 75:185-195.

Prince, M.J. (2004). Does active learning work? *Journal of Engineering Education,* 93:223-231.

Prosser, M. & Trigwell, K. (1999). *Understanding learning and teaching: The experience in higher education.* Philadelphia, PA: Open University Press.

Quality Assurance Agency (QAA). (2012). *Understanding assessment: its role in safeguarding academic standards and quality in higher education*. http://www.qaa.ac.uk/en/ Publications/Documents/understanding-assessment.pdf (Accessed on 20 August 2015).

Quality Assurance Agency (QAA). (2014). Effective principles for student engagement. http://www.qaa.ac.uk/en/Newsroom/Documents/Effective-principles-for-student-engagement-QAA.pdf (Accessed on 20 July 2016).

Race, P. (2001). *A briefing on self-, peer and group assessment.* Assessment Series No.9: LTSN Generic Center. http://phil-race.co.uk/wp-content/uploads/Self,_peer_and_group\assessment.pdf (Accessed on 27 August 2015).

Ramsden, P. (1992). *Learning to teach in higher education*. London: Routledge.

Ramsden, P. (2003). *Learning to teach in higher education*. 2nd ed. London: Routledge.

Reeves, T. & McKenny, S. (2013). Educational Design Research. pp. 1-29.

Ribiero, T. (2002). From a distance: Look at distance learning's increased following. *Education*, 152(9):85.

Richard, H. & and Haya, A. (2009). Examining student decision to adopt web 2.0 technologies: theory and empirical tests. *Journal of Computing in Higher Education*, 21(3):183-198.

Richardson, J.T.E. (2005). Students' perceptions of academic quality and approaches to studying in distance education. *British Educational Research Journal,* 31:7-27.

Rogers, E.M. (1995). *The diffusion of innovations*. 5th ed. New York: The free Press.

Romiszowski, A. (2004). How's the E-learning Baby? Factors Leading to Success or Failure of an Educational Technology Innovation. *Educational Technology,* 44(1):5-27.

Rooksby, J., Martin, D. & Rouncefield, M. (2006). Reading as Part of Computer Programming. An Ethnomethodological. *The 18th Workshop on Psychology of Programming*, pp. 198-212.

Rowntree, D. (1987). Assessing Students − how shall we know them? London: Harper and Row.

Ryan, S. (2001). Is online learning right for you? *American Agent & Broker*, 73(6):54-58.

Sadler, R.C. (1998). Formative assessment: Revisiting the territory. *Assessment in Education,* 5(1):77-84.

Sadler-Smith, E. (2000). Modern learning methods: Rhetoric and reality. *Personnel Review*, 29(4):474-490.

Sadlo, G. & Richardson, J.T.E. (2003). Approaches to studying and perceptions of the academic environment in students following problem-based and subject-based curricula. *Higher Education Research and Development*, 22:253-274.

Saltmarsh, S. & Sutherland-Smith, W. (2010). S(t)imulating learning: Pedagogy, subjectivity and teacher education in online environments. *London Review of Education*, 8:15-24.

Samarawickrema, G. & Stacey, E. (2007). Adopting web-based learning and teaching: A case study in higher education. *Distance Education,* 28(3):313-333.

SAQA (South African Qualifications Authority). (2001). *Criteria and guidelines for assessment of NQF registered unit standards and qualifications*. http://www.saqa.org.za/docs/guide/2001/assessment.pdf (Accessed on 20 August 2015).

Scott, T. (2000). The Wired Campus. *Business Weekly*, 102.

Scottish Qualifications Authority (SQA) (2007). E-assessment: Guide to effective practice. https://www.sqa.org.uk/files_ccc/guide_to_best_practice.pdf (Accessed on 20 February 2016).

Selim, H.M. (2007). Critical success factors for e-learning acceptance: Confirmatory factor models. *Computers & Education,* 49(2):396-413.

Serwatka, J. (2002). Improving student performance in distance learning courses. *The Journal of Technological Horizons in Education*, 29(9):46-52.

Shabha, G. (2000). Virtual universities in the third millennium: An assessment of the implications of teleworking on university buildings and space planning. *Facilities*, 18(5):235-244.

Sheard, J., Morgan, M., Butler, M., Falkner, K. & Weerasinghe, A. (2015). Assessment in First-Year ICT Education in Australia: Research and Practice. *Proceedings of the 17th Australasian Computing Education Conference*, Sydney, Australia. http://crpit.com/confpapers/CRPITV160Sheard.pdf (Accessed 7 October 2015).

Shi, F. (2008). How to cultivate the ability of innovative thinking in computer programming teaching. *International education studies,* 1(1):50-53

Sim, G., Holifield, P. & Brown, M. (2004). Implementation of computer assisted assessment: lessons from the literature. *ALT−J, Research in Learning Technology*, 12(3):216-229. http://files.eric.ed.gov/fulltext/EJ821509.pdf (Accessed on 1 July 2015).

Simon, B. & Hanks, B. (2008). First-year students' impressions of pair programming in CS1. *ACM Journal on Educational Resources in Computing*, 7(5):1-28. http://www.cc.gatech.edu/conferences/icer2007/slides/simon-talk.pdf (Accessed on 3 October 2015).

Snelgrove, S. & Slater, J. (2003). Approaches to learning: Psychometric testing of a study process questionnaire. *Journal of Advanced Nursing* 43:496-505.

Sorensen, E. (2013). Implementation and student perceptions of e-assessment in a chemical engineering module. *European Journal of Engineering Education,* 38(2):172-182.

Spiller, D. (2012). Assessment matters: self-assessment and peer assessment. *Teaching development unit,* 2-18. http://www.waikato.ac.nz/tdu/pdf/booklets/9_SelfPeerAssessment.pdf (Accessed on 28 August 2015).

Stansfield, M., McLellan, E. & Connolly, T. (2004). Enhancing Student Performance in Online Learning and Traditional Face to Face Class Delivery, *Journal of Information Technology Education,* 3:173-188.

Stead, D.R. (2005). A review of the one-minute paper. *Active Learning in Higher Education,* 6(2):118-131.

Stödberg, U. (2012). A Research Review of E-Assessment. *Assessment & Evaluation in Higher Education,* 37(5):591-604.

Strydom, J.F., Basson, N. & Mentz, M. (2010). *Enhancing the quality of teaching and learning: using student engagement data to establish a culture of evidence*. South African survey of student engagement. Council on Higher Education.

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

Svensson, L. (1977). On qualitative differences in learning III – study skills and learning, *British Journal of Educational Psychology*, 47:233-243.

Swan, G. (2004). Online Assessment and Study. In *Australasian Society for Computers in Learning in Tertiary Education Conference (ASCILITE)*, Perth, Western Australia, pp. 891-894. http://files.eric.ed.gov/fulltext/EJ1000654.pdf (Accessed on 10 August 2015).

Tan, F., Nabb, L., Aagard, S. & Kim, K. (2010). International ESL Graduate Student Perceptions of Online Learning in the Context of Second Language Acquisition and Culturally Responsive Facilitation. *Adult Learning*, 21(1, 2):9-14.

Tang, C. (1991). Effects of two different assessment procedures on tertiary students' approaches to learning. Doctoral dissertation, University of Hong Kong. http://hub.hku.hk/bitstream/10722/35045/1/FullText.pdf (Accessed on 12 August 2015).

Taylor, L. & Parsons, J. (2011). Improving student engagement. *Current Issues in Education,* 14(1):1-32.

Tian, X. (2007). Do assessment methods matter? A sensitivity test. *Assessment & Evaluation in Higher Education* 32:387-401.

Tight, M. (2012). *Researching Higher Education.* 2nd ed. Berkshire, UK: Society for Research into Higher Education & Open University Press.

Tinoca, L. (2012). Promoting e-assessment quality in higher education: a case study in online professional development. *ICICTE 2012 proceedings,* 213-223. http://www.icicte.org/ Proceedings2012/Papers/06-1-Tinoca.pdf (Accessed 20 August 2015).

Trigwell, K. & Prosser, M. (1991). Improving the quality of student learning: The influence of learning context and student approaches to learning on learning outcomes. *Higher Education,* 22:251-266.

Trowler, V. (2010). Student engagement literature review. *The Higher Education Academy.* Lancaster University.

Umbach, P.D. & Wawrzynski, M.R. (2005). Faculty Do Matter: The Role of College Faculty in Student Learning and Engagement. *Research in Higher Education*, 46(2):153-184.

Van Tonder, S.P., Wilkinson, A.C. & Van Schoor, J.H. (2005). Patchwork text: Innovative assessment to address the diverse needs of postgraduate learners at the African University of the 21st century. *South African Journal of Higher Education,* 19 (Special Issue):1282-1305.

Van Wyk, B. (2012). "*Research design and methods part 1*". University of Western Cape. https://www.uwc.ac.za/Students/Postgraduate/Documents/Research_and_Design_I.pdf (Accessed on 11 March 2016).

Volery, T. (2000). Critical success factors in online education. *The International Journal of Educational Management,* 14(5):216-223.

Wagner, N., Hassanein, K. & Head, M. (2008). Who is responsible for e-learning success in higher education? A stakeholders' analysis. *Educational Technology & Society,* 11(3):26-36.

Walker, D.J., Topping, K. & Rodrigues S. (2008). Student reflections on formative e-assessment: expectations and perceptions. *Learning, Media and Technology,* 33(3):221-234.

Walker, P. (2005). Book review. John Biggs 2003. Teaching for quality learning at university, 2nd ed. *Higher Education,* 49:535-537.

Wallace, P.E. & Clariana, R.B. (2000). Achievement predictors for a computer-applications module delivered via the world-wide web. *Journal of Information System Education,* 11(1):13-18.

Webb, G. (1997a). Deconstructing deep and surface: Towards a critique of phenomenography. *Higher Education*, 33(2):195-212.

Welsh, E.T., Wanberg, C.R., Brown, K.G. & Simmering, M.J. (2003). E-learning: emerging uses, empirical results and future directions. *International Journal of Training and Development*, 200(7):245-258.

Werner, L., McDowell, C. & Hanks, B. (2004). *Retaining women in computer science: The impact of pair programming*. Project update ITWF/ITR workforce PI's meeting. https://users.soe.ucsc.edu/~charlie/pubs/nsf_summary_nov_2004.pdf (Accessed on 30 September 2015).

West, L. & Bogumil, W. (2001). Immigration and the global IT work force. *Communications of the ACM,* 44(7):34-38.

Wiedenbeck, D.L. & Kain, V. (2004). Factors affecting course outcomes in introductory programming. *The 16th Workshop on Psychology of Programming*, pp. 97-109.

Willis, B. (1993). *Instructional Development for Distance Learning: ERIC Digest.* http://ericae.net/db/edo/ED351007.htm (Accessed on 25 July 2015).

Wilson, B. (2002). A study of factors promoting success in computer science including gender differences. *Computer science education,* 12(1-2):141-164. http://citeseerx.ist. psu.edu/viewdoc/download?doi=10.1.1.91.1477&rep=rep1&type=pdf (Accessed on 27 October 2015).

Wilson, G. (2001). The promise of online education: El Dorado or Fool's Gold? *The Educational Technology Journal*, 11(1):1-8.

Windham, C. (2005). The Student's Perspective. In Oblinger, D. & Oblinger, J. (eds). *Educating the Net generation,* 5.1-5.16. Boulder, CO: EDUCAUSE. http://www.educause. edu/educatingthenetgen (Accessed on 20 May 2015).

Winkley, J. (2010). *E-assessment and innovation.* A Becta report. http://www.becta.org.uk/ (Accessed on 5 July 2015).

Winter, G. (2000). A comparative discussion of the notion of 'validity' in qualitative and quantitative research. *The Qualitative Report,* 4(3/4). http://www.nova.edu/ssss/QR/QR4-3/winter.html (Accessed on 10 December 2016).

Yalcin, S.A., Yalcin, S., Sagirli, M.O. & Koc, A. (2011). The usage of instructional technologies by lecturers (examples of Erzincan). *Procedia – Social and Behavioural Sciences,* 28:435-438.

Yin, R.K. (2009). *Case study research: design and methods.* 4th ed. Thousand Oaks: Sage.

Yorke, M. (2001). Formative assessment and its relevance to retention. *Higher Education Research and Development,* 20(2):115-126.

Yorke, M. (2003). Formative assessment in higher education: moves towards theory and the enhancement of pedagogic practice. *Higher Education*, 45:477-501.

Yorke, M. (2005). Formative assessment in higher education: Its significance for employability, and steps towards its enhancement. *Tertiary Education and Management*, 11(3):219-238.

Yorke, M. & Knight, P. (2006). *Learning & employability: embedding employability into the curriculum*. The higher education, series one. https://www.heacademy.ac.uk/sites/default/files/id116_employability_in_higher_education_336.pdf (Accessed on 7 August 2015).

Zeegers, P. (2001). Approaches to learning in science: A longitudinal study. *British Journal of Educational Psychology* 71:115-32.

Zeitoun, H. (2008). *E-learning: Concept, Issues, Application, Evaluation.* Riyadh: Dar Alsolateah Publication.

Zengin, B., Arikan, A. & Dogan, D. (2011). Opinions of English Major Students about Their Departments' Websites. *Contemporary Educational Technology*, 2(4):294-307.

Zhang, D., Zhao, J., Zhou, L. & Nunamaker, J. (2004). Can e-learning replace classroom learning? *Communications of the ACM*, 47(5):75-79.

Zhang, L.F. & Sternberg, R.J. (2000). Are learning approaches and thinking styles related? A study in two Chinese populations. *Journal of Educational Psychology,* 134:469-489.

Zhang, Y. & Bhattacharyya, S. (2007). Effectiveness of Q-learning as a tool for calibrating agent-based supply network models. *Enterprise Information Systems*, 1(2):217-233.

APPENDICES

APPENDIX A:

LETTERS OF APPROVAL

APPENDIX A1:

ETHICAL CLEARANCE: UNIVERSITY OF THE FREE STATE

UNIVERSITY OF THE FREE STATE
UNIVERSITEIT VAN DIE VRYSTAAT
YUNIVESITHI YA FREISTATA
UFS·UV EDUCATION OPVOEDKUNDE

Faculty of Education
Ethics Office

2016-04-18

ETHICAL CLEARANCE APPLICATION:

A framework for the implementation of e-assessment in teaching and learning at a private higher education institution

Dear Mr Appiah

With reference to your application for ethical clearance with the Faculty of Education, I am pleased to inform you on behalf of the Ethics Board of the faculty that you have been granted ethical clearance for your research.

Your ethical clearance number, to be used in all correspondence, is:

UFS-EDU-2015-001

This ethical clearance number is valid for research conducted for one year from issuance. Should you require more time to complete this research, please apply for an extension in writing.

We request that any changes that may take place during the course of your research project be submitted in writing to the ethics office to ensure we are kept up to date with your progress and any ethical implications that may arise.

Thank you for submitting this proposal for ethical clearance and we wish you every success with your research.

Yours sincerely,

Duvenhage

Christa Duvenhage
Faculty Ethics Officer

APPENDIX A2:

ETHICAL CLEARANCE: CTI

Proposal Defended?	YES X	NO	N/A	Fieldwork Started?	YES	NO X	Pilot study/Fieldwork concluded?	YES	NO X

APPLICANT:

Date: 19/04/2016

Name: MARTIN KORANTENG APPIAH

Signature: [signature]

Approval Ethics Committee (for office use only)

☑ Yes   Clearance number: 2/2016 MA

☐ No

Reasons/Notes: UOFS cleared topic CTI clearance for survey of students and staff as indicated

Name (and position) : P R Dietrichsen Chair: Research Committee

Signature:

Date: 6 May 2016

APPENDIX B:

EXAMPLES OF QUESTIONNAIRES USED IN THE STUDY

APPENDIX B1.1:

E-MAIL INVITATION TO PARTICIPATE IN THE PILOT SURVEY: IT LECTURERS AND IT STUDENTS PARTICIPANTS

Dear Participant,

INVITATION TO PARTICIPATE IN A RESEARCH STUDY / INFORMED CONSENT (PLEASE NOTE THAT YOU ARE SURVEYED AS PART OF PRIVATE ACADEMIC RESEARCH FOR POST-GRADUATE QUALIFICATIONS)

My name is Martin Appiah and I am a lecturer from the Vaal University of Technology. My work telephone number is +27 (0)61 950 9792 and my e-mail address is martina@vut.ac.za.

I am inviting you to participate in a study which involves research into the implementation of e-assessment in the teaching and learning of Information Technology (IT) as a subject at CTI. For this purpose, students' and lecturers' experiences and perceptions of the implementation of e-assessment in the teaching and learning of IT at CTI will be investigated by means of online questionnaires. The ultimate aim of this research is to compile a framework for the effective implementation of e-assessment in the teaching and learning of IT as a subject at CTI. This study therefore aims at optimally benefiting students' learning and lecturers' teaching of IT through the use of e-assessment.

As a participant, your participation in this study must be voluntary. For this reason you will be allowed to withdraw from the study at any time without incurring any penalties, losses or consequences.

If you decide to participate, you will be required to complete an online questionnaire with mainly open-ended questions. In the questionnaire, you will, inter alia, be required to provide informed consent to participate in the survey by selecting a particular button which serves as a confirmation that you have read all the information provided and agree to participate.

Please not that this is only a pilot survey questionnaire. I would therefore be grateful if you can provide me with feedback concerning the questions you did not understand as well as any general comments you have about the questionnaire in order for me to improve on them. **I have also attached a WORD document feedback sheet where you can type in your feedback/comments/recommendations.**

Please, by clicking on the link below, you will be taken to the page where you can start answering the questions:

[LINK]

Thank you.

APPENDIX B1.2:

EXAMPLE OF THE PILOT SURVEY QUESTIONNAIRES: IT LECTURERS PARTICIPANTS

ONLINE QUESTIONNAIRE FOR IT LECTURERS OF THE CTI EDUCATION GROUP

Please note that you are surveyed as part of PRIVATE ACADEMIC RESEARCH FOR THE PURPOSE OF A POST-GRADUATE QUALIFICATION THE RESEARCHER IS ENROLLED FOR.

Dear colleague,

I would like to thank you for taking the time to participate in this research survey. The ultimate aim of this research is to investigate how CTI lecturers could best implement e-assessment in their teaching and learning of Information Technology (IT).

Below is a list of open ended questions that I would like you to respond to. You may decide to answer all questions or only those that relate to your own experiences. You may also rest assured that your responses will be kept completely confidential. Therefore, please do not mention your name or the name of any other lecturer or student in any of your answers.

(Note: Keeping all participants anonymous is intended to maintain the confidentiality around the identity of the participants and their respective responses in this research study.)

The expected duration for completing this questionnaire is between 30 and 45 minutes.

INFORMED CONSENT

Please consider the following statement and indicate whether or not you agree with the statement by clicking on the radio button next to your choice:

1. I HAVE READ AND UNDERSTOOD THE INFORMATION PROVIDED IN THE E-MAIL MESSAGE WITH THE LINK TO THIS QUESTIONNAIRE AND THEREFORE GIVE MY CONSENT THAT MY ANSWERS MAY BE USED FOR DATA COLLECTION, ANALYSIS AND REPORTING PURPOSES UNDER THE CONDITIONS SET OUT IN THE E-MAIL MESSAGE WITH THE LINK TO THIS QUESTIONNAIRE.

(To indicate your choice, click on the radio button next to your choice):

	Yes
	No

If **'NO'** is selected the participant will be taken to the end of the questionnaire

2. ARE YOU AN INFORMATION TECHNOLOGY (IT) LECTURER AT CTI?

To indicate your choice, click on the radio button next to your choice:

	Yes
	No

If **'NO'** is selected the participant will be taken to the end of the questionnaire

<u>DEMOGRAPHIC INFORMATION</u>

To indicate your choice, click on the radio button next to your choice:

3. Please indicate your gender:

	Male
	Female

<u>QUESTIONS PERTAINING TO YOUR OWN ASSESSMENT PRACTICES IN THE TEACHING OF INFORMATION TECHNOLOGY (IT) AT CTI</u>

Please type your answer to each of the open-ended questions in the text box provided for this purpose below each question.

Note: If you want to obtain an explanation of the meaning of any term used in this questionnaire, please consult the **glossary of terms.** The 'back' and 'next' buttons at the bottom of each section page in this questionnaire will allow you to move to and through the different section pages. In this way you will be able to consult the glossary whenever you feel the need to.

4. Nowadays students are assessed through paper-based and/or e-assessment tasks:

4.1 How often do you assess your IT students through *paper-based assessment tasks*?

(Please explain your answer, and indicate *why* you say so?)

4.2 How often do you assess your IT students through *e-assessment tasks* (i.e. assessment tasks on *myLMS*)?

(Please explain your answer, and indicate *why* you say so?)

5. Please explain your experience and perception pertaining to the value of e-assessment for the teaching and learning of IT as a discipline/subject?

(Please explain your answer, and indicate *why* you say so?)

6. As far as your own experience in the teaching and learning of IT as a subject/discipline is concerned, please indicate:

6.1 How long, and at what levels, have you been teaching IT?

(Please explain your answer?)

6.2 How has the way you assess your IT students, changed and/or improved over the years?

(Please explain your answer, and indicate *why* you say so?)

7. Which of the following forms of assessment do you use to assess your IT students? Also indicate *why* and *when* you use (or don't use) them?

7.1 Diagnostic assessment

7.2 Formative assessment

7.3 Summative assessment

7.4 Self-assessment, and peer assessment

8 As far as the assessment tasks that you usually let your IT students do are concerned, please elaborate on the following:

8.1 *What* assessment tasks do you use to assess your students, *why* do you use them, and *how often* do you let them do these tasks?

(Please explain your answer?)

8.2 In your opinion, what do you like and/or dislike about using *myLMS* in assessing IT students?

(Please explain your answer, and indicate *why* you say so?)

9 As far as setting deadlines and time limits for assessment are concerned, please indicate:

9.1 What is your opinion and/or experience about setting deadlines for the submission of assessment tasks in IT?

(Please explain your answer, and indicate *why* you say so?)

9.2 What is your opinion and/or experience about setting time limits for the completion of assessment tasks in IT? (e.g. a 1 hour test or a 3 hour exam paper).

(Please explain your answer, and indicate *why* you say so?)

10 What is your opinion and/or experience about the relation between your IT students' marks/grades and how and what they have learned?

(Please explain your answer, and indicate *why* you say so?)

11 What is your opinion and/or experience about informing IT students in advance of the content that they will be assessed on?

(Please explain your answer, and indicate *why* you say so?)

12 What is your opinion and/or experience about informing IT students in advance of the assessment criteria that they will be assessed on?

(Please explain your answer, and indicate *why* you say so?)

13 As far as providing feedback to students about their assessment is concerned, please indicate:

13.1 What is your opinion and/or experience of providing feedback to your IT students about assessment tasks they have performed?

(Please explain your answer, and indicate *why* you say so?)

13.2 What is your opinion and/or experience of the possible effect that the feedback you provide might have (or not have) on your IT students' performance in their assessment tasks?

(Please explain your answer, and indicate *why* you say so?)

14 To what extent do you think the *e-assessment* tasks that you let IT students do (if any), are fair?

(Please explain your answer, and indicate *why* you say so?)

15 To what extent do you think the *e-assessment* tasks that you let IT students do (if any), are practicable/feasible?

(Please explain your answer, and indicate *why* you say so?)

16 To what extent do you think the *e-assessment* tasks that you let IT students do (if any), are reliable?

Please explain your answer, and indicate *why* you say so?

17 To what extent do you think the *e-assessment* tasks that you let IT students do (if any), are valid?

(Please explain your answer, and indicate *why* you say so?)

18 What do you use your IT students' assessment results for?

(Please explain your answer, and indicate *why* you say so?)

19 How would you describe "quality e-assessment"?

(Please explain *why* you would describe it in this way?)

20 To what extent, and why, do you think (or disagree) that it is necessary for lecturers to have prior experience of and knowledge about student assessment before they try to implement e-assessment in their teaching of IT?

(Please explain your opinion, and indicate *why* you say so?)

21 Has *e-assessment* enhanced your teaching in any way? If it did (or did not),:

21.1 Indicate how and why e-assessment enhanced (or did not enhance) your teaching?

(Please explain your answer, including *why* you say so?)

21.2 Also indicate to what extent you would recommend (or not recommend) *e-assessment* in the teaching and learning of IT?

(Please explain your answer, including *why* you say so?)

22 What suggestions and recommendations can you give to other lecturers pertaining to how to assess their students through using computer/network technology (i.e. through *e-assessment*)?

(Please explain your answer, and indicate *why* you say so?)

END OF THE QUESTIONNAIRE

THANK YOU FOR TAKING THE TIME TO COMPLETE THIS QUESTIONNAIRE. YOUR INPUTS ARE HIGHLY APPRECIATED.

APPENDIX B1.3:

EXAMPLE OF THE PILOT SURVEY QUESTIONNAIRES: IT STUDENTS PARTICIPANTS

ONLINE QUESTIONNAIRE FOR IT STUDENTS OF THE CTI EDUCATION GROUP

Please note that you are surveyed as part of PRIVATE ACADEMIC RESEARCH FOR THE PURPOSE OF A POST-GRADUATE QUALIFICATION THE RESEARCHER IS ENROLLED FOR

Dear CTI IT student

I would like to thank you for taking the time to participate in this research survey. The ultimate aim of this survey is to investigate how CTI lecturers could best implement e-assessment in their teaching and learning of Information Technology (IT) so that it could ultimately enhance IT students' learning at CTI.

Below is a list of questions that I would like you to respond to. You may decide to answer all questions or only those that relate to your own experiences. You may also rest assured that your responses will be kept completely confidential. Therefore, please do not mention your name or the name of any other lecturer or student in any of your answers.

(Note: Keeping all participants anonymous is intended to maintain the confidentiality around the identity of the participants and their respective responses in this research study.)

The duration for completing this questionnaire is expected to be between 30 and 45 minutes.

INFORMED CONSENT

Please consider the following statement and indicate whether or not you agree with the statement by clicking on the radio button next to your choice:

1 I HAVE READ AND UNDERSTOOD THE INFORMATION PROVIDED IN THE E-MAIL MESSAGE WITH THE LINK TO THIS QUESTIONNAIRE AND THEREFORE GIVE MY CONSENT THAT MY ANSWERS MAY BE USED FOR DATA COLLECTION, ANALYSIS AND REPORTING PURPOSES UNDER THE CONDITIONS SET OUT IN THE E-MAIL MESSAGE WITH THE LINK TO THIS QUESTIONNAIRE.

(To indicate your choice, click on the radio button next to your choice):

	Yes
	No

If **'NO'** is selected the participant will be taken to the end of the questionnaire

2 ARE YOU AT LEAST EIGHTEEN (18) YEARS OLD?

To indicate your choice, click on the radio button next to your choice.

	Yes
	No

If **'NO'** is selected the participant will be taken to the end of the questionnaire

3 ARE YOU AN INFORMATION TECHNOLOGY (IT) STUDENT AT CTI?

To indicate your choice, click on the radio button next to your choice.

	Yes
	No

If **'NO'** is selected the participant will be taken to the end of the questionnaire

<u>DEMOGRAPHIC INFORMATION</u>

To indicate your choice, click on the radio button next to your choice.

4 Please indicate your gender:

	Male
	Female

5 Please indicate your home language:

	Afrikaans		Sotho		Tsonga
	English		Xhosa		Tswana
	Ndebele		Swati		Pedi
	Venda		Zulu		
	Other (please specify):	Space to type answer:			

6 Please indicate your age:

	Younger than 18		48-53
	18-23		54-59
	24-29		60-65
	30-35		Older than 65
	36-41		
	42-47		

If **'Younger than 18 years'** is selected the participant will be taken to the end of the questionnaire.

<u>QUESTIONS PERTAINING TO YOUR OWN EXPERIENCES OF THE WAY IN WHICH YOU ARE ASSESSED IN INFORMATION TECHNOLOGY (IT) AT CTI</u>

Please type your answer to each of the open-ended questions below in the text box provided for this purpose below the question.

Note: If you want to obtain an explanation of the meaning of any term used in this questionnaire, <u>please consult the **glossary of terms**</u>**.** The 'back' and 'next' buttons at the bottom of each section page in this questionnaire will allow you to move to and through the different section pages. In this way you will be able to consult the glossary whenever you feel the need to.

7. Please *elaborate on your general experiences of assessment in the IT modules* that you are enrolled for at CTI by answering the following questions:

    7.1 *Why* do you think, do your IT lecturers need to assess you? (Please explain your answer?)

    7.2 *When, how and how often* are you assessed (i.e. through *paper-based assessment* and on *myLMS*)?

    7.3 To what extent do you think your knowledge of *what* you will be assessed on, would influence your own learning and performance or not? (Please explain your answer, including *why* you say so?)

    7.4 To what extent do you think your knowledge of *how* you will be assessed, would influence your own learning and performance or not? (Please explain your answer, including *why* you say so?)

8 Consider how you experience and/or feel about the different *forms of assessment in IT modules* by answering the following questions:

    8.1 How do you experience and/or feel about assessment tasks that carry marks (e.g. tests, assignments, examination, etc.).

    (Please explain your answer, including *why* you say so?)

8.2 How do you experience and/or feel about assessment tasks or activities that do not carry any marks (e.g. class tests, class assignments, etc., if any).

(Please explain your answer, including *why* you say so?)

8.3 How do you experience and/or feel about *peer assessment* tasks (i.e. having to assess your peers, if any).

(Please explain your answer, including *why* you say so?)

8.4 How do you experience and/or feel about *self-assessment* tasks (i.e. having to assess yourself, if any?).

(Please explain your answer, including *why* you say so?)

8.5 Which of the above-mentioned forms of assessment (see 8.1 to 8.4) do you prefer?

(Please explain your answer, including *why* you say so?)

9 Consider the different *types of assessment tasks* (e.g. tests, exams, assignments, etc.) *in the IT modules* you are enrolled for and then elaborate on the following issues in this regard:

9.1 *What types of assessment tasks* (e.g. tests, exams, assignments, etc.) do you have to do *in IT modules*, and *how do you experience and/or feel about* each of these types of task?

(Please explain your answer, including *why* you say so?)

9.2 Do you get the *instructions for* these assessment tasks in printed format (e.g. in a study guide, etc.), <u>or</u> do you get these on *myLMS*?

(Please explain your answer, including *why* you say so?)

9.3 *To what extent do* you believe does each of these types of assessment tasks *test your knowledge of, as well as your skills in IT*?

(Please explain your answer, including *why* you say so?)

10 The following questions relate to types of *questions* in assessment tasks:

10.1 How do you experience and/or feel about *short answer questions* (e.g. true/false questions and multiple choice questions, etc.) that you have to answer *in IT assessment tasks* (if any)?

(Please explain your answer, including *why* you say so?)

10.2 Please explain *whether these* short answer questions in any way *test your level of understanding* of what you learn in the IT modules you are enrolled for?

(Please explain your answer, including *why* you say so?)

11 The following two questions refer to your knowledge about *what* will be assessed and *how* it will be done:

11.1 To what extent do *your IT lecturers inform you in advance about <u>what content</u>* you will be assessed on?

(Please explain your answer, including *why* you say so?)

11.2 To what extent do *your IT lecturers inform you in advance about how you will be assessed* (e.g. the types of questions that will be asked and/or the criteria according to which you will be assessed)?

(Please explain your answer, including *why* you say so?)

11.3 *<u>What</u> information* do your IT lecturers provide you with in advance (if any) and *<u>how</u>* they do it?

(Please explain your answer, including *why* you say so?)

12 Consider *different types of feedback* you might get *on your performance in the IT assessment tasks* you have to do, and then elaborate on the following:

12.1 To what extent *do you get feedback* (if any) from your IT lecturers and/or via the *myLMS* system (as applicable), on your performance in assessment tasks?
(Please explain your answer, including *why* you say so?)

12.2 *What type of feedback* (if any) do you get on your performance from your IT lecturers and/or via the *myLMS* system (as applicable), and how is the feedback given?
(Please explain your answer, including *why* you say so?)

12.3 *How does the feedback* you receive from your IT lecturers and/or on the *myLMS* system (as applicable), *relate to how you learn afterwards*?
(Please explain your answer, including *why* you say so?)

13 Consider the different *e-assessment tasks* (i.e. those tasks that you have to access on *myLMS*), *that you have to do in IT Modules* (if any), and then elaborate on the following:

13.1 To what extent would you say, are *the e-assessment tasks* that you have to do in IT modules, are *fair*? (Note: In this context "fair" means that an e-assessment task does not advantage any students above others).

(Please explain your answer, including *why* you say so?)

13.2 Which of the *e-assessment tasks* (if any) you have to do in IT, are *fair/not fair*, and *why, or why not*?
(Please explain your answer clearly?)

14 To what extent do the *e-assessment tasks* (if any) that you have to do in *IT modules* you are enrolled for, *test the content* that has been covered in the relevant IT modules?
(Please explain your answer, including *why* you say so?

15 Consider the various *e-assessment tasks* (if any) <u>and</u> the *conventional paper-based assessment tasks* (if any) that you have to do *in IT modules*, and then elaborate on the following:

15.1 *How do the marks* that you obtain for the various *e-assessment tasks* (if any), *<u>compare</u> with* one another?
(Please explain your answer, including *why* you say so?)

15.2 *How do the marks* that you obtain for the various *e-assessment tasks* (if any), *<u>compare</u> with the marks* you obtain for *conventional paper-based assessment tasks* (i.e. tasks that are <u>not</u> on *myLMS*; if any)?
(Please explain your answer, including *why* you say so?)

15.3 Please *refer to examples of* the *e-assessment tasks* <u>and</u> *paper-based assessment tasks* (as applicable) that you are required to do *in IT modules*?
(Please explain your answer, including *why* you say so?)

16 To what extent do you experience any *problems with* the *e-assessment tasks* that you have to do *in IT modules* (if any)?
(Please explain your answer, including *why* you think these problems occur (if any)?)

17 To what extent do you think, might *e-assessment tasks in IT modules* (if any), *add value to* (or *<u>not</u> add value to*) your own learning?
(Please explain your answer, including *what* value it might/might not add to your own learning, and *why* you say so?)

18 *What types of assessment tasks* do you think *can help most in* *<u>improving</u>* *your own learning*?

(Please explain your answer, including *why* you say so?)

19 *To what extent* do you think, *should e-assessment be used (or not used*) in the teaching and learning of IT?

(Please explain your answer, including *why* you say so?)

END OF THE QUESTIONNAIRE

THANK YOU FOR YOUR PARTICIPATION

APPENDIX B2.1:

E-MAIL INVITATION TO PARTICIPATE IN THE SURVEY QUESTIONNAIRES: IT LECTURERS AND IT STUDENTS PARTICIPANTS

Dear Participant,

INVITATION TO PARTICIPATE IN A RESEARCH STUDY / INFORMED CONSENT (PLEASE NOTE THAT YOU ARE SURVEYED AS PART OF PRIVATE ACADEMIC RESEARCH FOR POST-GRADUATE QUALIFICATIONS)

My name is Martin Appiah and I am a lecturer from the Vaal University of Technology. My work telephone number is +27 (0)61 950 9792 and my e-mail address is martina@vut.ac.za.

I am inviting you to participate in a study which involves research into the implementation of e-assessment in the teaching and learning of Information Technology (IT) as a subject at CTI. For this purpose, students' and lecturers' experiences and perceptions of the implementation of e-assessment in the teaching and learning of IT at CTI will be investigated by means of online questionnaires. The ultimate aim of this research is to compile a framework for the effective implementation of e-assessment in the teaching and learning of IT as a subject at CTI. This study therefore aims at optimally benefiting students' learning and lecturers' teaching of IT through the use of e-assessment.

As a participant, your participation in this study must be voluntary. For this reason you will be allowed to withdraw from the study at any time without incurring any penalties, losses or consequences.

If you decide to participate, you will be required to complete an online questionnaire with mainly open-ended questions. In the questionnaire, you will, inter alia, be required to provide informed consent to participate in the survey by selecting a particular button which serves as a confirmation that you have read all the information provided and agree to participate.

Please, by clicking on the link below, you will be taken to the page where you can start answering the questions: [LINK]

Thank you.

APPENDIX B2.2:

EXAMPLE OF THE SURVEY QUESTIONNAIRES: IT LECTURERS PARTICIPANTS

ONLINE QUESTIONNAIRE FOR IT LECTURERS OF THE CTI EDUCATION GROUP

Please note that you are surveyed as part of PRIVATE ACADEMIC RESEARCH FOR THE PURPOSE OF A POST-GRADUATE QUALIFICATION THE RESEARCHER IS ENROLLED FOR.

Dear colleague,

I would like to thank you for taking the time to participate in this research survey. The ultimate aim of this research is to investigate how CTI lecturers could best implement e-assessment in their teaching and learning of Information Technology (IT).

Below is a list of open ended questions that I would like you to respond to. You may decide to answer all questions or only those that relate to your own experiences. You may also rest assured that your responses will be kept completely confidential. Therefore, please do not mention your name or the name of any other lecturer or student in any of your answers.

(Note: Keeping all participants anonymous is intended to maintain the confidentiality around the identity of the participants and their respective responses in this research study.)

The expected duration for completing this questionnaire is between 30 and 45 minutes.

INFORMED CONSENT

Please consider the following statement and indicate whether or not you agree with the statement by clicking on the radio button next to your choice:

1 I HAVE READ AND UNDERSTOOD THE INFORMATION PROVIDED IN THE E-MAIL MESSAGE WITH THE LINK TO THIS QUESTIONNAIRE AND THEREFORE GIVE MY CONSENT THAT MY ANSWERS MAY BE USED FOR DATA COLLECTION, ANALYSIS AND REPORTING PURPOSES UNDER THE CONDITIONS SET OUT IN THE E-MAIL MESSAGE WITH THE LINK TO THIS QUESTIONNAIRE.

(To indicate your choice, click on the radio button next to your choice):

	Yes
	No

If **'NO'** is selected the participant will be taken to the end of the questionnaire

2 ARE YOU AN INFORMATION TECHNOLOGY (IT) LECTURER AT CTI?

To indicate your choice, click on the radio button next to your choice:

	Yes
	No

If **'NO'** is selected the participant will be taken to the end of the questionnaire

<u>DEMOGRAPHIC INFORMATION</u>

To indicate your choice, click on the radio button next to your choice:

3 Please indicate your gender:

	Male
	Female

<u>QUESTIONS PERTAINING TO YOUR OWN ASSESSMENT PRACTICES IN THE TEACHING OF INFORMATION TECHNOLOGY (IT) AT CTI</u>

Please type your answer to each of the open-ended questions in the text box provided for this purpose below each question.

Note: If you want to obtain an explanation of the meaning of any term used in this questionnaire, <u>please consult the **glossary of terms.**</u> The 'back' and 'next' buttons at the bottom of each section page in this questionnaire will allow you to move to and through between the different section pages. In this way you will be able to consult the glossary whenever you feel the need to.

4 Nowadays students are assessed through paper-based and/or e-assessment tasks:

4.1 How often do you assess your IT students through *paper-based assessment tasks*?
(Please explain your answer, and indicate *why* you say so?)

4.2 How often do you assess your IT students through *e-assessment tasks* (i.e. assessment tasks on *myLMS*)?
(Please explain your answer, and indicate *why* you say so?)

5 Please explain your experience and perception pertaining to the value of e-assessment for the teaching and learning of IT as a discipline/subject?
(Please explain your answer, and indicate *why* you say so?)

6 As far as your own experience in the teaching and learning of IT as a subject/discipline is concerned, please indicate:

6.1 How long, and at what levels, have you been teaching IT?
(Please explain your answer?)

6.2 How has the way you assess your IT students, changed and/or improved over the years?
(Please explain your answer, and indicate *why* you say so?)

7 Which of the following forms of assessment do you use to assess your IT students? Also indicate *why* and *when* you use (or don't use) them?

7.1 Diagnostic assessment

7.2 Formative assessment

7.3 Summative assessment

7.4 Self-assessment, and peer assessment

8 As far as the assessment tasks that you usually let your IT students do are concerned, please elaborate on the following:

8.1 *What* assessment tasks do you use to assess your students, *why* do you use them, and *how often* do you let them do these tasks?

(Please explain your answer?)

8.2 In your opinion, what do you like and/or dislike about using *myLMS* in assessing IT students?

(Please explain your answer, and indicate *why* you say so?)

9 As far as setting deadlines and time limits for assessment are concerned, please indicate:

9.1 What is your opinion and/or experience about setting deadlines for the submission of assessment tasks in IT?

(Please explain your answer, and indicate *why* you say so?)

9.2 What is your opinion and/or experience about setting time limits for the completion of assessment tasks in IT? (e.g. a 1 hour test or a 3 hour exam paper).

(Please explain your answer, and indicate *why* you say so?)

10 What is your opinion and/or experience about the relation between your IT students' marks and how and what they have learned?

(Please explain your answer, and indicate *why* you say so?)

11 What is your opinion and/or experience about informing IT students in advance of the content that they will be assessed on?

(Please explain your answer, and indicate *why* you say so?)

12 What is your opinion and/or experience about informing IT students in advance of the assessment criteria that they will be assessed on?

(Please explain your answer, and indicate *why* you say so?)

13 As far as providing feedback to students about their assessment is concerned, please indicate:

13.1 What is your opinion and/or experience of providing feedback to your IT students about assessment tasks they have performed?
(Please explain your answer, and indicate *why* you say so?)

13.2 What is your opinion and/or experience of the possible effect that the feedback you provide might have (or not have) on your IT students' performance in their assessment tasks?
(Please explain your answer, and indicate *why* you say so?)

14 To what extent do you think the *e-assessment* tasks that you let IT students do (if any), are fair?
(Please explain your answer, and indicate *why* you say so?)

15 To what extent do you think the *e-assessment* tasks that you let IT students do (if any), are practicable/feasible?
(Please explain your answer, and indicate *why* you say so?)

16 To what extent do you think the *e-assessment* tasks that you let IT students do (if any), are reliable?
(Please explain your answer, and indicate *why* you say so?)

17 To what extent do you think the *e-assessment* tasks that you let IT students do (if any), are valid?
(Please explain your answer, and indicate *why* you say so?)

18 What do you use your IT students' assessment results for?

(Please explain your answer, and indicate *why* you say so?)

19 How would you describe "quality e-assessment"?

(Please explain *why* you would describe it in this way?)

20 To what extent, and why, do you think (or disagree) that it is necessary for lecturers to have prior experience of and knowledge about student assessment before they try to implement e-assessment in their teaching of IT?

(Please explain your opinion, and indicate *why* you say so?)

21 Has *e-assessment* enhanced your teaching in any way? If it did (or did not),:

21.1 Indicate how and why e-assessment enhanced (or did not enhance) your teaching?

(Please explain your answer, including *why* you say so?)

21.2 Also indicate to what extent you would recommend (or not recommend) *e-assessment* in the teaching and learning of IT?

(Please explain your answer, including *why* you say so?)

22 What suggestions and recommendations can you give to other lecturers pertaining to how to assess their students through using computer/network technology (i.e. through *e-assessment*)?

(Please explain your answer, and indicate *why* you say so?)

END OF THE QUESTIONNAIRE

THANK YOU FOR TAKING THE TIME TO COMPLETE THIS QUESTIONNAIRE. YOUR INPUTS ARE HIGHLY APPRECIATED.

GLOSSARY OF TERMS USED IN THIS QUESTIONNAIRE

For clarity purposes, below are short explanations of some terms used in the questionnaire.

E-assessment involves the use of any information and communications technological (i.e. ICT) devices to create, deliver, store and/or report students' assessment products, marks and to provide feedback on the students' responses. Examples of devices that can be used to create and implement e-assessment tasks include laptops, desktop computers, smart phones, iPads, Android tablets, etc. In the context of this study, e-assessment involves the posting of assessment tasks on CTI's online learning management system (known as myLMS), and the students' online completion of these tasks, the marking of these tasks, the storage of their responses and the reporting of their performance via the myLMS system.

Diagnostic assessment, is carried out to determine what students know and what they can do, to identify their strengths, weaknesses, skills, and knowledge. This form of assessment enables lecturers to plan instructions that will build on students' strengths and also meet their weaknesses. That is, it allows the lecturer to make informed decisions regarding where to spend more time and effort in their teaching. Diagnostic assessment may take place at the beginning of a semester or a unit/chapter of study.

Formative assessment (i.e. assessment for learning), is planned and performed by lecturers to identify the capabilities (i.e. the strengths and weaknesses) of their students. Information (e.g. evidence) that the lecturers gather from the students may be used by him/her to provide constructive feedback for students on where they erred and what they did well, which may in turn help the students to improve their learning. This means that formative assessment focuses on improvement in student learning rather than a student achieving a higher grade/mark.

Summative assessment (i.e. assessment of learning), refers to approaches or strategies created to verify students' knowledge, skills and attitudes at a particular point in time and determine whether or not they have met the course's learning outcomes. In other words, summative assessment is used to assess, verify, and indicate students' level of learning after a particular learning period. The grades or marks that are awarded to students are based on the validity and authenticity of the students' work.

Module, is a programme or course that is, together with other modules, a building block of a whole qualification as offered by higher education institutions.

Information Technology (IT) refers to the subject or discipline that is taught at CTI and involves study and application of computer technology (i.e. the entire programme that you are teaching to your IT students).

Learning Management System (LMS) refers to a software tool that is used by lecturers for managing, monitoring and creating teaching and learning activities for their students.

MyLMS is CTI's LMS platform (see above) that is used by lecturers to create, monitor and manage online learning and assessment activities for their students.

Fair means that the assessment task should not favour some students over other students (i.e. it should not be biased).

Valid means that the assessment task only covers the content and skills that have been taught and/or learned by the students.

Reliable means that one is very certain that, should the same assessment task be given to a similar group of students in similar circumstances, their performance should be similar to that of the first group of students. In other words, the assessment task will produce consistent results.

Practicable / Feasible means that an assessment task can be implemented without facing too much difficulties as far as the available human (e.g. the lecturer and students), physical (e.g. the venue, furniture, instruments, etc.) and financial resources are concerned.

Peers: The students in your class are each other's peers. Similarly, the other lecturers who also teach IT, are your peers.

Moodle is an open source online software package that may be used by institutions and their lecturers to manage and facilitate their students' learning, assess them and monitor their learning/performance. An example of a Moodle LMS platform is CTI's is *myLMS* system.

APPENDIX B2.3:

EXAMPLE OF THE SURVEY QUESTIONNAIRES: IT STUDENTS PARTICIPANTS

ONLINE QUESTIONNAIRE FOR IT STUDENTS OF THE CTI EDUCATION GROUP

Please note that you are surveyed as part of PRIVATE ACADEMIC RESEARCH FOR THE PURPOSE OF A POST-GRADUATE QUALIFICATION THE RESEARCHER IS ENROLLED FOR

Dear CTI IT student

I would like to thank you for taking the time to participate in this research survey. The ultimate aim of this survey is to investigate how CTI lecturers could best implement e-assessment in their teaching and learning of Information Technology (IT) so that it could ultimately enhance IT students' learning at CTI.

Below is a list of questions that I would like you to respond to. You may decide to answer all questions or only those that relate to your own experiences. You may also rest assured that your responses will be kept completely confidential. Therefore, please do not mention your name or the name of any other lecturer or student in any of your answers.

(Note: Keeping all participants anonymous is intended to maintain the confidentiality around the identity of the participants and their respective responses in this research study.)

The duration for completing this questionnaire is expected to be between 30 and 45 minutes.

<u>INFORMED CONSENT</u>

Please consider the following statement and indicate whether or not you agree with the statement by clicking on the radio button next to your choice:

1 I HAVE READ AND UNDERSTOOD THE INFORMATION PROVIDED IN THE E-MAIL MESSAGE WITH THE LINK TO THIS QUESTIONNAIRE AND THEREFORE GIVE MY CONSENT THAT MY ANSWERS MAY BE USED FOR DATA COLLECTION, ANALYSIS AND REPORTING PURPOSES UNDER THE CONDITIONS SET OUT IN THE E-MAIL MESSAGE WITH THE LINK TO THIS QUESTIONNAIRE.

(To indicate your choice, click on the radio button next to your choice):

	Yes
	No

If **'NO'** is selected the participant will be taken to the end of the questionnaire

2 ARE YOU AT LEAST EIGHTEEN (18) YEARS OLD?

To indicate your choice, click on the radio button next to your choice.

	Yes
	No

If **'NO'** is selected the participant will be taken to the end of the questionnaire

3 ARE YOU AN INFORMATION TECHNOLOGY (IT) STUDENT AT CTI?

To indicate your choice, click on the radio button next to your choice.

	Yes
	No

If **'NO'** is selected the participant will be taken to the end of the questionnaire

<u>DEMOGRAPHIC INFORMATION</u>

To indicate your choice, click on the radio button next to your choice.

4 Please indicate your gender:

	Male
	Female

5 Please indicate your home language:

	Afrikaans		Sotho		Tsonga
	English		Xhosa		Tswana
	Ndebele		Swati		Pedi
	Venda		Zulu		
	Other (please specify):	Space to type answer:			

6 Please indicate your age:

	Younger than 18		48-53
	18-23		54-59
	24-29		60-65
	30-35		Older than 65
	36-41		
	42-47		

If **'Younger than 18 years'** is selected the participant will be taken to the end of the questionnaire.

<u>QUESTIONS PERTAINING TO YOUR OWN EXPERIENCES OF THE WAY IN WHICH YOU ARE ASSESSED IN INFORMATION TECHNOLOGY (IT) AT CTI</u>

Please type your answer to each of the open-ended questions below in the text box provided for this purpose below the question.

Note: If you want to obtain an explanation of the meaning of any term used in this questionnaire, please consult the **glossary of terms.** The 'back' and 'next' buttons at the bottom of each section page in this questionnaire will allow you to move to and through between the different section pages. In this way you will be able to consult the glossary whenever you feel the need to.

7 Please *elaborate on your general experiences of assessment in the IT modules* that you are enrolled for at CTI by answering the following questions:

7.1 *Why* do you think, do your IT lecturers need to assess you?
(Please explain your answer?)

7.2 *When, how and how often* are you assessed (i.e. through *paper-based assessment* and on *myLMS*)?

7.3 To what extent do you think your knowledge of *what* you will be assessed on, would influence your own learning and performance or not?
(Please explain your answer, including *why* you say so?)

7.4 To what extent do you think your knowledge of *how* you will be assessed, would influence your own learning and performance or not?
(Please explain your answer, including *why* you say so?)

8. Consider how you experience and/or feel about the different *forms of assessment in IT modules* by answering the following questions:

8.1 How do you experience and/or feel about assessment tasks that carry marks (e.g. tests, assignments, examination, etc.).
(Please explain your answer, including *why* you say so?)

8.2 How do you experience and/or feel about assessment tasks or activities that do not carry any marks (e.g. class tests, class assignments, etc., if any).
(Please explain your answer, including *why* you say so?)

8.3 How do you experience and/or feel about *peer assessment* tasks (i.e. having to assess your peers, if any).
(Please explain your answer, including *why* you say so?)

8.4 How do you experience and/or feel about *self-assessment* tasks (i.e. having to assess yourself, if any?).
(Please explain your answer, including *why* you say so?)

8.5 Which of the above-mentioned forms of assessment (see 8.1 to 8.4) do you prefer?
(Please explain your answer, including *why* you say so?)

9 Consider the different *types of assessment tasks* (e.g. tests, exams, assignments, etc.) *in the IT modules* you are enrolled for and then elaborate on the following issues in this regard:

9.1 *What types of assessment tasks* (e.g. tests, exams, assignments, etc.) do you have to do *in IT modules*, and *how do you experience and/or feel about* each of these types of task?
(Please explain your answer, including *why* you say so?)

9.2 Do you get the *instructions for* these assessment tasks in printed format (e.g. in a study guide, etc.), or do you get these on *myLMS*?

(Please explain your answer, including *why* you say so?)

9.3 *To what extent do* you believe does each of these types of assessment tasks *test your knowledge of, as well as your skills in IT*?

(Please explain your answer, including *why* you say so?)

10 The following questions relate to types of *questions* in assessment tasks:

10.1 How do you experience and/or feel about *short answer questions* (e.g. true/false questions and multiple choice questions, etc.) that you have to answer *in IT assessment tasks* (if any)?

(Please explain your answer, including *why* you say so?)

10.2 Please explain *whether these* short answer questions in any way *test your level of understanding* of what you learn in the IT modules you are enrolled for?

(Please explain your answer, including *why* you say so?)

11 The following two questions refer to your knowledge about *what* will be assessed and *how* it will be done:

11.1 To what extent do *your IT lecturers inform you in advance about what content* you will be assessed on?

(Please explain your answer, including *why* you say so?)

11.2 To what extent do *your IT lecturers inform you in advance about how you will be assessed* (e.g. the types of questions that will be asked and/or the criteria according to which you will be assessed)?

(Please explain your answer, including *why* you say so?)

11.3 *What information* do your IT lecturers provide you with in advance (if any) and *how* they do it?

(Please explain your answer, including *why* you say so?)

12 Consider *different types of feedback* you might get *on your performance in the IT assessment tasks* you have to do, and then elaborate on the following:

12.1 To what extent *do you get feedback* (if any) from your IT lecturers and/or via the *myLMS* system (as applicable), on your performance in assessment tasks?
(Please explain your answer, including *why* you say so?)

12.2 *What type of feedback* (if any) do you get on your performance from your IT lecturers and/or via the *myLMS* system (as applicable), and how is the feedback given?
(Please explain your answer, including *why* you say so?)

12.3 *How does the feedback* you receive from your IT lecturers and/or on the *myLMS* system (as applicable), *relate to how you learn afterwards*?
(Please explain your answer, including *why* you say so?)

13 Consider the different *e-assessment tasks* (i.e. those tasks that you have to access on *myLMS*), *that you have to do in IT Modules* (if any), and then elaborate on the following:

13.1 To what extent would you say, are *the e-assessment tasks* that you have to do in IT modules, are *fair*? (Note: In this context “fair” means that an e-assessment task does not advantage any students above others).

(Please explain your answer, including *why* you say so?)

13.2 Which of the *e-assessment tasks* (if any) you have to do in IT, are *fair/not fair*, and *why, or why not*?

(Please explain your answer clearly?)

14 To what extent do the *e-assessment tasks* (if any) that you have to do in *IT modules* you are enrolled for, *test the content* that has been covered in the relevant IT modules?

(Please explain your answer, including *why* you say so?

15 Consider the various *e-assessment tasks* (if any) and the *conventional paper-based assessment tasks* (if any) that you have to do *in IT modules*, and then elaborate on the following:

15.1 *How do the marks* that you obtain for the various *e-assessment tasks* (if any), *compare with* one another?

(Please explain your answer, including *why* you say so?)

15.2 *How do the marks* that you obtain for the various *e-assessment tasks* (if any), *compare with the marks* you obtain for *conventional paper-based assessment tasks* (i.e. tasks that are not on *myLMS*; if any)?

(Please explain your answer, including *why* you say so?)

15.3 Please *refer to examples of* the *e-assessment tasks* and *paper-based assessment tasks* (as applicable) that you are required to do *in IT modules*?

(Please explain your answer, including *why* you say so?)

16 To what extent do you experience any *problems with* the *e-assessment tasks* that you have to do *in IT modules* (if any)?

(Please explain your answer, including *why* you think these problems occur (if any)?)

17 To what extent do you think, might *e-assessment tasks in IT modules* (if any), *add value to* (or *<u>not</u> add value to*) your own learning?

(Please explain your answer, including *what* value it might/might not add to your own learning, and *why* you say so?)

18 *What types of assessment tasks* do you think *can help most in <u>improving</u> your own learning*?

(Please explain your answer, including *why* you say so?)

19 *To what extent* do you think, *should e-assessment be used (or not used*) in the teaching and learning of IT?

(Please explain your answer, including *why* you say so?)

END OF THE QUESTIONNAIRE

THANK YOU FOR YOUR PARTICIPATION

GLOSSARY OF TERMS USED IN THIS QUESTIONNAIRE

For clarity purposes, below are short explanations of some terms used in the questionnaire.

<u>E-assessment</u> involves the use of any information and communications technological (i.e. ICT) devices to create, deliver, store and/or report students' assessment products, marks and to provide feedback on the students' responses. Examples of devices that can be used to create and implement e-assessment tasks include laptops, desktop computers, smart phones, iPads, Android tablets, etc. In the context of this study, e-assessment involves the posting of assessment tasks on CTI's online learning management system (known as *myLMS*), and the students' online completion of these tasks, the marking of these tasks, the storage of their responses and the reporting of their performance via the myLMS system.

Module refers to a programme or course that is, together with other modules, a building block of a whole qualification as offered by higher education institutions.

Information Technology (IT) refers to the subject or discipline that is taught at CTI and involves study and application of computer technology (i.e. the entire programme that you are studying as an IT student).

Learning Management System (LMS) refers to a software tool that is used by lecturers for managing, monitoring and creating teaching and learning activities for their students.

MyLMS is CTI's LMS platform (see above) that is used by lecturers to create, monitor and manage online learning and assessment activities for their students.

Peers refers to all the other IT students in your IT class. Therefore **peer assessment** occurs when you have to assess other students in your class.

Moodle is an open source online software package that may be used by institutions and their lecturers to manage and facilitate their students' learning, assess them and monitor their learning/performance. An example of a Moodle LMS platform is CTI's is *myLMS* system.

APPENDIX B3.1:

E-MAIL INVITATION TO PARTICIPATE IN THE FOCUS GROUPS INTERVIEW (i.e. PARTICIPANT REVIEW): IT LECTURERS AND IT STUDENTS PARTICIPANTS

PARTICPANT INVITATION LETTER FOR FOCUS GROUP INTERVIEWS (PLEASE NOTE THAT YOU ARE INVITED TO TAKE PART IN DATA COLLECTION FOR PRIVATE ACADEMIC RESEARCH FOR POST-GRADUATE QUALIFICATIONS)

Andries Potgieter Blvd
Vanderbijlpark
1900

16 February 2017

Dear Participant,

INVITATION TO PARTICIPATE IN A FOCUS GROUP INTERVIEW

My name is Martin Appiah and I am a lecturer from the Vaal University of Technology. My work address is shown above. My work telephone number is +27 (0)16 950 9792 and my e-mail address is martina@vut.ac.za

You will remember that I have invited you, in your capacity as a CTI Information Technology lecturer / student, to take part in an online questionnaire survey relating to using e-assessment in the teaching and learning of IT.

The mentioned questionnaire survey, including the interpretation of the data obtained, has now been completed. In order to confirm the trustworthiness of the research, I need to conduct focus group interviews with selected IT students, in order to compare the findings of the envisaged focus group interview with, and verify the validity of the data collected in the survey and my interpretation thereof.

I am hereby inviting you to take part in such a focus group interview with a number of other IT students to discuss your experiences and perceptions of e-assessment in the teaching and learning of IT at a time and place that will suit all of you best. As a focus group interviewee, your participation in this interview must be voluntary. For this reason, you will be allowed to withdraw from our arrangements for the focus group interview at any time without incurring any penalties, losses or consequences.

(Students: Please note that you may only partake in this focus group interview if you are already 18 years of age or older and are enrolled for IT as a subject at CTI. If you are younger than eighteen years and/or not enrolled for an IT module, please inform me accordingly so that I can invite and replace you with another IT student of CTI who qualifies for the mentioned criteria.)

If you agree to take part in the focus group interview, you should please complete and sign the attached informed consent form and bring it with you to the focus group interview. The duration of the proposed focus group interview would be no more than 1 hour and 30 minutes. The information I shall provide, as well as the questions I shall ask you during the interview, will relate to the teaching and learning of IT. The major purpose of the interview will therefore be to either confirm or refute the data collected during the questionnaire survey and my subsequent interpretation thereof.

I assure you that your feedback in the focus group interview will be treated as highly confidential and that you will remain anonymous during the final analysis, interpretation and reporting of the data. The questions will also be directly to the point and not personal.

For authenticity purposes or if you have any questions, you may contact my research promoter, Dr. SP van Tonder, at the University of Free State, by e-mail vtondersp@ufs.ac.za, or phone him at 051 401 9174 during office hours.

Sincerely

Martin Appiah
Researcher

APPENDIX B3.2:

EXAMPLE OF THE FOCUS GROUPS INTERVIEW QUESTIONS: IT LECTURERS PARTICIPANTS

FOCUS GROUP INTERVIEW SCHEDULE: CTI IT LECTURERS

I started by doing the following:

- I introduced myself, explained the purpose of the study and requested the participants to read and sign the informed consent letter.
- I explained that the focus group interview is being audio recorded for transcription purposes and I assured the participants of anonymity and confidentiality of their information.
- I informed the participants that the expected duration of the focus group discussion would be approximately 1 hour and 30 minutes.
- I explained to the participants that the interview would be an open discussion session and encouraged them to actively participate.
- I also explained what e-assessment meant for the purpose of this discussion.
- I informed the participants that I would first ask a broad, overarching, open question about the topic to be discussed and that I would provide ample time for all group members to respond in the hope that they would touch upon many of the issues I have identified as important for this study, as well as any other important issues I might not yet have identified.
- I explained that if there are important issues that I know of and they have not referred to in their answers to the first broad, open question, I would subsequently ask a selection of the rest of the questions (1 to 11) in order to obtain their perceptions of those issues not yet covered.
- After formulating a question, I always added the following request: “Please explain your answers?”.

Upon completion of providing the instructions for the focus group interview, I first asked the following broad and open question:

Please explain your own experiences and perceptions of e-assessment in the teaching and learning of IT at CTI?

I trusted/hoped that the focus group members, in their answers to this broad open question and the discussion around it, would touch upon most of the issues relating to the research focus that I had already identified as important for this study. I therefore subsequently only asked a selection of the eleven (11) more specific questions below, namely those relating to issues not sufficiently covered in the discussion of the first broad and open question (i.e. 1 to 11):

1. Please describe why, and how often you assess IT students through
    - paper-based tasks, and
    - e-assessment tasks?

    (Please explain your answers?)

2. What forms of assessment do you expose your IT students do, and why?
    If any of the forms of assessment mentioned below was not referred to, I then mentioned and explained the relevant form in order to ensure that all the forms were sufficiently covered:
    - Diagnostic assessment
    - Baseline assessment
    - Formative assessment
    - Summative assessment
    - Peer assessment
    - Self-assessment

    (Please explain your answers?)

3. What assessment tasks do you let your IT students do, and why?
    If not referred to in their answers, the following follow-up questions would be asked:
    - How often do they do these tasks, and why?
    - What do you like (or dislike) about using myLMS in assessing IT students, and why?

    (Please explain your answers?)

4. What is your opinion as far as setting deadlines and time limits for assessment are concerned, and why?

    (Please explain your answer?)

5. What is your opinion regarding a possible relationship between your IT students' marks and how and what they have learned, and why?

   (Please explain your answer?)

6. What is your opinion about informing your IT students in advance about the content and/or assessment criteria they will be assessed on, and why?

   (Please explain your answer?)

7. What feedback do you provide to your IT students on their assessment tasks, and why? If not referred to in their answers, the following follow-up question would be asked:
   - What effect does the feedback you give, have on students' performance?

   (Please explain your answers?)

8. To what extent do the e-assessment tasks you let your IT students do, adhere to the principles of good assessment such as fairness, reliability, validity and practicability/feasibility?

   (Please explain your answer?)

9. What is your opinion about the need for IT lecturers to have prior experience of and knowledge about student assessment before they implement e-assessment in their teaching of IT, and why?

   (Please explain your answer?)

10. What is the possible value of e-assessment for:
    - your own teaching of IT, and
    - for IT students' learning?

    (Please explain your answers?)

11. Are there any suggestions or recommendations you can give to other IT lecturers pertaining to how to assess IT students by using available technology (e.g. e-assessment / myLMS)?
    (Please explain your suggestions?)

<u>Concluding question</u>: Do you have any questions you would like me to respond to?

Finally, I thanked the group for taking the time to take part in the focus group discussion.

APPENDIX B3.3:

EXAMPLE OF THE FOCUS GROUPS INTERVIEW QUESTIONS: IT STUDENTS PARTICIPANTS

FOCUS GROUP INTERVIEW SCHEDULE: CTI IT STUDENTS

I started by doing the following:

- I introduced myself, explained the purpose of the study and requested the participants to read and sign the informed consent letter.
- I explained that the focus group interview is being audio recorded for transcription purposes and I assured the participants of anonymity and confidentiality of their information.
- I informed the participants that the expected duration of the focus group discussion would be approximately 1 hour and 30 minutes.
- I explained to the participants that the interview would be an open discussion session and encouraged them to actively participate.
- I also explained what e-assessment meant for the purpose of this discussion.
- I informed the participants that I would first ask a broad, overarching, open question about the topic to be discussed and that I would provide ample time for all group members to respond in the hope that they would touch upon many of the issues I have identified as important for this study, as well as any other important issues I might not yet have identified.
- I explained that if there are important issues that I know of and they have not referred to in their answers to the first broad, open question, I would subsequently ask a selection of the rest of the questions (1 to 14) in order to obtain their perceptions of those issues not yet covered.
- After formulating a question, I always added the following request: “Please explain your answers?”.

Upon completion of providing the instructions for the focus group interview, I first asked the following broad and open question:

Please explain your own experiences and perceptions of e-assessment in the teaching and learning of IT subjects at CTI?

I hoped that the focus group members, in their answers to this broad open question and the discussion around it would touch upon most of the issues relating to the research focus that I had already identified as important for this study. I therefore subsequently only asked a selection of the fourteen (14) more specific questions below, namely those relating to issues not covered in the discussion of the first broad and open question (i.e. 1 to 14):

1. Please explain to me how you experience the ways in which you are assessed in IT at CTI, and why?

   If not yet referred to, the following questions were asked:

   - Why do lecturers need to assess you?
   - When, how and how often you are assessed through paper-based and/or myLMS?
   - To what extent does your knowledge about WHAT and HOW you will be assessed influence your own learning and performance or not?

   (Please explain your answers?)

2. Which forms of assessment are you subjected to, how do you experience each, which ones do you prefer, and why?

   (I then mentioned and explained, if necessary, the forms of assessment below in order to guide the students' answers):

   - Assessment tasks that carry marks
   - Assessment tasks that do not carry marks
   - Peer assessment
   - Self-assessment
   - Baseline assessment

   (Please explain your answers?)

3. What types of assessment tasks do you have to do in IT subjects, and how do you experience these?

   If not yet referred to, the following follow-up questions were asked:

   - Do the assessment tasks that you do, sufficiently test your knowledge and skills in IT?
   - In what format do you get the instructions for the different assessment tasks (i.e. in the study guide, on myLMS, or any other format?).

   (Please explain your answers?)

4. What is your opinion about short answer questions, and why?

   If not yet referred to, the following follow-up question was asked:

   - To what extent do you think, short answer questions test your level of understanding of what you learn (i.e. are they too easy, too difficult, or neither of these two, and why?)?

   (Please explain your answers?)

5. To what extent are you informed beforehand by your lecturers about WHAT will be assessed, and HOW is it done?

   If not yet referred to, the following follow-up question was asked:

   - What other assessment information do you perhaps get from your lecturers before the assessment takes place?

   (Please your answers?)

6. What type of feedback do you get from your lecturers on your performance of assessment tasks? If not yet referred to, the following follow-up question was asked:

   - How does the feedback from your lecturers subsequently (i.e. afterwards) influence what and how you learn?

   (Please explain your answers?)

7. Are the e-assessment tasks that you have to do, fair or not fair? Why or why not?

   (Please explain your answer?)

8. To what extent do the e-assessment tasks that you have to do, test the content that has been covered in your IT modules?

   (Please explain your answer?)

9. How do the marks that you obtain for the various e-assessment tasks compare, with one another, and how do they compare with marks you get for paper-based assessment tasks?

   (Please explain your answers?)

10. Please mention and explain some of the e-assessment tasks and paper-based tasks that you have to do in your IT modules? (This question relates to question 3).

11. What problems do you encounter with e-assessment tasks that you have to do, and why?

    (Please explain your answer?)

12. To what extent do the e-assessment tasks you have to do, add value to (or not add value to) your own learning, and why?

    (Please explain your answer?)

13. What types of assessment tasks (whether paper-based or e-assessment tasks) do you think can help most in improving your own learning, and why?

    (Please explain your answer?)

14. To what extent should e-assessment be used (or not be used) in the teaching and learning of IT, and why?

    (Please explain your answer?)

<u>Concluding question</u>: Do you have any questions you would like me to respond to?

Finally, I thanked the group for taking the time to take part in the focus group discussion.

APPENDIX B4.1:

E-MAIL INVITATION TO PARTICIPATE IN THE EXPERT SURVEY: EXPERT PANEL

E-MAIL INVITATION TO PARTICIPATE IN THE STUDY: FRAMEWORK EVALUATION PANEL

Dear Participant,

My name is Martin Appiah and I am a lecturer from the Vaal University of Technology. My work telephone number is +27 (0)61 950 9792 and my e-mail address is martina@vut.ac.za.

Thank you for taking the time to evaluate the feasibility and possible value of the proposed framework which is based on the findings of my research.

The overarching aim of this research was to investigate how lecturers for Information Technology (IT) at the Computer Training Institute (CTI) could best implement e-assessment in the teaching and learning of the subject. The contributions made by the participants were analysed, interpreted and these findings were constantly compared and integrated with findings from the literature review. This ultimately enabled me to compile a framework for the effective implementation of e-assessment in the teaching and learning of IT at CTI.

The purpose and objectives of this evaluation of the framework is to:

- Evaluate the importance/necessity of the proposed features of the framework.
- Obtain experts' opinions regarding the proposed framework.
- Obtain suggestions for enhancement and/or improvement of the framework.
- Adapt and refine the current framework according to the above-mentioned feedback.
- Enhance the trustworthiness of the framework in terms of its credibility, confirmability, transferability and dependability.

Please take note of the following:

- This survey focuses on your own private capacity as experts in a particular field, and not as representatives of your employers.

- Please do not mention your own name or the name of the organisation that you are employed at. No answers or responses should be directly linked to an organisation, but rather focus on the value and development of e-assessment. This survey focuses on your own expertise and opinions, and not that of your organisation (or organisational variables)
- All answers will be kept anonymous and will not be linked to any specific individual. Instead, pseudonyms will be used when findings are reported.
- Participation in this survey is voluntary
- You may choose to withdraw from the research at any stage.
- All data will remain confidential, password protected and/or stored in a locked cabinet.

If you decide to participate, you will be required to complete an online questionnaire with closed and open-ended questions. In the questionnaire, you will, inter alia, be required to provide **INFORMED CONSENT** to participate in the survey by selecting a button which serves as a confirmation that you have read all the information provided in this e-mail message and in the introduction to the questionnaire, that you agree to participate voluntarily.

By clicking on the link below, you will be taken to the questionnaire after which you may start answering the questions. Besides answering the closed questions by clicking the selected buttons, you should *please* provide comments and recommendations in the space provided at the end of each section.

[LINK]

Please, I humbly ask that you nominate other experts that could also be requested to take part in this survey.

For authenticity purposes, or if you have any questions, you may contact my research promoter, Dr. SP van Tonder, at the University of Free State, by e-mail vtondersp@ufs.ac.za, or phone him at 051 401 9174 during office hours.

Thank you.

APPENDIX B4.2:

EXAMPLE OF THE EXPERT SURVEY QUESTIONNAIRES: EXPERT PANEL

ONLINE QUESTIONNAIRE FOR MEMBERS OF THE EXPERT PANEL: EVALUATING AND VALIDATING A PROPOSED FRAMEWORK FOR E-ASSESSMENT

BACKGROUND INFORMATION PERTAINING TO THIS QUESTIONNAIRE

The aim of this research was to investigate how CTI IT lecturers could best implement e-assessment in the teaching and learning of Information Technology (IT), and to ultimately compile a framework for the effective implementation of e-assessment in the teaching and learning of IT at the Computer Training Institute (CTI).

Data for this qualitative research study was firstly collected from relevant and current literature and then from participants through open-ended questionnaire surveys and follow-up focus group interviews. The participants who completed the questionnaires were as follows:

- Lecturers from the Faculty of Information Technology at the Computer Training Institute (CTI) Education Group in South Africa.
- Students from the Faculty of Information Technology at the Computer Training Institute (CTI) Education Group in South Africa.

For each of the above-mentioned open-ended questionnaire surveys as well as the focus groups, the literature review guided the development of questions and items in the instruments. The participants were asked questions with regards to the following:

- Demographic information.
- General knowledge of and/or experience regarding paper-based assessment and e-assessment.
- Forms of assessment (i.e. diagnostic assessment; assessment for learning/formative assessment; and assessment of learning/summative assessment).
- Paper-based assessment tasks and e-assessment tasks in IT.
- Types of feedback provided to students
- Principles of good e-assessment.

- The participants' final opinions and suggestions regarding e-assessment in the teaching and learning of IT.

Although the above-mentioned sections/themes in the questionnaires were the same for the two participant groups, the questions pertaining to these sections and/or themes varied slightly in terms of the applicability to the specific group of participants.

INFORMED CONSENT

Please do not mention your own name or the name of the organisation where you are employed. No answers or responses should be directly linked to a specific person or an organization. Therefore, rather focus on the value and development of e-assessment. This survey focuses on your own expertise and opinions, and not that of your organisation (or organisational variables).

1. I HAVE READ AND UNDERSTOOD THE INFORMATION PROVIDED IN THE E-MAIL MESSAGE WITH THE LINK TO THIS QUESTIONNAIRE AND THEREFORE GIVE MY CONSENT THAT MY ANSWERS MAY BE USED FOR DATA COLLECTION, ANALYSIS AND REPORTING PURPOSES UNDER THE CONDITIONS SET OUT IN THE E-MAIL MESSAGE WITH THE LINK TO THIS QUESTIONNAIRE.

TO INDICATE YOUR CHOICE, CLICK ON THE RADIO BUTTON NEXT TO YOUR CHOICE.

◉ Yes

○ No

If **'NO'** is selected, the participant will be taken to the end of the questionnaire

DEMOGRAPHIC INFORMATION

PLEASE TYPE YOUR ANSWER TO THE FOLLOWING QUESTIONS (i.e. QUESTIONS 2 TO 5) IN THE TEXT BOXES PROVIDED FOR THIS PURPOSE:

2. What is your gender?

3. How many years of experience do you have in the field of teaching, learning and assessment in higher education?

4. How many years of experience do you have in the teaching, learning and assessment of Information Technology specifically?

5. How many years of experience do you have pertaining to e-learning and/or e-assessment?

The tables below represent the features of the e-assessment framework for IT education that I compiled by means of constant comparison and convergence of my literature and empirical research findings.

Please rate the importance of each of the listed features in the tables by making use of the three point scale explained below.

The three point scale represents the rating of the importance of the features:

Next to each feature and sub-feature in all the tables below, please mark ONLY ONE of the three letters shown on the right-hand side by selecting the relevant letter that represents your evaluation of the importance of the feature (i.e. please choose either E, U or N). The letters E, U and N represent the following levels of importance of the features:

"**Essential**" **(E)**, "**Useful**" **(U)** and "**Not necessary**" **(N)**.

Each major set of features in the proposed framework is also followed by ***A REQUEST TO PROVIDE YOUR OWN COMMENTS AND/OR SUGGESTIONS REGARDING THE PARTICULAR SET OF FEATURES. PLEASE FEEL FREE TO PROVIDE THESE COMMENTS*** *in the space provided in the relevant text boxes.*

Note: For a glossary of terms used in this questionnaire, please click here.

CHARACTERISTICS AND/OR REQUIREMENTS FOR THE SUCCESSFUL IMPLEMENTATION OF E-ASSESSMENT				
Rating scale: E=Essential feature U=Useful feature N=Not necessary				
A:	**THE DELIVERY SYSTEM FOR E-ASSESSMENT SHOULD BE APPROPRIATE. THIS REQUIRES THE FOLLOWING CONSIDERATIONS:**	**E**	**U**	**N**
A1	The IT server must be in place.	**E**	**U**	**N**
A2	The delivery system should have stable internet connectivity.	**E**	**U**	**N**
A3	Students should be able to access e-assessment tasks on any browser and on any operating system (i.e. there should be interoperability and compatibility).	**E**	**U**	**N**
A4	The system should be able to randomize questions/tasks.	**E**	**U**	**N**

A5	The system should be able to award marks automatically for students' answers.	**E**	**U**	**N**
DO YOU HAVE ANY SUGGESTIONS OR COMMENTS REGARDING THE DELIVERY SYSTEM FOR E-ASSESSMENT? (Space to type comments)				
B: THE CONTROL MECHANISMS FOR E-ASSESSMENT SHOULD BE APPROPRIATE. THIS REQUIRES THE FOLLOWING CONSIDERATIONS:		**E**	**U**	**N**
B1	The e-assessment system should enable an assessor to set a time limit (i.e. a duration limit) for the completion of any e-assessment task.	**E**	**U**	**N**
B2	The e-assessment system should allow cut-off of access to e-assessment tasks after deadline submission dates.	**E**	**U**	**N**
B3	The e-assessment system should allow candidates to go back to previous questions/tasks and make amendments.	**E**	**U**	**N**
B4	The e-assessment system should limit the number of times a student can re-attempt a task.	**E**	**U**	**N**
B5	The e-assessment system should allow switching between synchronous and asynchronous modes of e-assessment.	**E**	**U**	**N**
DO YOU HAVE ANY SUGGESTIONS OR COMMENTS REGARDING THE CONTROL MECHANISMS FOR E-ASSESSMENT? (Space to type comments)				
C: THE SYSTEM FEEDBACK FOR E-ASSESSMENT SHOULD BE APPROPRIATE. THIS REQUIRES THE FOLLOWING		**E**	**U**	**N**

CONSIDERATIONS:				
C1	The e-assessment system should allow assessors to turn feedback on an e-assessment task on or off.	**E**	**U**	**N**
C2	The e-assessment system should be programmed to provide appropriate feedback when an answer is wrong or right.	**E**	**U**	**N**
C3	The e-assessment system should allow assessors to provide feedback per question.	**E**	**U**	**N**
DO YOU HAVE ANY SUGGESTIONS OR COMMENTS REGARDING THE SYSTEM FEEDBACK FOR E-ASSESSMENT? (Space to type comments)				
D: THE STABILITY AND SPEED FOR THE E-ASSESSMENT SYSTEM SHOULD BE APPROPRIATE. THIS REQUIRES THE FOLLOWING CONSIDERATIONS:		**E**	**U**	**N**
D1	The e-assessment system should be stable while the assessor is compiling the task.	**E**	**U**	**N**
D2	Regardless of the number of students who are completing the e-assessment task (e.g. simultaneously), the system should remain stable.	**E**	**U**	**N**
D3	In case of power failure when students are completing the e-assessment tasks, there should be an alternative/emergency power source.	**E**	**U**	**N**
D4	The delivery of relevant tests, videos, graphics and e-assessment tasks from the server to the student's computer should be fast and not be delayed.	**E**	**U**	**N**
DO YOU HAVE ANY SUGGESTIONS OR COMMENTS REGARDING THE STABILITY				

AND SPEED FOR THE E-ASSESSMENT SYSTEM? (Space to type comments)				
E: THE SECURITY FOR E-ASSESSMENT SHOULD BE APPROPRIATE. THIS REQUIRES THE FOLLOWING CONSIDERATIONS:		**E**	**U**	**N**
E1	Only students who are registered for the module should be able to access the e-assessment tasks.	**E**	**U**	**N**
E2	The e-assessment system should allow for the e-assessment task to be scheduled for a pre-specified date and time (i.e. it should allow a synchronous mode, if so required).	**E**	**U**	**N**
E3	The e-assessment system must allow assessors to set the number of times students will be allowed to access an e-assessment task.	**E**	**U**	**N**
E4	The time a student logs into and off the system/e-assessment task should be recorded and made available for the lecturer to monitor.	**E**	**U**	**N**
E5	Before an e-assessment task is uploaded and ready, students' login and/or password should be working.	**E**	**U**	**N**
E6	Students should be authenticated (by using their own unique usernames and passwords) when accessing an e-assessment task.	**E**	**U**	**N**
DO YOU HAVE ANY SUGGESTIONS OR COMMENTS REGARDING THE SECURITY FOR E-ASSESSMENT? (Space to type comments)				
F: THE RECORDING AND REPORTING OF E-ASSESSMENT RESULTS SHOULD BE APPROPRIATE. THIS REQUIRES THE		**E**	**U**	**N**

FOLLOWING CONSIDERATIONS:				
F1	The e-assessment system must be able to download, report and upload data such as students' numbers, names and marks in Excel, Word and other relevant text formats.	**E**	**U**	**N**
F2	The e-assessment system must be able to record, calculate and report results per topic per student.	**E**	**U**	**N**
F3	The e-assessment system must be able to report individual students' average performance or achievement.	**E**	**U**	**N**
F4	The e-assessment system must be able to report the average time spent by the students to complete an e-assessment task.	**E**	**U**	**N**
DO YOU HAVE ANY SUGGESTIONS OR COMMENTS REGARDING RECORDING AND REPORTING E-ASSESSMENT RESULTS? (Space to type comments)				
G: APPROPRIATE SUPPORT AND TRAINING OPPORTUNITIES ABOUT THE E-ASSESSMENT SYSTEM SHOULD BE AVAILABLE FOR STAFF AND STUDENTS. THIS REQUIRES THE FOLLOWING CONSIDERATIONS:		**E**	**U**	**N**
G1	Technical support must be available for lecturers and students in the institution always.	**E**	**U**	**N**
G2	A mobile application needs to be developed for the e-assessment system to ensure easy access for all.	**E**	**U**	**N**
G3	Proper and adequate training should be given to both students and staff to enable them to use and benefit fully from the implementation of e-assessment.	**E**	**U**	**N**

G4	In the event of a technical problem, there should be a prompt response by the technical support team.	**E**	**U**	**N**
G5	A service legal agreement should be in place.	**E**	**U**	**N**
G6	The IT administrators need to ensure that there are no restricted modes of capturing typed information (i.e. the e-assessment should allow lecturers and students to type mathematical formulas and symbols).	**E**	**U**	**N**
G7	The necessary technological infrastructure (such as computers, internet connections, etc.) should be available for all students.	**E**	**U**	**N**
G8	The required resources to use (i.e. physical, human and financial resources) should be readily available.	**E**	**U**	**N**
DO YOU HAVE ANY SUGGESTIONS OR COMMENTS REGARDING THE APPROPRIATE SUPPORT AND TRAINING REGARDING THE E-ASSESSMENT SYSTEM FOR STAFF AND STUDENTS? (Space to type comments)				
H: AN EVALUATION OF THE E-ASSESSMENT SYSTEM SHOULD BE IN PLACE. THIS REQUIRES THE FOLLOWING CONSIDERATIONS:		**E**	**U**	**N**
H1	An institution should first implement the e-assessment system on their network for pilot testing.	**E**	**U**	**N**
H2	An institution should obtain permission to use the e-assessment system in a “live” test/assessment situation for a specified period of time.	**E**	**U**	**N**
H3	Evaluation of the e-assessment system should be done by consulting different stakeholders, e.g. students, lecturers, ICT staff and other relevant stakeholders.	**E**	**U**	**N**

H4	All the relevant e-assessment policies should be made known and be clear to lecturers, students, and all other participants.	**E**	**U**	**N**
H5	The institution should have an appropriate e-assessment policy that integrates pedagogical and practical aims.	**E**	**U**	**N**
H6	There must be policies and procedures in place to ensure reliability and validity of e-assessment.	**E**	**U**	**N**
DO YOU HAVE ANY SUGGESTIONS OR COMMENTS REGARDING AN EVALUATION OF THE E-ASSESSMENT SYSTEM? (Space to type comments)				
LECTURERS' PRIOR EXPERIENCE OF AND KNOWLEDGE ABOUT STUDENT ASSESSMENT				
Rating scale: E=Essential feature U=Useful feature N=Not necessary				
A: LECTURERS WHO ARE ASSESSORS NEED TO HAVE PRIOR EXPERIENCE OF AND KNOWLEDGE ABOUT STUDENT ASSESSMENT. THIS REQUIRES THE FOLLOWING CONSIDERATIONS:		**E**	**U**	**N**
A1	Lecturers (i.e. assessors) need to design e-assessment tasks of which the contexts are related to the students' socio-economic backgrounds (i.e. the tasks must be relevant).	**E**	**U**	**N**
A2	Lecturers (i.e. assessors) should have prior experience of and knowledge about information technology or e-learning.	**E**	**U**	**N**
A3	Lecturers (i.e. assessors) require prior experience of change in education to enable them to adapt to the change towards e-assessment.	**E**	**U**	**N**

A4	Lecturers (i.e. assessors) should have the knowledge and skills required for designing and implementing quality e-assessment tasks.	**E**	**U**	**N**
A5	Lecturers (i.e. assessors) should have knowledge about how to make appropriate use of action verbs (according to Bloom's taxonomy) in formulating items and questions.	**E**	**U**	**N**

DO YOU HAVE ANY SUGGESTIONS OR COMMENTS REGARDING THE LECTURERS' PRIOR EXPERIENCE OF AND KNOWLEDGE ABOUT STUDENT ASSESSMENT BEFORE IMPLEMENTING E-ASSESSMENT?
(Space to type comments)

USING IT STUDENTS' ASSESSMENT RESULTS FOR DIFFERENT TEACHING AND LEARNING PURPOSES

Rating scale: E=Essential feature U=Useful feature N=Not necessary

A: STUDENTS' E-ASSESSMENT RESULTS SHOULD BE USED FOR DIFFERENT PURPOSES, FOR EXAMPLE:		**E**	**U**	**N**
A1	Lecturers should use e-assessment results to provide students with constructive feedback about their learning (i.e. feedback on their performance and progress).	**E**	**U**	**N**
A2	Students' e-assessment results should enable the lecturer to assess how the students are progressing and performing.	**E**	**U**	**N**
A3	Based on the students' e-assessment results, lecturers should evaluate and enhance the efficiency of their own methods of teaching.	**E**	**U**	**N**
A4	The efficiency of the curriculum/programme should be evaluated and enhanced based on the students' e-	**E**	**U**	**N**

	assessment results.			

DO YOU HAVE ANY SUGGESTIONS OR COMMENTS REGARDING THE USE OF IT STUDENTS' RESULTS (i.e. THE PURPOSE OF E-ASSESSMENT)?
(Space to type comments)

SETTING DEADLINE DATES FOR THE COMPLETION/SUBMISSION OF E-ASSESSMENT TASKS

Rating scale: E=Essential feature U=Useful feature N=Not necessary

A: DEADLINES SHOULD BE SET FOR THE SUBMISSION OF E-ASSESSMENT TASKS. THIS SHOULD BE DONE BY CONSIDERING THE FOLLOWING:		**E**	**U**	**N**
A1	Deadlines are necessary to teach students how to effectively manage time, which is a requirement for employability.	**E**	**U**	**N**
A2	Deadlines force students to complete e-assessment tasks on time, because they know that the link for submission will not be available once the deadline elapses.	**E**	**U**	**N**
A3	Deadlines for completion of e-assessment tasks should be reasonable. For example, unforeseen circumstances (such as server failure or inability to upload e-assessment tasks on the platform) must be taken into account.	**E**	**U**	**N**

DO YOU HAVE ANY SUGGESTIONS OR COMMENTS REGARDING THE SETTING OF DEADLINES FOR THE SUBMISSION OF ASSESSMENT TASKS?
(Space to type comments)

SETTING DURATION LIMITS (i.e. LIMITING THE ALLOWED DURATION) FOR THE COMPLETION OF E-ASSESSMENT TASKS

Rating scale: E=Essential feature U=Useful feature N=Not necessary				
A: SETTING DURATION (TIME) LIMITS FOR THE COMPLETION OF E-ASSESSMENT TASKS IS NECESSARY BUT THE FOLLOWING SHOULD BE CONSIDERED:		**E**	**U**	**N**
A1	Duration limits prepare students for the working environment (i.e. to perform tasks within a prescribed period).	**E**	**U**	**N**
A2	Duration limits should motivate students to set fixed targets for the achievement of their tasks.	**E**	**U**	**N**
A3	Duration limits work well on an e-assessment platform because students are forced to complete the tasks on time, knowing that they will not be able to continue with the tasks once the duration limit expires.	**E**	**U**	**N**
A4	Duration limits must suit the complexity of the e-assessment task.	**E**	**U**	**N**
A5	Duration limits must suit the types of questions in the e-assessment tasks.	**E**	**U**	**N**
A6	Duration limits for e-assessment tasks should be reasonable, in that the assessor needs to make provision for unforeseen circumstances (e.g. technical problems such as a slow internet connection, unreliable computer software or hardware, etc.).	**E**	**U**	**N**
DO YOU HAVE ANY SUGGESTIONS OR COMMENTS REGARDING THE SETTING OF TIME LIMITS FOR THE COMPLETION OF ASSESSMENT TASKS? (Space to type comments)				
RELATIONSHIP BETWEEN IT STUDENTS' MARKS AND HOW AND WHAT THEY				

HAVE LEARNED				
Rating scale: E=Essential feature U=Useful feature N=Not necessary				
A: THERE IS A NEED FOR A CONSISTENT RELATIONSHIP BETWEEN IT STUDENTS' E-ASSESSMENT MARKS AND HOW AND WHAT THEY HAVE LEARNED. THIS INVOLVES THE FOLLOWING:		**E**	**U**	**N**
A1	Students should achieve good e-assessment grades when they apply a deep approach to learning / are actively engaged.	**E**	**U**	**N**
A2	Students should not achieve good e-assessment marks if they just recall what they learned (i.e. if they applied a surface learning approach).	**E**	**U**	**N**
A3	**THE MARKS STUDENTS OBTAIN FOR E-ASSESSMENT TASKS SHOULD BE A REFLECTION OF THE FOLLOWING:**	**E**	**U**	**N**
A3.1	The quality of lecturers' teaching.	**E**	**U**	**N**
A3.2	The way in which the e-assessment tasks are formulated (i.e. whether the assessor used appropriate action verbs that represent the appropriate cognitive levels in Bloom's taxonomy).	**E**	**U**	**N**
A3.3	The assessor's level of leniency or strictness during marking.	**E**	**U**	**N**
A3.4	The leniency or strictness built into an automated marking tool.	**E**	**U**	**N**
A3.5	Students' interest in the IT module	**E**	**U**	**N**
DO YOU HAVE ANY SUGGESTIONS OR COMMENTS REGARDING THE RELATIONSHIP BETWEEN IT STUDENTS' E-ASSESSMENT MARKS AND HOW AND				

WHAT THEY HAVE LEARNED? (Space to type comments)				
STUDENTS' KNOWLEDGE REGARDING WHAT (i.e. THE CONTENT) THEY WILL BE ASSESSED ON				
Rating scale: E=Essential feature U=Useful feature N=Not necessary				
A: INFORMING IT STUDENTS IN ADVANCE OF WHAT (I.E. THE CONTENT) THEY WILL BE ASSESSED ON, IS IMPORTANT. THE FOLLOWING ALSO NEED TO BE CONSIDERED:		**E**	**U**	**N**
A1	Providing students in advance with information about the content that will be assessed, is a principle of good e-assessment.	**E**	**U**	**N**
A2	The e-assessment task should assess students' mastery of a representative sample of content being assessed.	**E**	**U**	**N**
A3	The lecturer should not provide students with a reduced "scope" of content (i.e. a reduced sample of content).	**E**	**U**	**N**
A4	**BESIDES INFORMING STUDENTS IN ADVANCE OF THE CONTENT THAT WILL BE ASSESSED, THE LECTURER MAY ALSO DO THE FOLLOWING:**	**E**	**U**	**N**
A4.1	*Discuss/make available previous examination papers.*	**E**	**U**	**N**
A4.2	*Discuss/make available a memorandum for the task.*	**E**	**U**	**N**
A4.3	*Design and discuss mock tests or examination papers with the students.*	**E**	**U**	**N**
DO YOU HAVE ANY SUGGESTIONS OR COMMENTS REGARDING STUDENTS' KNOWLEDGE ABOUT WHAT (I.E. THE CONTENT) THEY WILL BE ASSESSED ON?				

(Space to type comments)

STUDENTS' KNOWLEDGE REGARDING HOW THEY WILL BE ASSESSED (i.e. WHAT THE ASSESSMENT CRITERIA WILL BE)				
Rating scale: E=Essential feature U=Useful feature N=Not necessary				
A: INFORMING IT STUDENTS IN ADVANCE OF HOW THEY WILL BE ASSESSED (I.E. WHAT THE E-ASSESSMENT CRITERIA WILL BE) IS IMPORTANT. HOWEVER, THE FOLLOWING ALSO NEED TO BE CONSIDERED:		**E**	**U**	**N**
A1	Students will, in advance, be aware of the competencies that they will be required to demonstrate through the e-assessment task.	**E**	**U**	**N**
A2	If students are informed in advance of how they will be assessed, they will be better motivated to prepare adequately.	**E**	**U**	**N**
A3	If students are informed in advance of how they will be assessed, they will become aware of the alignment between teaching/learning activities, e-assessment tasks and the relevant learning outcome(s) (i.e. the constructive alignment of e-assessment tasks).	**E**	**U**	**N**
A4	Informing students in advance of how they will be assessed, should include how marks will be awarded (i.e. what information will be required and what not, etc.).	**E**	**U**	**N**
DO YOU HAVE ANY SUGGESTIONS OR COMMENTS REGARDING STUDENTS' KNOWLEDGE REGARDING HOW (I.E. ASSESSMENT CRITERIA) THEY WILL BE ASSESSED?				

(Space to type comments)				
FEEDBACK TO IT STUDENTS ABOUT THEIR PERFORMANCE IN E-ASSESSMENT TASKS				
Rating scale: E=Essential feature U=Useful feature N=Not necessary				
A: *Providing constructive feedback on IT students' performance in their e-assessment tasks is important. However, the following should also be considered:*		**E**	**U**	**N**
A1	Automated feedback on e-assessment tasks should inform students of the competency levels at which they performed.	**E**	**U**	**N**
A2	Automated feedback on e-assessment tasks should be timely (i.e. prompt) in order for it to be effective.	**E**	**U**	**N**
A3	Feedback provided by lecturers on e-assessment tasks should be timely (i.e. prompt) in order for it to be effective.	**E**	**U**	**N**
A4	Automated feedback on e-assessment tasks should be detailed so that the students will have a clear understanding of what they did wrong and what they did right.	**E**	**U**	**N**
A5	Lecturer's feedback on e-assessment tasks should be detailed so that the students will have a clear understanding of what they did wrong and what they did correctly.	**E**	**U**	**N**
A6	Automated feedback on e-assessment tasks must be constructive/motivating in order for the students to consider and apply the feedback.	**E**	**U**	**N**
A7	The lecturer's feedback must be constructive/motivating in	**E**	**U**	**N**

	order for the students to consider and apply the feedback.			
DO YOU HAVE ANY SUGGESTIONS OR COMMENTS REGARDING THE POSSIBLE EFFECT OF FEEDBACK ON IT STUDENTS' PERFORMANCE IN THEIR ASSESSMENT TASKS AND HOW THE FEEDBACK IS PROVIDED? (Space to type comments)				
FORMS OF E-ASSESSMENT IN HIGHER EDUCATION				
A: FORMATIVE E-ASSESSMENT				
Rating scale: E=Essential feature U=Useful feature N=Not necessary				
FORMATIVE E-ASSESSMENT IS IMPORTANT BUT THE FOLLOWING SHOULD ALSO BE TAKEN INTO ACCOUNT:		**E**	**U**	**N**
A1	Lecturers may design formative e-assessment tasks that will assist in preparing students for forthcoming e-assessment tasks that are awarded marks (i.e. summative e-assessment tasks such as an examination, or test papers).	**E**	**U**	**N**
A2	E-assessment tasks should be followed up in order to provide an opportunity for students to ask questions and seek clarifications.	**E**	**U**	**N**
A3	Questions and instructions in formative e-assessment tasks should motivate students to make an extra effort (e.g. motivate them to do some extra reading and research).	**E**	**U**	**N**
A4	It is not necessary to award marks for formative e-assessment tasks.	**E**	**U**	**N**
A5	Some summative e-assessment tasks may also be used for formative purposes (i.e. if feedback is provided to the student about his/her performance in the e-assessment task, it is also	**E**	**U**	**N**

	used formatively).			
A6	Formative e-assessment tasks should be used for providing feedback to the lecturer on how well he/she is teaching.	**E**	**U**	**N**
A7	Formative e-assessment tasks should be used for providing feedback to the lecturer on how well the student is learning (i.e. how well the student performs and progresses).	**E**	**U**	**N**
A8	Feedback on formative e-assessment tasks should be prompt, continuous and constructive (i.e. continuously show the student the way forward in the learning process).	**E**	**U**	**N**
A9	If problem-solving scenarios are included in formative e-assessment tasks, they may assist in preparing students for the world of work.	**E**	**U**	**N**
A10	If practical tasks are used as formative e-assessment tasks, they may assist in preparing students for the world of work.	**E**	**U**	**N**
A11	**TYPES OF FORMATIVE E-ASSESSMENT TASKS THAT WILL BEST IMPROVE STUDENT LEARNING, INCLUDE:**	**E**	**U**	**N**
A11.1	Online presentations.	**E**	**U**	**N**
A11.2	E-group discussions and e-activities.	**E**	**U**	**N**
A11.4	E-journal or e-article reviews.	**E**	**U**	**N**
A11.5	Online question and answer sessions.	**E**	**U**	**N**
A11.6	Online discussions between students and lecturers.	**E**	**U**	**N**
A12	**OTHER POSSIBLE TYPES OF FORMATIVE E-ASSESSMENT TASKS**	**E**	**U**	**N**

A12.1	IF OTHER, PLEASE NAME THEM: (Space to type comments)	**E**	**U**	**N**
DO YOU HAVE ANY SUGGESTIONS OR COMMENTS REGARDING HOW FORMATIVE E-ASSESSMENTS ARE CONDUCTED AND THE ASSESSMENT TASKS USED FOR FORMATIVE E-ASSESSMENT? (Space to type comments)				
B: SUMMATIVE E-ASSESSMENT				
Rating scale: E=Essential feature U=Useful feature N=Not necessary				
SUMMATIVE E-ASSESSMENT IS IMPORTANT BUT SHOULD TAKE THE FOLLOWING INTO ACCOUNT:		**E**	**U**	**N**
B1	Summative e-assessment tasks should require some research in order for them to add value to students' learning.	**E**	**U**	**N**
B2	Lecturers should conduct summative e-assessment after completing a section or chapter of work, a module, and/or at the end of a semester to determine how their students are learning (i.e. performing and progressing).	**E**	**U**	**N**
B3	If constructive feedback is provided after summative e-assessment tasks have been done, some students will learn to take the feedback into consideration and not only focus on the marks obtained.	**E**	**U**	**N**
B4	If problem-solving scenarios are included in summative e-assessment tasks, they may assist in preparing students for the world of work.	**E**	**U**	**N**
B5	If practical tasks are used as summative e-assessment tasks, they may assist in preparing students for the world of work.	**E**	**U**	**N**

B6	**TYPES OF SUMMATIVE E-ASSESSMENT TASKS THAT WILL BEST IMPROVE STUDENT LEARNING, INCLUDE:**	**E**	**U**	**N**
B6.1	Online research reports (e.g. academic assignments) for undergraduate students.	**E**	**U**	**N**
B6.2	E-tests.	**E**	**U**	**N**
B6.3	E-examinations.	**E**	**U**	**N**
B6.4	E-portfolios.	**E**	**U**	**N**
B6.5	Online presentations.	**E**	**U**	**N**
B6.6	E-project reports.	**E**	**U**	**N**
B7	***Other possible types of summative e-assessment tasks***	**E**	**U**	**N**
B7.1	If other, please name them: (Space to type comments)	**E**	**U**	**N**
DO YOU HAVE ANY SUGGESTIONS OR COMMENTS REGARDING HOW SUMMATIVE E-ASSESSMENTS ARE CONDUCTED AND THE ASSESSMENT TASKS USED FOR SUMMATIVE E-ASSESSMENT? (Space to type comments)				
C: PEER E-ASSESSMENT				
Rating scale: E=Essential feature U=Useful feature N=Not necessary				
PEER E-ASSESSMENT IS IMPORTANT BUT SHOULD TAKE THE FOLLOWING INTO ACCOUNT:		**E**	**U**	**N**

C1	Lecturers may divide students into small groups and require group members (i.e. peers) to assess one another.	**E**	**U**	**N**
C2	Peer e-assessment tasks will motivate students to share ideas and learn from one another.	**E**	**U**	**N**
C3	Peer e-assessment tasks can be used very effectively during group work.	**E**	**U**	**N**
C4	Peer e-assessment tasks should be planned in such a way that they elicit students' creative questioning of topics.	**E**	**U**	**N**
C5	Peer e-assessment requires peer assessors to identify their peers' mistakes.	**E**	**U**	**N**
C6	Peer e-assessment requires peer assessors to identify their peers' strengths.	**E**	**U**	**N**
C7	Peer e-assessment feedback should assist students to identify their own mistakes.	**E**	**U**	**N**
C8	Peer e-assessment feedback should assist students to identify their own strengths.	**E**	**U**	**N**
C9	If more able students have to give feedback to less able peers, they will also benefit since they have to explain procedures to less able students.	**E**	**U**	**N**
C10	Peer e-assessment will make students feel that they own the assessment process.	**E**	**U**	**N**
C11	Peer e-assessment will motivate peers to explain their decisions and/or answers to one another.	**E**	**U**	**N**
C12	Peer assessors may be selected randomly in order to avoid	**E**	**U**	**N**

	unfair or biased assessment among peers where possible.			
C13	Peer e-assessment can be used at the end of any learning period (e.g. students' final project presentations).	**E**	**U**	**N**
C14	Peer e-assessment usually works well if short questions and answers are used.	**E**	**U**	**N**
C15	Peers' feedback on e-assessment tasks will motivate student engagement.	**E**	**U**	**N**
C16	**TYPES OF PEER E-ASSESSMENT TASKS THAT WILL BEST IMPROVE STUDENT LEARNING, INCLUDE:**			
C16.1	Peers' e-assignments (i.e. undergraduate research reports).	**E**	**U**	**N**
C16.2	E-tests.	**E**	**U**	**N**
C16.3	Online academic essays.	**E**	**U**	**N**
C16.4	Online presentations.	**E**	**U**	**N**
C17	***Other possible types of peer e-assessment tasks***	**E**	**U**	**N**
C17.1	If other, name them: (Space to type comments)	**E**	**U**	**N**
DO YOU HAVE ANY SUGGESTIONS OR COMMENTS REGARDING HOW PEER E-ASSESSMENTS ARE CONDUCTED AND THE ASSESSMENT TASKS USED FOR PEER E-ASSESSMENT? (Space to type comments)				
D: SELF E-ASSESSMENT / SELF-ASSESSMENT OF E-ASSESSMENT TASKS				

Rating scale: E=Essential feature U=Useful feature N=Not necessary				
SELF E-ASSESSMENT IS IMPORTANT BUT THE FOLLOWING SHOULD ALSO BE TAKEN INTO ACCOUNT:		**E**	**U**	**N**
D1	Self e-assessment tasks should contain questions and/or instructions that enable students to evaluate their own level of understanding of a specific topic or content.	**E**	**U**	**N**
D2	Self e-assessment questions and/or instructions should enable students to evaluate their own knowledge of specific topics or content.	**E**	**U**	**N**
D3	Self e-assessment tasks should help students to identify their own weaknesses.	**E**	**U**	**N**
D4	Self e-assessment tasks should help students to identify their own strengths.	**E**	**U**	**N**
D5	Self e-assessment can prepare students for forthcoming assessment tasks that are awarded marks (i.e. summative e-assessment tasks such as examinations, tests, etc.).	**E**	**U**	**N**
D6	Self e-assessment tasks should encourage students to think critically about their own work.	**E**	**U**	**N**
D7	Self e-assessment tasks should be aimed at empowering students in their own learning processes.	**E**	**U**	**N**
D8	**TYPES OF SELF E-ASSESSMENT TASKS THAT WILL BEST IMPROVE STUDENT LEARNING, INCLUDE:**			
D8.1	E-assignments (e.g. research reports).	**E**	**U**	**N**
D8.2	E-tests.	**E**	**U**	**N**

D8.3	Online academic essays.	**E**	**U**	**N**
D8.4	Online presentations.	**E**	**U**	**N**
D9	***Other possible types of self e-assessment tasks***	**E**	**U**	**N**
D9.1	If other, name them: (Space to type comments)	**E**	**U**	**N**
DO YOU HAVE ANY SUGGESTIONS OR COMMENTS REGARDING HOW SELF E-ASSESSMENTS ARE CONDUCTED AND THE ASSESSMENT TASKS USED FOR SELF E-ASSESSMENT? (Space to type comments)				
E: DIAGNOSTIC E-ASSESSMENT				
Rating scale: E=Essential feature U=Useful feature N=Not necessary				
DIAGNOSTIC E-ASSESSMENT IS IMPORTANT BUT THE FOLLOWING SHOULD BE CONSIDERED:		**E**	**U**	**N**
E1	Diagnostic e-assessment should be used to determine what students understand or don't understand at a specific point in time.	**E**	**U**	**N**
E2	Diagnostic e-assessment can help lecturers to plan meaningful and efficient teaching methods.	**E**	**U**	**N**
E3	Diagnostic e-assessment can also be used as baseline assessment (i.e. assessment done at the beginning of a module to establish what the students' knowledge and levels of understanding are).	**E**	**U**	**N**

E4	**TYPES OF DIAGNOSTIC E-ASSESSMENT TASKS THAT WILL BEST IMPROVE STUDENT LEARNING, INCLUDE:**			
E4.1	Online activities/exercises.	**E**	**U**	**N**
E4.2	Online chapter/unit pre-tests.	**E**	**U**	**N**
E5	***Other possible types of diagnostic e-assessment tasks***	**E**	**U**	**N**
E5.1	If other, name them: (Space to type comments)	**E**	**U**	**N**
DO YOU HAVE ANY SUGGESTIONS OR COMMENTS REGARDING HOW DIAGNOSTIC/BASELINE E-ASSESSMENTS ARE CONDUCTED AND THE ASSESSMENT TASKS USED FOR DIAGNOSTIC/BASELINE E-ASSESSMENT? (Space to type comments)				

TYPES OF ASSESSMENT TASKS THAT MAY BE USED IN E-ASSESSMENT:				
A: PRESENTATIONS				
Rating scale: E=Essential feature U=Useful feature N=Not necessary				
PRESENTATIONS IN THE CONTEXT OF E-ASSESSMENT IS IMPORTANT BUT THE FOLLOWING SHOULD ALSO BE CONSIDERED:		**E**	**U**	**N**
A1	Students should be able to upload their presentation slides on the e-assessment platform.	**E**	**U**	**N**
A2	Students should be given the opportunity to ask the online presenters some questions for clarity so that they can learn	**E**	**U**	**N**

	from one another.			
DO YOU HAVE ANY SUGGESTIONS OR COMMENTS REGARDING HOW PRESENTATIONS IN THE CONTEXT OF E-ASSESSMENT ARE CONDUCTED? (Space to type comments)				
B: SHORT ANSWER QUESTIONS OR TASKS (I.E. MULTIPLE CHOICE QUESTIONS, TRUE/FALSE QUESTIONS, QUIZZES, ETC.)				
Rating scale: E=Essential feature U=Useful feature N=Not necessary				
SHORT ANSWER QUESTIONS CAN BE USED IN E-ASSESSMENT BUT REQUIRE THE FOLLOWING CONSIDERATIONS:		**E**	**U**	**N**
B1	Lecturers should design short answer questions in a way that requires students to think critically.	**E**	**U**	**N**
B2	Lecturers should design short answer questions that focus on higher cognitive levels.	**E**	**U**	**N**
B3	Short answer questions should be alternated with long answer questions.	**E**	**U**	**N**
B4	Lecturers need to design short answer questions or tasks that will prevent students from memorizing and regurgitating knowledge.	**E**	**U**	**N**
DO YOU HAVE ANY SUGGESTIONS OR COMMENTS REGARDING HOW SHORT ANSWER QUESTIONS ARE USED IN E-ASSESSMENT? (Space to type comments)				
C: TESTS AND EXAMINATIONS				

Rating scale: E=Essential feature U=Useful feature N=Not necessary				
E-TESTS AND E-EXAMINATIONS MAY BE USED BUT THE FOLLOWING SHOULD ALSO BE CONSIDERED:		**E**	**U**	**N**
C1	Lecturers should ensure that the e-test or e-examination paper assesses students' competence pertaining to what they had learned after a particular learning period (i.e. use them as summative assessments).	**E**	**U**	**N**
C2	If e-tests and e-examinations are appropriately developed, they can also be used to prepare students for the real world (i.e. by including IT industry-related/authentic tasks/questions).	**E**	**U**	**N**
C3	E-tests and e-examinations must be followed up with constructive feedback so that the students will be able to identify their own problems/mistakes.	**E**	**U**	**N**
C4	E-tests and e-examinations should be used to determine students' performance at a particular point in time.	**E**	**U**	**N**
C5	E-examinations should be written at the end of a semester or year course (i.e. for summative purposes).	**E**	**U**	**N**
C6	E-tests should be written upon completion of a unit, section or chapter (i.e. for summative purposes).	**E**	**U**	**N**
DO YOU HAVE ANY SUGGESTIONS OR COMMENTS REGARDING HOW E-TESTS AND E-EXAMINATIONS ARE CONDUCTED? (Space to type comments)				
D: ASSIGNMENTS				

Rating scale: E=Essential feature U=Useful feature N=Not necessary				
E-ASSIGNMENTS MAY BE USED BUT THE FOLLOWING SHOULD BE CONSIDERED:		**E**	**U**	**N**
D1	E-assignments should be aimed at developing students' practical experience in IT.	**E**	**U**	**N**
D2	E-assignments should be aimed at developing students' skills in IT.	**E**	**U**	**N**
D3	Students' research skills will be improved if the e-assignment instructions and/or questions encourage them to read about and apply relevant information/knowledge/skills.	**E**	**U**	**N**
D4	Lecturers should set e-assignments in advance (i.e. at the beginning of the semester or the year, and not later).	**E**	**U**	**N**
DO YOU HAVE ANY SUGGESTIONS OR COMMENTS REGARDING HOW E-ASSIGNMENTS ARE CONDUCTED? (Space to type comments)				
E: GROUP PROJECTS				
Rating scale: E=Essential feature U=Useful feature N=Not necessary				
E-GROUP PROJECTS MAY BE USED AFTER CONSIDERING THE FOLLOWING:		**E**	**U**	**N**
E1	Lecturers need to design e-group projects in such a way that they will enable students to acquire practical experience in IT.	**E**	**U**	**N**
E2	Lecturers need to design e-group projects in such a way that they will enable students to acquire the necessary skills in IT.	**E**	**U**	**N**

E3	E-group projects should encourage students to apply what they have learned practically in an authentic context.	**E**	**U**	**N**
E4	Members of groups doing e-group projects should be heterogeneous in order for the students to learn from one another and share ideas.	**E**	**U**	**N**
E5	E-group projects must be designed in advance, i.e. in the beginning of the semester or the year, and not later.	**E**	**U**	**N**
E6	Peer assessment can be used in e-group projects.	**E**	**U**	**N**
DO YOU HAVE ANY SUGGESTIONS OR COMMENTS REGARDING HOW E-GROUP PROJECTS ARE CONDUCTED? (Space to type comments)				
F: CASE STUDIES				
Rating scale: E=Essential feature U=Useful feature N=Not necessary				
CASE STUDIES MAY BE USED IN E-ASSESSMENT AFTER CONSIDERING THE FOLLOWING:		**E**	**U**	**N**
F1	E-case studies must require students to think critically.	**E**	**U**	**N**
F2	E-case studies must require students to apply higher cognitive skills.	**E**	**U**	**N**
F3	E-case studies must require students to come up with solutions to real-world problems.	**E**	**U**	**N**
DO YOU HAVE ANY SUGGESTIONS OR COMMENTS REGARDING HOW E-CASE STUDIES ARE CONDUCTED? (Space to type comments)				

PRINCIPLES OF GOOD E-ASSESSMENT				
A: FAIRNESS				
Rating scale: E=Essential feature U=Useful feature N=Not necessary				
E-ASSESSMENT ALWAYS NEEDS TO BE FAIR, AND SHOULD CONSIDER THE FOLLOWING:		**E**	**U**	**N**
A1	The content that is assessed through the e-assessment task should fall within the scope of the relevant IT module's curriculum.	**E**	**U**	**N**
A2	The e-assessment task does not favour/benefit only certain students.	**E**	**U**	**N**
A3	The marking of the e-assessment tasks by the assessor should be consistent.	**E**	**U**	**N**
A4	The automated marking of the e-assessment tasks by the system should be consistent.	**E**	**U**	**N**
A5	The assessor who sets and/or marks the e-assessment task should be adequately trained to create e-assessment tasks.	**E**	**U**	**N**
A6	The assessor who marks the e-assessment task should award marks for the different steps that students must follow in order to arrive at the final answer.	**E**	**U**	**N**
A7	The e-assessment task should include both higher order questions/tasks and lower order questions/tasks, more especially if the platform selects questions at random.	**E**	**U**	**N**

A8	Students' prior knowledge and understanding should be considered when designing/selecting e-assessment tasks.	**E**	**U**	**N**
A9	Students' levels of technology experience should be considered when designing/selecting e-assessment tasks for students.	**E**	**U**	**N**
DO YOU HAVE ANY SUGGESTIONS OR COMMENTS REGARDING THE FAIRNESS OF E-ASSESSMENT TASKS? (Space to type comments)				
B: PRACTICABILITY/FEASIBILITY				
Rating scale: E=Essential feature U=Useful feature N=Not necessary				
ALL E-ASSESSMENT TASKS MUST BE PRACTICABLE/FEASIBLE, AND THE FOLLOWING MUST BE CONSIDERED:		**E**	**U**	**N**
B1	The e-assessment environment should be conducive to learning (e.g. it should not cause unnecessary pressure, etc.).	**E**	**U**	**N**
B2	Lecturers (i.e. assessors) should be trained in how to insert complicated texts such as formulae and symbols that are required in some IT modules (e.g. programming, mathematics, etc.).	**E**	**U**	**N**
B3	Students (if possible) should be trained in how to insert complicated text such as formulae and symbols that are required in some IT modules (e.g. programming, mathematics, etc.).	**E**	**U**	**N**
B4	Students should not be overloaded with e-assessment tasks to perform.	**E**	**U**	**N**

B5	Lecturers' (i.e. assessors') marking load should be manageable.	**E**	**U**	**N**
DO YOU HAVE ANY SUGGESTIONS OR COMMENTS REGARDING THE PRACTICABILITY/FEASIBILITY OF E-ASSESSMENT TASKS? (Space to type comments)				
C: RELIABILITY				
Rating scale: E=Essential feature U=Useful feature N=Not necessary				
E-ASSESSMENT TASKS MUST BE RELIABLE. THIS REQUIRES THE FOLLOWING CONSIDERATIONS:		**E**	**U**	**N**
C1	When similar students do the same e-assessment tasks under similar conditions, they should obtain similar results.	**E**	**U**	**N**
C2	The marking of e-assessment tasks by assessors should be consistent.	**E**	**U**	**N**
C3	The automated marking of e-assessment tasks by the system should be consistent.	**E**	**U**	**N**
C4	The e-assessment tasks should be well aligned with the relevant learning outcomes, assessment criteria, and the teaching/learning activities being used.	**E**	**U**	**N**
C5	The types of e-assessment tasks should be frequently varied / alternated.	**E**	**U**	**N**
DO YOU HAVE ANY SUGGESTIONS OR COMMENTS REGARDING THE RELIABILITY OF E-ASSESSMENT TASKS? (Space to type comments)				

D: VALIDITY				
Rating scale: E=Essential feature U=Useful feature N=Not necessary				
THE E-ASSESSMENT TASKS MUST BE VALID. THIS REQUIRES THE FOLLOWING CONSIDERATIONS:		**E**	**U**	**N**
D1	The e-assessment task should assess only the content the students were required to study.	**E**	**U**	**N**
D2	The e-assessment task should only assess the achievement of the relevant, prescribed learning outcome(s).	**E**	**U**	**N**
DO YOU HAVE ANY SUGGESTIONS OR COMMENTS REGARDING THE VALIDITY OF E-ASSESSMENT TASKS? (Space to type comments)				

END OF THE QUESTIONNAIRE

THANK YOU FOR YOUR PARTICIPATION

ATTACHMENT: GLOSSARY OF TERMS USED IN THIS QUESTIONNAIRE

For purposes of clarity, short explanations of some of the terms used in the questionnaire are given below. (Note: To go back to the questionnaire, please click here):

E-assessment involves the use of any information and communication technological devices to create, deliver, store and/or report students' assessment tasks, products, marks and to provide them with feedback. Examples of devices that can be used to create and implement e-assessment tasks include laptops, desktop computers, smart phones, iPads, Android tablets, etc. In the context of this study, e-assessment involves the posting of assessment tasks on CTI's online learning management system (known as myLMS), and the students' subsequent online completion of these tasks, the marking of these tasks, the storage of their responses and the reporting of their performance via the myLMS system.

Assessment tasks that are in a '**synchronous mode**', require that all the enrolled students get access to the task at the same time until an exact cut-off time. Thus, all of them will only have access to the task at the same time until the same cut-off time. (e.g. all of them may only start with the task on a particular day at exactly 09:00 and will only be able to complete the time in two hours; i.e. their access to the task will be cut off at exactly 11:00 the same day).

This is similar to traditional test or exam papers for which students get a fixed duration limit, and where all the students are in the same room while writing the paper; say a 3-hour paper to be written strictly from 09:00 to 12:00.

However, an assessment task that is in an '**asynchronous mode**", does not require of students to access the task at the same time. It means that a student can access the task at any time that best suits her/him to perform the task or make a contribution to the task. A *discussion forum/discussion board* is a typical example of an asynchronous task. (They may be limited through a cut-off date and/or time, however.)

Forms of e-assessment, are approaches or strategies for assessing students that relate to a particular major purpose.

Diagnostic e-assessment, is carried out to determine what students know and what they can do, so as to identify their strengths, weaknesses, skills, and knowledge. This form of assessment enables lecturers to plan instructions that will build on students' strengths and also meet their weaknesses. That is, it allows lecturers to make informed decisions regarding on what to spend more time and effort in their teaching. Diagnostic assessment may take place at the beginning of a semester or a unit/chapter of study.

Formative e-assessment, is planned and performed by lecturers to identify the capabilities (i.e. the strengths and weaknesses) of their students. Information (e.g. evidence) that the lecturers gather from the students may be used by him/her to provide constructive feedback for students as to where they erred and what they did well, which may in turn help the students to improve their learning. This means that formative assessment focuses on improvement in student learning rather than on a student achieving a higher grade/mark.

Summative e-assessment, refers to approaches or strategies created to verify students' knowledge, skills and attitudes at a particular point in time and to determine whether or not they have met the course's learning outcomes. In other words, summative assessment is used to assess, verify, and indicate students' level of learning after a particular learning period. The grades or marks that are awarded to students are based on the validity and authenticity of the students' work.

E-assignment refers to an online task or an activity given to students, typically as part of their studies.

Information Technology (IT) refers to the subject or discipline that is taught at CTI and involves the study and application of computer technology (i.e. the entire programme of studies one is doing).

Learning Management System (LMS) refers to a software tool that is used by lecturers for managing, monitoring and creating teaching and learning activities for their students.

Module refers to a programme or course that, together with other modules, is a building block of a whole qualification as offered by a higher education institution.

APPENDIX C:

FINDINGS AND DISCUSSIONS OF THE PILOT SURVEY QUALITATIVE QUESTIONNAIRE DATA

C1 PARTICIPANTS' DEMOGRAPHIC CHARACTERISTICS

This section discusses participants' demographic characteristics that were gathered during the pilot survey among lecturer and student participants. For the purpose of this study, gender was the only demographic characteristic collected from the lecturer participants. However, for the student participants, the demographic characteristics collected were gender, home language and age.

In the context of this chapter, the term 'majority' implies the highest number of selections made by the research participants for specific categories/types/concepts and is therefore not necessarily an indication of a frequency of 50% or more.

C1.1 Response rates in the pilot survey

All the student *(N=7)* and lecturer *(N=5)* participants who were invited to take part in the pilot survey agreed to take part and none of them needed to be disqualified.

C1.2 Demographic characteristics of the pilot survey participants

During the pilot survey, seven (7) IT students and five (5) IT lecturers from the Faculty of Information Technology at CTI, completed the proposed questionnaire and subsequently also provided feedback pertaining to the questions in the questionnaire. The participants were from the Bloemfontein campus where I was teaching at that time and the sampling of participants may therefore be typified as convenient sampling.

C1.2.1 Gender

The majority [85.7%, (6)] of the pilot student participant group (N=7) were male. Similarly, the majority [60%, (3)] of lecturer participants (N=5) were also male. Although the males dominated in both participant groups, the aim of the pilot study was not to distinguish between the findings with regards to gender but rather the ability of the pilot participants to provide rich information that would be significant to the research study, as well as whether amendments had to be made to the two questionnaires.

C1.2.2 Home language of the pilot student participants

Table C1 indicates the home language distribution of the student participants. The majority of the student participants indicated Sotho as their home language [71.4%, (5)]. This was followed by Afrikaans [14.2%, (1)] and English [14.2%, (1)] as home languages.

Table C1: Home language distribution of student participants *(N=7)*

Language(s)	Number of participants	Percentage (%)
Afrikaans	1	14.2%
English	1	14.2%
Sotho	5	71.4%

C1.2.3 Age

All the student participants who took part in the pilot survey were between the ages of 18 to 23 [100% (7)]. This distribution was as a result of the condition that the student participants should be eighteen years old or above.

C2 FINDINGS AND DISCUSSIONS OF THE PILOT SURVEY QUALITATIVE QUESTIONNAIRE DATA

In this section, the responses of the participants to every question in the pilot survey questionnaires are discussed briefly. The purpose of the pilot survey was to provide the lecturer and student participants the opportunity to inform me concerning the questions they might not have understood as well as to provide general comments regarding the questions in the questionnaires. The participants' feedback was indeed used to finalise the questionnaire. The questions in the pilot survey questionnaires were based on the themes/topics that emanated in the literature review. The findings are reported here according to the questions in the respective questionnaires.

C2.1 Lecturers' responses to their pilot questionnaire

This section reports on how the lecturer participants answered the different questions in their pilot questionnaire and how the questions were eventually amended.

C2.1.1 Students' assessment through paper-based and/or e-assessment tasks

With regards to paper-based tasks, the different lecturer participants indicated they assessed their students either twice a semester (i.e. during semester test and examination) [40%, (2)], or throughout the semester [40%, (2)]. Some, however indicated that they did not assess their students often [20%, (1)] because their students were not used to technology (see 3.3.12.9). Pertaining to e-assessment tasks, some lecturer participants [40%, (2)] used them mostly with students at higher year levels. A few others [40%, (2)] used up to six e-assessment tasks and this was for the sake of continuous assessment. One participant [20%, (1)] reported that he/she had never used e-assessment.

The lecturer participants responded well to this question, most probably since paper-based and/or e-assessment tasks were capitalised in the questionnaire. However, they failed to provide reasons why they used paper-based and/or e-assessment tasks.

L P1: "Almost half of the assessment I give to my students are paper based since students are not yet comfortable with the assessment technology. I give my students paper based assessment throughout the semester."

L P2: "In the beginning of the semester for my first years and throughout the semester for my senior students. I use them for semester test and exams. For continuous assessment, I use e-assessment and I do about six exercises during the semester."

L P3: "I use e-assessment tasks up to 6 times per semester for continuous assessment."

L P4: "…not often."

L P5: “Twice a semester. First time during semester test and during the final exam. All assessments are paper based.

C2.1.2 The value of e-assessment

All the pilot participants [100%, (5)] reported that they valued e-assessment. Reasons provided included the instant feedback (see 3.3.7), its flexibility (see 3.3.8), the reduced marking load (see 3.2.6, 3.3.8, 3.3.10) and the ease of reporting student answers (see 3.3.8). Lecturers responded well to this question and no changes were made.

L P1: “… student responses are instantly evaluated.”

L P2: “… it provides prompt feedback to the students.”

L P3: “they reduce marking time.”

L P4: “it eases mark analysis.”

L P5: “It is very effective and flexible.”

C2.1.3 Lecturers’ experience in the teaching and learning of IT

All the lecturer participants [100%, (5)] of the pilot survey had five (5) years of teaching experience in IT. The year levels they taught were higher certificate [20%, (1)], year level 1 [60%, (3)], year level 2 [60%, (3)] and year level 3 [40%, (2)]. Keywords such as *how long and year levels* were capitalized.

L P1: “It has been 5 years. At CTI, I have been teaching higher certificates, first and second years of BSc in IT.”

L P2: “5 years’ experience at levels 1, 2, and 3.”

L P3: “I have 5 years’ experience at the undergraduate levels 1, 2 and 3.”

C2.1.4 How lecturers’ assessment practices have changed and/or improved over the years

Majority of the lecturer participants [80%, (4)] indicated that they have now moved towards the use of e-assessment as compared to previous years. Some of the lecturer participants seemed [40%, (2)] more comfortable with the e-assessment tools and are able to provide more practical exercises [20%, (1)] for students by using these tools. One participant [20%, (1)] do more e-assessment. Some, however mentioned that nothing has changed about their assessment [20%, (1)] since they still use paper-based assessment tasks. In this question, the words *changed and/or improved* were capitalized.

L P1: “In the beginning, I relied a lot on the paper based assessment, but now I do more e-assessment.”

L P2: “I now use e-assessment because as a lecturer I am now more familiar and comfortable with the available assessment tools.”

L P3: “I now do more practical exercises.”

L P4: “I have developed in terms of assessment development as well as the advent of e-assessment.”

L P5: “All assessments are paper-based and nothing has changed.”

C2.1.5 Forms of assessment

The lecturer participants were asked what form(s) of assessment (i.e. diagnostic, formative, summative, peer and/or self-assessment) they used to assess their IT students. All of the participants [100%, (5)] indicated that they used formative (see 2.9.2) and summative assessment (see 2.9.1). Formative assessment was used throughout the semester to monitor the students’ learning (see 2.9.2) and/or to provide effective feedback (see 2.9.2, 2.9.2.1.3). Summative assessment was used at the end of the semester (see 2.9.1), for example an examination (see 2.9.2.1). Some participants [60%, (3)] indicated that they used diagnostic assessment in the beginning of the semester to determine the strengths and weaknesses of their students. Regarding peer assessment (see 2.9.3.2), it was also used throughout the semester by [40%, (2)] participants to ensure team work and the sharing of ideas by students. Some of the lecturer participants [40%, (2)] reported that they had created test banks for their students to use for self-assessment (see 2.9.3.2). This was done to determine students’ level of understanding of the IT module.

The heading *form of assessment* was capitalized in the question. One participant made mention of baseline assessment as a form of assessment.

L P1: “I use diagnostic assessment in the beginning of the semester to identify students’ weakness and strengths and planning my lecturing accordingly. This is called baseline assessment at CTI.”

L P2: “I use formative assessment throughout the semester to gauge how much students have grasped concepts.”

L P3: “I use summative assessment at the end of the semester to give final grading.”

L P4: “I use peer assessment throughout the semester to enforce team work and sharing of ideas.”

L P5: “Self-assessment is done throughout the semester to evaluate level of assessment. A database or test bank is made available for students to test themselves during self-study.”

C2.1.6 Assessment tasks in general

The assessment tasks mostly used by the lecturers were presentations, examinations (see 3.2.4.1, 4.6.2.1), quizzes (see 3.2.4.1), multiple choice questions (see 3.2.4.1, 4.7.2), assignments (see 3.2.4.1, 4.6.2.2) and tests (see 3.2.4.1, 4.6.2.3). According to some of the lecturers [40%, (2)], presentations were used as formative assessment which also improved the students’ communication skills or their ability to engage with the presenters by asking questions. Some of the participants [60%, (3)], indicated that they used quizzes and/or multiple choice questions on the e-assessment platform because of the ease of automated marking (see 3.3.10).

For the sake of clarity, the heading *assessment tasks* and words such as *what, like, dislikes* were capitalized.

L P1: “Presentations and written exams. I use them as formative assessment during the semester.”

L P2: “Presentation improves students’ communication skills and allows other students who are not presenting to participate since they can ask questions for more clarifications.”

L P3: “Written tests are very typical way of assessing students and I think most students are comfortable with it.”

L P4: “Assignments, tests and exams.”

L P5: "…quizzes and multiple choice questions because these are automatically evaluated by the LMS."

C2.1.7 Lecturers' experiences and opinions about myLMS

Most of the lecturer participants [80%, (4)] were positive in their answers to the question about the use of myLMS in assessing their students. Some reported that myLMS indicated prompt feedback (see 3.3.10) and automated marking (see 3.3.10), and/or a reduced workload (see 3.3.10). Only one participant [20%, (1)] stated a negative remark, namely the inappropriate network and internet connectivity (see 3.3.12) made it difficult to use myLMS in assessing their IT students. The keywords *like* and *dislike* were capitalized in the question to indicate their importance in the question.

L P1: "…for lecturers, it is fast to do the marking and students gain confidence in using technology."

L P2: "I like the idea of quick, prompt feedback to learners."

L P3: "it reduces my marking workload."

L P5: "…The problem is internet and network connectivity. Any network failure means that the assessment may need to be postponed."

C2.1.8 Deadlines and time limits for assessment

All of the participants [100%, (5)] supported the idea of setting deadlines and time limits for the submission and completion of assessments tasks. One participant [20%, (1)] reported that the deadlines and time limits would provide the students with the necessary soft skill (i.e. time management) in the world of work. Others advised that deadlines and time limits should be reasonable. For example, it should still allow students to achieve the intended outcome of the assessment task and consider the amount of information the student should provide. Another lecturer participant indicated that the type and difficulty of the questions should be considered when setting deadlines and time limits.

In this question, *setting deadlines* and *time limits* were subsequently capitalized to draw the attention of the participants to the significance of these words when responding to this question.

L P1: “It is necessary to set deadlines. Students need to be trained to meet deadlines since they will need this soft skill at work.”

L P2: “Deadlines should be reasonable otherwise the assessment will not achieve the intended results.”

L P3: “Every test whether it is paper based or e-assessment, there is always time limit.”

L P4: “You have to consider the amount of content that the student has to give and provide for such adequately.”

L P5: “Duration of the assessment is determined by types of questions and complexity of the assessment.”

C2.1.9 Relation between students’ marks and how and what they have learned

Some the lecturer participants [80%, (4)] confirmed that there was a relation between students’ marks and how and what they have learned. However, one participant indicated that the question was not clear. Participants indicated that some of the factors that determine students’ marks included their knowledge about the module, effectiveness of lecturers’ teaching methods (see 2.2.4.1, 2.2.4.2), and student’s attitude towards the module (see 2.2.4.1, 2.2.6.4).

The keywords *relation, students’ marks, how* and *what* were subsequently capitalized in the question to indicate to the participants that they needed to respond to this question based on these keywords.

L P1: “There is a correlation between marks and knowledge obtained.”

L P2: “It depends on the effectiveness of the teaching method used.”

L P3: “Marks obtained depends on students’ attitude towards the module itself.”

L P4: “It depends on the students’ knowledge of the module.”

L P5: “This is not clear.”

C2.1.10 IT students' knowledge about the content that they will be assessed on

One of the lecturer participants mentioned that students' knowledge about the content that they would be assessed on, enabled them (the students) to have better control of the content [20%, (1)] and narrowed students' research focus [20%, (1)]. Nevertheless, some stated that students tend to be lazy [20%, (1)], and skip classes [40%, (2)] when they are aware of the content they would be assessed on. Assessment is fair (see 2.6.2.1) and valid (see 2.6.2.2) if students are aware of the content on which they will be assessed as confirmed by the literature (see 2.7.3.2, 2.7.3.3, 3.2.10.2, 4.4).

For the sake of clarity, the words *informing* and *content* were capitalized in this question after the pilot.

L P1: "…students dominate all the content in the module."
L P2: "It narrows their research focus."
L P3: "It makes them lazy."
L P4: "It is good even though it affects other students because they would not always attend classes."
L P5: "I think it is necessary."

C2.1.11 IT students' knowledge about the assessment criteria according to which they will be assessed

When students are aware of the assessment criteria according to which they would be assessed, it makes the assessment to be fair [40%, (2)], it helps students to understand and take control of the content of the IT module [20%, (1)] and focus on the important areas of the assessment tasks [20%, (1)]. One participant [20%, (1)] further reported that it requires an alignment between teaching, learning and assessment. Assessment is reliable (see 2.6.2.3) and valid (see 2.6.2.2) if students are aware of the assessment criteria according to which they will be assessed.

For the sake of clarity, the words *informing* and *assessment criteria* were subsequently capitalized in this question.

L P1: “I think it is necessary because students need to understand and dominate all the content in the module.”

L P2: “…so that they know what the important aspects of the assessment are.”

L P3: “To satisfy principle of fair assessment.”

L P4: “This will provide fair assessment.”

L P5: “…there should be the alignment between teaching, learning and assessment.”

C2.1.12 Providing feedback to students and its possible effect on students’ performance

All the participants [100%, (5)] were positive about the need to provide feedback to their students. They mentioned that feedback had a positive effect on their students’ learning because it helped the students to identify their mistakes and improve on them (see 3.2.9.10, 3.3.7), it helped their students to answer questions appropriately, it improves students’ learning curve (i.e. the way they learn) and it motivated students to have a change in attitude towards the module.

L P1: “It is very crucial for students to know what they did wrong or right so that they can improve.”

L P2: “It is critical. Feedback motivates change in attitude and effort as well as positive reinforcement.”

L P3: “It allowed students to answer questions in the expected manner.”

L P4: “It has a positive effect on the learners’ learning curve.”

L P5: “Feedback allows the students to know their mistakes and improve.”

C2.1.13 Principles of e-assessment

The lecturer participants were asked whether the e-assessment tasks that they let their IT students do were fair, practicable/feasible, reliable and/or valid. Some indicated that their e-assessment tasks were fair [40%, (2)] (see 2.6.2.1, 3.3.6.3), practicable/feasible [20%, (1)] (see 2.6.2.4, 3.3.6.4) and/or or valid [40%, (2)] (see 2.6.2.2, 3.3.6.1). Reasons provided were that the content of the assessment was within the scope of the module and that he/she is adequately trained in assessment development. None of the lecturer participants indicated whether their e-assessment tasks were reliable or not (see 2.6.2.3, 3.3.6.2).

The questions pertaining to the principles of good assessment (i.e. fair, practicable/feasible, reliable and valid) were not answered well at all in the pilot survey. My promoter and I therefore decided that I should insert a shaded textbox in the final survey questionnaire that would direct the participants to the glossary of terms which included explanations of the meanings of fair, practicable/feasible, reliable and valid.

L P1: "They are fair; I always assess the content within the scope of the module."
L P2: "To a huge extent because I have been adequately trained in the development of assessments."
L P3: "Yes they are fair."
L P4: "They are practicable."
L P5: "My tests are within the content covered."

C2.1.14 The use of IT students' assessment results

Some of the lecturer participants confirmed that they used their IT students' assessment results for academic records to determine if a student has passed or failed [40%, (2)] (see 2.6.1), to provide students feedback for improvement [20%, (1)] (see 2.6.1), to adjust their own teaching methods [20%, (1)] (see 2.6.1), and to determine students' predicate [20%, (1)] (see 2.6.1).

Although the lecturer pilot participants responded well to this question, the word *use* was subsequently capitalized for the sake of clarity.

L P1: "…for students' academic records whether they have passed or failed the task."
L P2: "I use their marks to give them feedback for improvement."
L P3: "To adjust my teaching methods."
L P4: "To perform grading."
L P5: "To get the credit."

C2.1.15 Quality e-assessment

According to some of the lecturer participants, quality e-assessment requires that errors and biases are avoided in the e-assessment task [20%, (1)] (see 2.6) and that the e-assessment task is relevant [20%, (1)], reliable [20%, (1)] (see 2.6.2.3, 3.3.6.2), and practicable [20%, (1)] (see 2.6.2.4, 3.3.6.4). One participant [20%, (1)] also indicated that quality e-assessment occurs when marks awarded to the questions in the e-assessment tasks are correct and fair (see 2.6.2.1, 3.3.6.3).

This question was well responded to; however, the keyword *quality e-assessment* was subsequently capitalized to draw the attention of its importance in the question.

L P1: "An evaluation of the extent to which systematic errors and biases have been prevented."

L P2: "Relevant, reliable and practicable."

L P3: "If marks are awarded correctly and fairly."

C2.1.16 Prior experience of and knowledge about student assessment

Some of the lecturer participants confirmed that it was important for lecturers to have prior experience of and knowledge about student assessment. Two participants [40%, (2)] indicated that they could develop assessment tasks that have the right content and for the appropriate level of students [40%, (2)]. Furthermore, one lecturer indicated that it helped to link his/her teaching with the assessment tasks that they develop.

The keywords *prior experience of, and knowledge about student assessment* were capitalized afterwards since the lecturer pilot participants did not really respond well to the question.

L P1: "A lecturer needs to have enough knowledge of each assessment she/he intends to use so that the lecturer uses the right assessment for the right content and to the right level of the students."

L P2: "The level and content can determine which assessment can best be used."

L P3: "So that there could always be a direct link between teaching and assessments."

C2.1.17 Suggestions and recommendations pertaining to e-assessment

The following suggestions and recommendations were reported by the lecturer participants:

- E-assessment tasks should be creative and exciting [20%, (1)] (see 2.3.1, 2.3.2, 2.4.2, 2.9.2.1.4).
- Variety of e-assessment methods should be used by the lecturers [20%, (1)] (see 3.3.4).
- Adequate resources must be available when completing e-assessment tasks [20%, (1)] (see 3.2.9).
- Proper training should be in place on how to use e-assessment tools [20%, (1)] (see 3.2.8.11, 3.2.9.3, 3.3.1, 3.3.12.9).
- We need training on how to develop quality e-assessment [20%, (1)] (see 3.2.8.11, 3.2.9.3, 3.3.1, 3.3.12.9).

For the sake of clarity, the keywords *suggestions, recommendations* and *e-assessment* were subsequently capitalized.

L P1: “They must be creative and come up with exciting assessments.”

L P2: “They must use a variety of e-assessment methods and not abuse any one or a few of them.”

L P3: “They can be implemented if there are adequate resources to conduct the assessment.”

L P5: “Proper training must be conducted with all parties.”

C2.1.18 Report on the lecturers’ pilot survey

In general, the lecturers’ responses to the pilot questionnaire were a bit disappointing compared to that of the students. Based on the responses of the lecturers, my promoter and I decided that I should change some of the wordings of the questions. Furthermore, key words in the questions were subsequently capitalized to draw the attention of the participants to the key issues involved. Baseline assessment was added as a form of assessment in the final survey questionnaire because one of the lecturer participants mentioned it in his/her response. Unfortunately, most of the pilot lecturer participants did not comment on the formulation of the questions in the pilot survey even though they were asked to. Only one participant indicated that the question pertaining to the r*elation between students' marks and how and what they have learned* was not clear (see C2.1.9).

C2.2 Student participants' responses to their pilot questionnaire

This section reports on how the student participants answered the different questions in their pilot questionnaire and how the questions were subsequently amended.

C2.2.1 Students general experiences and perceptions of assessment in IT

The seven (7) student participants were asked about their opinions of the need for assessment; how and how often they are assessed; and their knowledge of what and how they would be assessed. The question consisted of three separate sub-questions.

The student participants indicated that they were assessed in order for their lecturers to monitor their learning progress [43%, (3)] (see 2.6, 2.6.1), to test their knowledge and level of understanding [29%, (2)] (see 2.6, 2.6.1), and to evaluate their performance [29%, (2)] (see 2.6, 2.6.1).

S P1: "…They need to assess me in order to get to know my day to day improvement."

S P2: "…To test our knowledge of what we know at our current."

S P3: "…To check at what level our understanding of the work covered is."

S P4: "…To evaluate my performance in class and assist in areas I struggle with."

S P5: "…To monitor my performance and help me where I need help."

S P6: "…To ensure we fully understand the module at hand."

Participants reported that they were assessed either through paper-based [71.4%, (5)]; or myLMS assessments [29%, (2)].

S P1: "Paper-based."

S P2: "Most of the time it is paper based."

S P3: "…on paper."

S P4: "We are assessed on myLMS."

S P5: “Through paper-based assessment and on myLMS to monitor my performance and help me where I need help.”

S P6: “Every month I write assessment test on paper-based

Some participants mentioned that they were assessed every month [29%, (2)], at the beginning of each semester [29%, (2)]; and three to five times per semester [43%, (3)].

S P1: “Thrice a semester.”

S P2: “We are assessed at the beginning of the semester.”

S P3: “Roughly 3-5 times a semester.”

S P4: “We are assessed on average every month.”

S P5: “Beginning of each semester.”

S P6: “Every month.”

S P7: “About five times.”

Regarding their knowledge of what and how they will be assessed, all the participants [100%, (7)] reported that it influenced their learning and performance positively because they were able to prepare adequately since they focused on the important areas and they were able to deliver what was expected of them.

S P1: “I am able to study only the important things.”

S P2: “It makes it easier for me to learn because I focus on the scope that will come in the test.”

S P4: “It helps me to prepare well for the test because I know exactly what to learn.”

S P7: “Knowing how I would be assessed improves my learning because it prepares me for semester test and final exams and I am able to adequately prepare.”

The three separate questions were well answered and no changes were made.

C2.2.2 Forms of assessment

The student participants were asked about their experience about assessment tasks that carry marks; tasks that do not carry marks; peer assessment; and self-assessment. They were also asked to identify their preferred form of assessment.

Some of the students [43%, (3)] reported that tasks that carried marks motivated them to study hard. Reasons they provided were that tasks that carried marks improves their predicate [14%, (1)] and the marks motivate them [29%, (2)].

S P1: "I feel assessment tasks that carry marks is a good practice because it boosts some students predicate."

S P2: "…assessment tasks that carry marks motivate me to actually sit down and study my work because of the marks."

With regards to tasks that do not carry marks, some of the student participants indicated that they were good because they prepared them for tests (see 3.2.4.1, 4.6.2) and examinations [29%, (2)] (see 3.2.4.1, 4.6.2.1); it improved their knowledge and level of understanding [43%, (3)]. However, some students [29%, (2)] felt that these tasks were boring and too easy.

S P1: "I also feel assessment tasks that do not carry marks is a good practice because it helps me to learn for test and exams."

S P3: "Assessment tasks that do not carry marks are good because it gets us prepared for main tests and exams and it helps you to gain knowledge and understand the work in a subject."

S P6: "They are boring and easy."

Most of the student participants [71.4%, (5)] were very negative about peer assessment (see 2.9.3.2, 2.9.3.2.1) since they were not motivated to do them and they felt their peers were not fair in the assessment process. Some participants [29%, (2)] were subjected to peer assessment as a tool to identify their strengths and weaknesses (see 2.9.3.2).

S P1: “I feel peer assessment is not fair.”

S P3: Peer assessment helps me to know strengths and weakness.”

S P4: “I feel peer assessment is more affected by bias than a lecturer.”

Self-assessment enabled some of the students to identify their strengths and weaknesses [86%, (6)] (see 2.9.3.2); and one indicated that he/she was then motivated to do more [14.3%, (1)].

S P5: “Self-assessment is fair because I know my weaknesses and strong points therefore I can assess myself based on what I know and don’t know.”

S P7: “…Self-assessment because I am able to assess myself.”

The majority of the student participants [71.4%, (5)] indicated that assessment tasks that carry marks were their preferred form of assessment. Reasons provided included the motivation that comes with such tasks [29%, (2)], the ability to study harder [14%, (1)] and the marks that are obtained [29%, (2)]. The other participants [29%, (2)] identified self- and peer assessment as their preferred forms of assessment. Reasons provided included the ability to determine his/her strengths and weaknesses [14%, (1)] and assess himself/herself [14%, (1)].

S P1: “I like assessment tasks that carry marks because I am motivated to do them.”

S P2: “I prefer assessment tasks that carry marks because of the marks.”

S P3: “Assessment tasks that carry marks.”

S P4: “I will choose assessment tasks that carry marks because it helps me to study hard because I get marks for my hardwork.”

S P5: “Self-assessment because I know my weaknesses and strong points therefore I can assess myself based on what I know and don’t know.”

S P6: “I prefer assessment tasks that carry marks. I feel that the reward of doing well is a good motivation”

S P7: “I would choose peer assessment and self-assessment because I am able to assess myself.”

The pilot student participants responded very well to this question. However, the words *peer* and *self* were capitalized for the sake of clarity.

C2.2.3 Types of assessment task that IT students do

The student participants were asked about the types of assessment tasks that they do; the format of instructions for the assessment tasks; and whether or not these tasks test their knowledge and skills of IT.

The assessment tasks identified by all the student participants [100%, (7)] were tests (see 3.2.4.1, 4.6.2), examination (see 3.2.4.1, 4.6.2.1), assignments and projects (see 3.2.4.1, 4.6.2.2).

S P1: “We are assessed mostly about continuous assessment tests and main projects.”

S P3: “We are required to do tests, exams and assignments.”

S P5: “Tests, exams, practical and assignments.”

S P6: “…Assignment and projects.”

All the student participants [100%, (7)] confirmed that these assessment tasks tested their knowledge and skills in IT. Some indicated that these tasks motivated them to study harder and beyond the module requirements [29%, (2)]; that they acquired more knowledge and practical experience [43% (3)]; and they were able to determine their performance in the module [29%, (2)].

S P1: “…Firstly, it helps us to gain marks to boost our predicate to write exams and the project assessment in software development helps us to grow in terms of working with others in the working field.”

S P2: These types of assessments only test our theory; we lack assessment in a practical aspect.”

S P3: “…This helps us to gain more knowledge through studying and the assignment help us to learn more than what we cover in class because we do a lot of research.”

S P4: “They expand our knowledge because most of them are based on the real world examples in a way they prepare you tackle the challenges you may face outside.”

S P6: "…Assignment and projects are practical which is a good thing because we gain experience since it forces us to search for things we don't know."

Some of the participants reported that they received their assessment instructions in their study guides [29%, (2)], some through myLMS [57.1%, (4)], and one indicated that he/she also sometimes received the instructions verbally [14.3%, (1)].

S P1: "…in guides."

S P2: "…assignments on myLMS."

S P3: "…myLMS."

S P7: "…Verbally."

Baseline assessment was added as a form of assessment in the final survey questionnaire since some of the student participants indicated that it was used at CTI.

C2.2.4 Types of question in assessment task

The student participants were asked of their experiences with short answer questions and whether or not these tested their level of understanding of what they have learned. All the student participants [100%, (7)] indicated that short answer questions (see 3.2.4.1) prepared them for other assessment tasks and tested their knowledge of the module. Some of the participants reported that these questions tested their level of understanding because he/she put in the same effort of studies when preparing for them [14.3%, (1)], he/she had to critically think before answering the questions [14.3%, (1)] and he/she study hard for it [14.3%, (1)]. However, other participants stated that short answer questions were too easy and did not test their level of knowledge of the module [14.3%, (1)].

The question pertaining to the participants' perception of short answer questions had to be rephrased because most of the student participants failed to indicate whether the short answer questions tested their level of understanding of what they had learned. For the sake of clarity, the insertion *too easy or too difficult, or neither of these two* were added to the question.

S P1: “I feel it’s good to answer such questions because it prepares students for other assessment tasks and I study hard for it. They test my understanding.”

S P2: They don’t bother me. Short answer questions are asked for a reason and they are quick to do and prepare us.”

S P3: “I feel they are too easy, and do not test knowledge.”

S P4: “They are confusing.”

S P5: “They do test my knowledge because I still have to know the answer to them.”

S P6: “They do test our level of understanding because I put in the same effort for all my assessment tasks.”

S P7: “They are tricky so in order to answer.”

C2.2.5 Students’ knowledge about what will be assessed and how it will be done

The student participants were asked about the extent that their IT lecturers informed them about what they would be assessed on, how the assessment would be done, and the assessment information they were provided.

According to two of the participants [29%, (2)], their knowledge about what they will be assessed and how it would be done differed depending on who their IT lecturer was. One reported that his/her IT lecturers informed them a month before the assessment [14.3%, (1)], two mentioned that it was done a week before the assessment [28.6%, (2)], while other lecturers informed them at the beginning of the semester [14.3%, (1)]. One participant [14.3%, (1)] indicated that their knowledge about what they would be assessed and how it would be done could enable them to prepare adequately for the assessment tasks. Another participant [14.3%, (1)] mentioned that their IT lecturers went through past papers and rubrics with them.

S P1: “Mostly a week before and they do that to give us time ahead to study and prepare for the assessment.”

S P2: “The lecturers inform us a month before time of our assignments and a week if we are required to write a test/exam.”

S P3: “They all differ. Some inform you months prior.”

S P4: “In the beginning of the semester and it’s good to know how we are going to be assessed because it helps us to know what marks we are going to get.”

Participants reported that the assessment information they were provided with included the criteria to be assessed [43%, (3)] (see 2.6.2.2, 2.9.1.3, 2.9.2.3, 3.3.6.2), rubrics [29%, (2)] (see 2.9.1.3), when the assessment would take place [14.3%, (1)] and how to answer the tasks [14.3%, (1)].

S P5: “We are told what information is being tested, as well as the format in which we will be assessed.”

S P6: “Lecturers inform us in advance about the marking criteria and rubric.”

S P7: “We are also told what criteria we will be assessed against.”

For the sake of clarity, the words *what* and *how* were subsequently capitalized in the final questionnaire.

C2.2.6 Feedback and its impact on students’ learning

All the student participants [100%, (7)] confirmed that they received feedback from their IT lecturers on their performance in assessment tasks. Participants reported that their lecturers sent them e-mails with their assessment tasks (with comments) attached [29%, (2)]; the lecturers discussed their work in class and provided them with feedback [29%, (2)], and that the lecturers went through the memorandum with them in class [29%, (2)]. One participant [14.3%, (1)] indicated that the lecturers provided handwritten comments for each question they answered incorrectly.

S P1: “We mostly get e-mails frequently on how the project or assessment is going.”

S P2: “As soon as possible, either through myLMS or they bring our scripts back.”

S P3: “We get descriptive and correction feedback.”

S P4: “The feedback we are given helps us understand where we went wrong and we can further focus on that and work harder to better our performance.”

S P5: “It helps us to get know how we should have answered a question or dealt with a specific task. And it that cases it improves and broadens our mindset of studying.”

S P6: “They comment on each and every question and at the end of the task. This is done by commenting on the printouts of the task that was submitted.”

S P7: “…Some lecturers work through memorandum and explain why a particular answer was right or wrong.”

Regarding the question of whether the feedback students received had an impact on their learning, the participants reported that feedback they received from their lecturers improved the way they answered questions and their learning [29%, (2)] (see 2.9.2.1.3, 3.3.7, 4.6.2.2), and helped them to determine their weaknesses [71.4%, (5)] (see 2.9.2).

S P3: “…The feedback which we receive points out our errors and how we can improve.”

S P4: “The feedback we are given helps us understand where we went wrong and we can further focus on that and work harder to better our performance.”

S P5: “It helps us to get know how we should have answered a question or dealt with a specific task. And it that cases it improves and broadens our mindset of studying.”

S P6: “It helps us to know our mistakes.”

In this question, *feedback* and *type of feedback* were subsequently capitalized as it was the central focus of importance to this question.

C2.2.7 Fairness of e-assessment tasks

The student participants were asked if the e-assessment tasks that they had to do, were fair.

All the student participants [100%, (7)] reported that all their e-assessment tasks were fair (see 2.6.2.1, 3.3.6.3). Reasons provided were that it did not favour specific group of students [29%, (2)], all have the same opportunity [14.3%, (1)], all the students were given the same assessment tasks and time to complete the tasks [29%, (2)], all the students have access to the same resources on campus [14.3%, (1)] and the tasks increase students’ knowledge and skills [14.3%, (1)].

S P1: “They are fair and it is not advantageous to only some students but all students because it gives us all the opportunity to better our marks and improve our learning strategy.”

S P2: “Yes. Every student in class gets the same assessment tasks, we take it at the same time and hand it in together. So no one gets an advantage over the other.”

S P3: “All of them are fair to me. Every student in class gets the same assessment tasks and at the same time.”

S P4: “All assessments are fair because they increase your knowledge and skills.”

S P5: “I think it is fair, as we all have access to systems capable of accessing myLMS on campus, so there is no reason that we should not be able to access the material.”

S P6: “All students have the same opportunity so it was fair.”

S P7: “We all write the same test and there is no bias.”

The heading *difference* and the keywords *fair/not fair,* and *why,* or *why not* were subsequently capitalized in the question for clarity purpose.

C2.2.8 Content that e-assessment tasks cover (i.e. validity)

The students were asked if their e-assessment tasks that they did, tested the content that they have covered in their IT module. All the participants [100%, (7)] confirmed that their e-assessment tasks covered only the content that they had covered in the module (see 2.6.2.2, 3.3.6.1). In other words, they all confirmed that their e-assessment tasks were valid (see 2.6.2.2).

S P1: “They all are in the content of the module.”

S P2: “Only to the extend where we know the just to we have learned it. This also varies from assessment to assessment.”

S P3: “A high amount of our assessments are related to the work we are studying.”

S P4: “Work covered in tests, assignments and exams are always relevant to the course material we are provided.”

S P5: “All the time.”

S P6: “Very huge because all assessments divide the whole content into sections”

S P7: “All the content of assessment tasks is covered.”

The pilot student participants responded well to this question; however, the phrase *test the content* was subsequently capitalized.

C2.2.9 Comparison of marks obtained for the various e-assessment tasks (i.e. reliability)

The student participants were asked about the relation between the marks that they obtain in different e-assessment tasks. The majority of the students [57.1%, (4)], reported that their marks were consistent. Reasons provided were that they put in the same effort in studying for each task [29%, (2)], the same rules for each module are applied in all e-assessment tasks [14.3%, (1)] and he/she studies hard for all subjects [14.3%, (1)]. However, two participants [29%, (2)] were of the opinion that their marks differed from one IT module to the other. One participant only indicated that his/her e-assessment tasks were fair.

S P1: “I feel they are all fair.”

S P2: They are constant, meaning they are very similar. I work just as hard for every module and study the same for each, so my assessments are almost a reflection of each other”

S P3: “They are calculated the same way; same rules for each module are applied throughout.”

S P4: “Marks are the same because I put in the same effort.”

S P5: “The marks are dependent on the module.”

S P6: “I think my marks differ from modules.”

S P7: “They are the same because I study hard for all the subjects.”

The heading *e-assessment tasks* and the keywords *marks* and *compare* were subsequently capitalized for the sake of clarity.

C2.2.10 Comparison of the marks obtained for the e-assessment tasks, compared with paper-based assessment tasks (i.e. reliability)

The student participants were also asked about the relation or difference between the marks that they obtained in e-assessment tasks and paper-based assessment tasks respectively. The majority of the students [57.1%, (4)], reported that their marks were consistent. Reasons provided were that they put in the same effort in studying for each task [29%, (2)], the same rules for each module are applied in all e-assessment tasks [14.3%, (1)] and he/she studies hard for all subjects [14.3%, (1)]. However, two participants [29%, (2)] were of the opinion that their marks differed from one IT module to the other. One participant only indicated that his/her e-assessment tasks were fair.

S P1: “I feel they are all fair.”

S P2: They are constant, meaning they are very similar. I work just as hard for every module and study the same for each, so my assessments are almost a reflection of each other”

S P3: “They are calculated the same way; same rules for each module are applied throughout.”

S P4: “Marks are the same because I put in the same effort.”

S P5: “The marks are dependent on the module.”

S P6: “I think my marks differ from modules.”

S P7: “They are the same because I study hard for all the subjects.”

The heading *e-assessment tasks, paper-based assessment tasks* and the keywords *marks* and *compare* were all eventually capitalized for the sake of clarity.

C2.2.11 Examples of e-assessment tasks and paper-based assessment tasks

One e-assessment task that most of the student participants [57.1%, (4)] provided was the test (see 3.2.4.1, 3.3.4, 4.6.2.3). Two participants [29%, (2)] mentioned multiple choice and true/false questions and one participant [14.3%, (1)] indicated multiple choice questions.

S P1: “E-assessment tasks – class tests are normally put on myLMS to do.”

S P2: “Practice tests.”

S P3: “Multiple choice and true/false”

S P4: “We sometimes do class tests on myLMS.”

S P5: “We normally do the true/false and multiple choice on myLMS.”

S P6: “Multiple choice.”

S P7: “Our tests are done online.”

The examples of paper-based assessment tasks that the student participants provided were assignments [100%, (7)] (see 3.2.4.1, 4.6.2.2); examinations [100%, (7)] (see 3.2.4.1, 4.6.2.1), continuous assessment [43%, (3)] and semester tests [57.1%, (4)].

S P1: “Exams, semester test, and assignments are paper based.”
S P2: “Semester tests, continuous assessment, exams and assignments.”
S P3: “Paper-based tasks are semester tests, assignments and exams”
S P4: “We do semester tests, exams, assignment on paper.”
S P5: “Exams and assignments are done paper.”
S P6: “Our exams, assignment and continuous assessment are all paper based.”
S P7: “Continuous assessment, assignment, exams.”

The words *examples of the e-assessment tasks* and *paper-based assessment tasks* were capitalized.

C2.2.12 Problems experienced with e-assessment tasks

Six of the student participants [86%, (6)] mentioned that they had no issues with e-assessment tasks. However, one participant [14.3%, (1)] indicated that students cheat during e-assessment tasks by using online search engines.

S P1: “I haven’t encountered any problems concerning assessment so far.”
S P2: I do not. E-assessments are always available when they need to be done; the campus provides free Wi-Fi so there is no problem connecting to the internet”
S P3: “I do not experience many issues with the e-assessment.”
S P4: “One issue that comes to mind is that of people using the easily available browser functions such as searching the internet during a test.”
S P5: “None. It’s pretty easy.”
S P6: “I don’t experience any problems with the e-assessment.”
S P7: “No problems.”

Although the pilot student participants responded well to this question, the keywords *problems* and *e-assessment tasks* were eventually capitalized.

C2.2.13 Value of e-assessment tasks for student learning

All the student participants [100%, (7)] confirmed that e-assessment tasks added value to their learning. Reasons provided were that the tasks are readily available (i.e. anytime and anywhere accessibility) [57.1% (4)] (see 3.2.6, 3.2.6.1, 3.3.10); marks obtained are shown immediately upon completion [29%, (2)] and the tasks added value to his/her career field [14.3%, (1)].

S P1: "All my module assessment adds value to my career field and therefore there is none that do not add value."

S P2: "I can see my marks and do not have to wait for my lecturer to mark."

S P3: I think they add value to my learning because they are more readily available than paper based assessments"

S P4: "They add value because of easily accessibility."

S P5: "I don't have to go to campus to do exercise because I can do them at home in my own time."

S P6: "I am able to see my results immediately."

S P7: "I can access my tasks anytime."

For the sake of clarity, the keywords *e-assessment tasks, add value to or not add value to* were subsequently capitalized.

C2.2.14 Types of assessment task that improve student learning

The types of assessment tasks that the student participants confirmed that they improved student learning were group activity [14.3%, (1)] (see 2.3.2.2, 2.9.2.4, 4.5.2.4), self-assessment [14.3%, (1)] (see 2.9.3.2), tests [14.3%, (1)] (see 3.2.4.1, 4.6.2.3), examinations [14.3%, (1)] (see 3.2.4.1, 4.6.2.1), assignments [14.3%, (1)] (see 3.2.4.1, 4.6.2.2) and practical assessment tasks (see 4.4.1) [29%, (2)].

S P1: “Group activity assessment and self-assessment.”

S P2: Test, exam and assignment assessments”

S P3: “I think practical assessment tasks would help improve my learning the most.”

S P4: “Assignments because they require research and through research you gain more knowledge.”

This question was not well answered by the pilot student participants because each participant mentioned only one example of assessment task that improve their learning. The key phrases *types of assessment tasks, can help most* were eventually capitalized.

C2.2.15 Recommendations for the use of e-assessment in the teaching and learning of IT

Most of the participants [71.4%, (5)] advised that e-assessment tasks should be used more often. Other participants indicated that it should only be used once a week [14.3%, (1)] and to the extent it is being used now [14.3%, (1)].

S P1: “Once a week.”

S P2: To the extent it is being used now.”

S P3: “I think it should be used a lot more than it currently is.”

S P4: “It should. I mean it’s IT after all.”

S P5: “It should be used often since this would save on pricing costs for both students and the campus.”

S P6: “It should be used a lot because the world at large is transforming to a paperless society.”

S P7: “Frequently.”

For the sake of clarity, the phrase *should e-assessment be used or not used* was subsequently capitalized.

C2.2.16 Report on the students' pilot survey

Although the responses to the pilot questionnaire from the student participants were generally satisfying, there were still some questions where the participants' responses were disappointing. My promoter and I decided that I should change some of the wordings of most of these questions in order to invite more relevant answers. Furthermore, some of the keywords, phrases and headings in the pilot questionnaire were eventually capitalized to ensure that the participants focus on these key issues in their answers. None of the pilot student participants, however specifically commented on the formulation of the questions in the pilot survey.

2.3 Synthesis of the pilot survey results

Tables C2 – C19 represents the comparison of both IT lecturers' and IT students' responses of their pilot survey

Table C2: Assessment through paper-based tasks and/or e-assessment tasks

Related pilot survey questions for both the IT lecturers and IT students	IT lecturers' responses	IT students' responses
Assessment through paper-based tasks and/or e-assessment tasks	With regards to paper-based tasks, IT lecturers assessed their students: • Twice a semester (i.e. during semester test and examination). • Throughout the semester. • Not often (i.e. rarely) because their students were not used to the assessment tool (i.e. myLMS). Pertaining to e-assessment tasks, IT lecturers assessed their students: • Mostly with students at higher year levels. • Up to six times (for continuous)	Participants reported that they were assessed either through paper-based or myLMS: • Every month through continuous assessment • At the beginning of each semester • Three to five times per semester.

Related pilot survey questions for both the IT lecturers and IT students	IT lecturers' responses	IT students' responses
	assessment. • One lecturer had never used e-assessment.	

Although the frequency as suggested by both participant groups differed, both participant groups' responses indicated that they used paper-based tasks and e-assessment tasks quite often in their assessment. The main similarities were the fact that both participant groups reported that students were assessed often through continuous assessment. However, one lecturer participant reported that he/she used paper-based because the students were not used to technology. I believe that if students are appropriately trained on how to use the myLMS system it would be easier for them to do e-assessment tasks. Furthermore, I believe one lecturer had never used e-assessment tasks because of lack of training and his/her knowledge of the benefits that come with e-assessment tasks.

Table C3: The value of e-assessment

Related pilot survey questions for both the IT lecturers and IT students	IT lecturers' responses	IT students' responses
The value of e-assessment	• Instant feedback • Flexibility • Reduced marking • Ease of reporting student answers	• Tasks were readily available (i.e. anytime and anywhere accessibility)

Both participant groups indicated that they valued e-assessment. A similar reason provided was the aspect of flexibility where tasks could be accessed from anywhere and at any time. I believe the aspect of reduced marking and ease of reporting student answers were valuable only to the lecturers and that was why it did not appear in the student responses. Although the student participant groups did not indicate instant feedback as a value of e-assessment, they can also benefit from it. With e-assessment, students are able to see the feedback provided by their lecturers and/or the e-assessment system immediately. They are also able to see their e-assessment results immediately. I believe students failed to comment on the aspect of feedback because they have not yet had enough experience of such feedback after e-assessment tasks.

Table C4: Summative assessment

Related pilot survey questions for both the IT lecturers and IT students	IT lecturers' responses	IT students' responses
Summative assessment	• It was used at the end of the semester (e.g. examination); in order to provide students with their final grades.	• It motivated students to study hard; improved their predicate / final grades. • They were more committed to tasks that carried marks; due to the reward (i.e. marks).

Both participant groups agreed that tasks that carried marks and/or summative assessment were undertaken to provide the final grades or the predicate. I believe this was because the marks obtained from semester tests, assignments, continuous assessments and examinations were combined and the average used as students' final grade. The student participant groups were motivated to do tasks that carried marks because they knew it would determine whether they could continue with the course or not.

Table C5: Formative assessment

Related pilot survey questions for both the IT lecturers and IT students	IT lecturers' responses	IT students' responses
Formative assessment	• It was used throughout the semester to monitor the students' learning and to provide effective feedback.	• It prepared students for tests and examinations. • It improved their knowledge and level of understanding. • Some students felt that these tasks were boring and too easy.

Formative assessment was used by both participant groups. Both participant groups reported that this form / task was used to monitor students' progress and their level of understanding in the IT modules. I believe this was so because constant feedback could be provided to the students and that the feedback improved students' learning. The student participant groups indicated that this form of assessment also helped students to prepare for assessment tasks that carried marks. I agree with the student participants because assessment tasks that do not carry marks can indeed allow students to practice more often and receive constructive feedback from their lecturers. This in turn, would enable students to respond to assessment tasks that carry marks effectively.

Table C6: Peer assessment

Related pilot survey questions for both the IT lecturers and IT students	IT lecturers' responses	IT students' responses
Peer assessment	• Used throughout the semester to ensure team work and the sharing of ideas by students; identify students' weaknesses and strengths.	• Students were not motivated to do them; some felt their peers were not fair in the assessment process. • Some participants used peer assessment as a tool to identify their strengths and weaknesses.

Both participant groups reported that peer assessment enabled students to identify their own weakness and strengths. In my opinion, this is true because students would be able to learn from their peers and ask questions on concepts that they do not understand in order to improve on them (see 2.9.3.2). However, one of the student participants was not motivated to do peer assessment due to unfairness on the side of his/her peers. I suggest that lecturers should put in place peer assessment policies for students to follow in order to eradicate the issue of biasness.

Table C7: Self-assessment

Related pilot survey questions for both the IT lecturers and IT students	IT lecturers' responses	IT students' responses
Self-assessment	• Test banks were created for students to use; used to determine students' level of understanding of the IT modules.	• It enabled some of the students to identify their strengths and weaknesses. • Students were motivated to do more work

Self-assessment was embraced by both participant groups. They reported that it confirmed the students' level of understanding (i.e. strengths and weaknesses). I also believe that when a student tries to assess him/herself, he/she becomes more confident and is able to identify whether or not he/she understands the task he/she is doing.

Table C8: Diagnostic assessment

Related pilot survey questions for both the IT lecturers and IT students	IT lecturers' responses	IT students' responses
Diagnostic assessment	• It was used in the beginning of the semester to determine the strengths and weaknesses of their students.	• This was not added as form of assessment to the student pilot survey. However, in the survey questionnaire survey it was included as Baseline assessment

This form of assessment is very important and would entreat lecturers to practice it. It will enable them to know the types of students that they have and how to meet their academic needs.

Table C9: Assessment tasks

Related pilot survey questions for both the IT lecturers and IT students	IT lecturers' responses	IT students' responses
Assessment tasks	The assessment tasks mostly used by the lecturers were: • Presentations, examinations, quizzes, multiple choice questions, assignments and tests. • Presentations were used as formative assessment. It could improve the students' communication	The assessment tasks identified by the student participants were: • Tests, examinations, assignments and projects. Students indicated that the assessment tasks tested their knowledge and skills in IT because: • They were motivated to study harder and beyond the module requirements (e.g. for tests and

Related pilot survey questions for both the IT lecturers and IT students	IT lecturers' responses	IT students' responses
	skills and their ability to engage with the presenters by asking questions. • Quizzes and multiple choice questions were used on e-assessment platform because of the ease of automated marking.	examinations). • They acquired more knowledge and practical experience (e.g. through assignments and projects) • They were able to determine their performance in the module.

The participant groups mentioned some assessment tasks that were similar (i.e. tests, examinations and assignments). I believe this was because these were the main assessment tasks that took place in the institution. The student participant groups reported that they were motivated through tests and examinations. I believe the reason was that these tasks carried marks. Furthermore, they obtained more practical experience in their assignments and projects. In my opinion, this was because these tasks were not just theory based but was based on real-world scenarios.

I believe the lecturer participant groups did not mention "projects" as a task because they think it falls under assignment. Although the lecturer participants made mention of quizzes and multiple choice questions as assessment tasks and the student participants did not, I believe the tests that students did could be combination of both. This means that the students might have assumed that since their tests covered both quizzes and multiple choice questions, there was no need to mention them. Presentations was, however, mentioned by the lecturer participant groups.

Table C10: Likes and/or dislikes of e-assessment tasks

Related pilot survey questions for both the IT lecturers and IT students	IT lecturers' responses	IT students' responses
Likes and/or dislikes of e-assessment tasks (i.e. myLMS)	**Likes:** • Prompt feedback. • automated marking • reduced workload **Dislike(s):** • Inappropriate network and internet connectivity makes it difficult to use myLMS in assessing IT students.	**Like(s):** • The majority remaining participants indicated that they had no issues or dislikes about myLMS. **Dislike(s):** • One participant indicated that students cheat during e-assessment tasks by using online search engines.

In terms of *likes*, majority of the participants liked e-assessment tasks although the student participant group did not mention their reasons. I believe the lecturer participants provided the reasons of prompt feedback, automated marking and reduced workload because e-assessment tasks made their work easier in this regard.

The *dislikes* for both participant groups were completely different. I suspect that the IT lecturers might have used the e-assessment platform (i.e. myLMS) more often than the students. The lecturer participants' issue of inappropriate network and slow internet connectivity could be considered by the institution. Appropriate infrastructure and resources should be in place for e-assessment tasks. Regarding one student's issue of other students using the internet to cheat during e-assessment, lecturers and the institution should have a policy in place where the internet may be disconnected during e-assessment or security cameras maybe in place to monitor the students.

Table C11: Relationship between IT students' marks and how and what they have learned

Related pilot survey questions for both the IT lecturers and IT students	IT lecturers' responses	IT students' responses
Relationship between IT students' marks and how and what they have learned (i.e. comparison between paper-based assessment tasks marks and e-assessment tasks marks)	• Most confirmed that there was a relation between their marks and how they have learned. • Some of the factors that determine students' marks included their knowledge about the module, effectiveness of lecturers' teaching methods and students' attitudes towards the module.	Comparison of marks among various e-assessment tasks: • Students' marks were consistent because they put in the same effort in studying for each task. • Sometimes the marks differed from one IT module to the other. Comparison of marks for e-assessment tasks and paper-based assessment tasks respectively: • Students' marks were consistent with each other because they put in the same effort in studying for each task (i.e. whether e-assessment tasks or paper-based tasks).

Both participant groups agreed that there was a relationship between students' marks and how and what they had learned. For instance, the lecturer participants reported that the marks students obtain, may depend on the effectiveness of the lecturers' teaching method. The student participant groups also stated that the marks differ from one IT module to the other. These two groups are saying the same thing. When the lecturers need to apply effective teaching methods that would make their IT students understand the concepts better and ultimately acquire better marks. Lecturers need to know their students' needs in order to implement effective teaching methods.

However, there were some differences between the two groups of participants. The lecturer participant group reported that students' marks may depend on how well they understand the module as well as students' attitude towards the IT module. I believe that these reasons are valid because when students show interest in a subject, they tend to do well. However, students might have positive attitudes towards the IT modules if the lecturers engage them in activities and make the IT module more interesting. This again, comes down to the issue of lecturers' teaching method.

Table C12: IT students' knowledge about the content that they will be assessed on

Related pilot survey questions for both the IT lecturers and IT students	IT lecturers' responses	IT students' responses
IT students' knowledge about the content that they will be assessed on	• It enabled the students to be in control of the content. • It narrowed students' research focus. • Students tended to be lazy and skip classes.	• It improved students' learning because they were able to adequately prepare • It enabled students to focus on important areas. • It enabled students to know what is expected of them • Students were able to know their strong and weak areas in the IT modules

The similarity among both participant groups was the fact that students are able to focus on important content for the assessment. This means that some participants in both groups agreed to the content being made known to the students. I believe this is important because the content in the modules is too much and as such would not be fair on the students' side if they are not aware of the content they would be assessed on. When lecturers are providing students with the content, they should not leave out any important content. In order words, providing students with information of the content that will be assessed, is a principle of constructive alignment.

However, some lecturer participants stated that students tend to be lazy and skip classes when they get to know the content that they will be assessed on. I believe that this might happen only if lecturers leave out something important (i.e. if they provide a limited "scope"). Lecturers should be aware that, giving the students the content does not mean giving away the exact questions in the assessment tasks. The content meant to be the unit of information the students need to focus on, such as a unit or chapter, topics etc.

Table C13: IT students' knowledge about the assessment criteria according to which they will be assessed

Related pilot survey questions for both the IT lecturers and IT students	IT lecturers' responses	IT students' responses
IT students' knowledge about the assessment criteria according to which they will be assessed	• It makes the assessment to be fair. • It helps the students to focus on the important areas of the assessment tasks. • It would ensure an alignment between teaching, learning and assessment.	• It improved students' learning because it prepared them for semester tests, examinations and other assessment tasks. • It enabled students to focus on important areas.

All participants in both groups agreed that students' knowledge about the assessment criteria according to which, they would be assessed was important. Their knowledge of the assessment criteria would enable them to focus on the important areas and on required competencies. I believe that the intention behind assessment tasks is not to take students by surprise. Students should be in the known throughout the assessment process.

Table C14: Feedback and its possible effect on students' learning

Related pilot survey questions for both the IT lecturers and IT students	IT lecturers' responses	IT students' responses
Feedback and its possible effect on students' learning	Feedback has a positive effect on their students' learning because: • It helped the students to identify their mistakes and improve on them. • It helped their students to answer questions appropriately. • It motivated students to have a change in attitude towards the IT modules.	How feedback was provided: • Lecturers sent them e-mails with their assessment tasks (with comments) attached. • Some lecturers discussed their work in class and provided them with feedback. • Some lecturers went through the memorandum with them in class. • Some lecturers provided handwritten comment for each question they answered incorrectly. Effect of feedback on students' learning: • It improved the way students answered questions. • It improved their way of learning. • It helped them to determine their weaknesses.

Regarding the effect of feedback, similar responses were provided. Through the feedback students were able to improve their learning and way of answering questions and also identified their mistakes. These were agreed on by both participant groups because, when effective feedback is provided, students tend to look at their mistakes, find solutions and improve on subsequent assessment tasks.

The question regarding how feedback was given, applied only to the student participants. Their responses showed that they were given feedback in various ways which ultimately improved their learning. However, none made mention of feedback via myLMS system which needs to be encouraged because the myLMS system would provide prompt feedback.

Table C15: Fairness of e-assessment tasks

Related pilot survey questions for both the IT lecturers and IT students	IT lecturers' responses	IT students' responses
Fairness of e-assessment tasks	The IT lecturer participants indicated that their e-assessment tasks were fair because: • The content covered in the assessment was within the scope of the module. • He/she was adequately trained in assessment development.	All the students indicated that the e-assessment tasks were fair. Reasons included: • It did not favour a specific group of students. • All the students were given the same assessment tasks. • All had the same time to complete the tasks.

Both participant groups agreed that their e-assessment tasks were fair and they mentioned similar reasons. In a nut shell, their e-assessment tasks were fair because they did not favor specific students and the content of the assessment tasks was within the scope of the IT module. This means that the IT lecturers did their best in ensuring equity in their assessment.

However, a lecturer participant indicated that his/her training in assessment development, assisted him/her in creating fair e-assessment tasks. I believe that all IT lecturers need to undertake such training in order to develop appropriate and fair e-assessment tasks. The institution could make time for their IT lecturers to undergo such training.

Table C16: Validity of e-assessment tasks

Related pilot survey questions for both the IT lecturers and IT students	IT lecturers' responses	IT students' responses
Validity of e-assessment tasks	The IT lecturer participants indicated that their e-assessment tasks were valid because: • The content of the assessment was within the scope of the module. • He/she was adequately trained in assessment development.	All the students believed that their e-assessment tasks were valid because of the following reasons: • Their e-assessment tasks covered only the content that they had covered in the IT modules. • Their e-assessment tasks were related to what they had studied.

Both participant groups agreed that their e-assessment tasks were valid and they mentioned similar reasons. Their e-assessment tasks were valid because the content of the assessment tasks was within the scope of the IT module. This means that the IT lecturers did their best in ensuring that their students were not surprised by their e-assessment tasks. However, one lecturer participant emphasised that he/she was enabled through his/her training in assessment development.

Table C17: Reliability of e-assessment tasks

Related pilot survey questions for both the IT lecturers and IT students	IT lecturers' responses	IT students' responses
Reliability of e-assessment tasks	• None of the lecturer participants responded to the question pertaining to the reliability of e-assessment tasks in the pilot survey	• Some of the IT student participants indicated that their e-assessment tasks were reliable because their marks were consistent. • Reasons provided were that they put in the same effort when studying for the various assessment tasks;

Related pilot survey questions for both the IT lecturers and IT students	IT lecturers' responses	IT students' responses
		that the same rules are applied for each module in the e-assessment tasks • Some mentioned that their marks differed from one IT module to the other.

Literature confirms that e-assessment tasks indeed improves students' grades and performance (see 3.2.5). Lecturers are entreated to provide students with e-assessment tasks that will engage the students. E-assessment tasks should be design in such a way that the students are encouraged to participate (see 2.3.1, 3.2.5, 3.2.10.1, 3.2.10.2). Students' marks will be better when they show interest in the e-assessment tasks (see 3.2.5).

Table C18: Practicability/feasibility of e-assessment tasks

Related pilot survey questions for both the IT lecturers and IT students	IT lecturers' responses	IT students' responses
Practicability/feasibility of e-assessment tasks	• One IT lecturer participant mentioned that the e-assessment tasks that he/she did was practicable/feasible because he/she was trained in developing assessment tasks.	• There was no question pertaining to the practicability/feasibility of e-assessment tasks in the pilot survey

One lecturer participant indicated that his/her training in assessment development, assisted him/her in creating practicable/feasible e-assessment tasks. I believe that all IT lecturers need to undertake such training in order to develop appropriate and fair e-assessment tasks. The institution could make time for their IT lecturers to undergo such training.

Table C19: Suggestions and recommendations pertaining to the use of e-assessment in the teaching and learning of IT

Related pilot survey questions for both the IT lecturers and IT students	IT lecturers' responses	IT students' responses
Suggestions and recommendations pertaining to the use of e-assessment in the teaching and learning of IT	The following suggestions and recommendations were reported by some of the lecturer participants: • E-assessment tasks should be creative and exciting. • Variety of e-assessment methods should be used by the lecturers. • Adequate resources must be available when completing e-assessment tasks. • Proper training on how to use e-assessment tools and develop quality e-assessment should be in place.	• E-assessment tasks should be used more often in order to save costs. • They should be used once a week.

The suggestions and recommendations from both participant groups were completely different. The lecturer participant group provided practical suggestions and recommendations whereas the student participants referred to the frequency of the use of e-assessment.

As suggested by the lecturer participant group, if lecturers could use different assessment practices and create engaging activities, their IT students would be more willing to participate in e-assessment tasks. However, it is also the institution's responsibility to provide the necessary resources and train the IT lecturers on the appropriate use of e-assessment platform (i.e. myLMS). It will be effective if specific times are allocated to staff training on myLMS.

Some of the student participants requested that e-assessment should be used more often in order to save cost. I believe this related to cost-savings on paper. When e-assessment is implemented in the teaching and learning of IT, both the IT students and IT lecturers would benefit from it.

C3 CONCLUSION

The formulation of a number of the pilot survey questions were amended in the final questionnaires. For instance, some headings, phrases and keywords were capitalized in the final questionnaire as a way to emphasise their importance in answering the question. This was done because my supervisor and I realised that some of the participants did not understand some of the questions well and ultimately ended up not responding well to those questions. Furthermore, the feedback I received from my supervisor influenced the formulation of questions in the final questionnaires. That is, based on my supervisor’s feedback, I had to capitalize some headings, keywords and break some questions into two or three parts for the sake of clarity.

APPENDIX D:

DISCUSSION OF THE FINDINGS FROM THE FOCUS GROUP INTERVIEWS

D1 FOCUS GROUP INTERVIEWS

On conclusion of the questionnaire surveys, two focus group interviews were organized (i.e. one with IT lecturers and another with IT students). An e-mail invitation was sent to both the IT lecturers and IT students of the Vanderbijlpark Campus of CTI since I had easy access to these participants. All the participants responded positively that they would attend the interview; which they did. In total, there were twelve (12) participants [i.e. five (5) IT lecturer participants and seven (7) IT student participants]. The seven (7) students were randomly selected from all the year levels (i.e. higher certificate, year level 1 to 3) to participate in the focus group interview. The focus group interviews were conducted to seek confirmation of the findings of the questionnaire surveys, were to obtain a deeper understanding; as such each focus group was used as a participant review opportunity. As participant opportunities, the focus groups also strengthened the confirmability and credibility (i.e. trustworthiness) of the questionnaire data and interpretation.

The focus group interviews were semi-structured, making them relatively informal. The participants were provided with some refreshments. The interviews lasted for approximately 1 hour and 30 minutes. All the participants were relaxed and honestly shared their experiences and perceptions of e-assessment with me. I managed the discussions by ensuring that no participant dominated the discussion. I also encouraged other participants to come out of their shell and provide rich information.

At the beginning of each session, I introduced myself, explained the purpose of the study and requested the participants to read and sign the informed consent form. I obtained permission from the participants to audio record the interview for transcription purposes, and explained that it was necessary to analyse their verbatim remarks. The participants were assured of their anonymity and their confidentiality of their information (see Appendix B3.1).

D1.1 Focus group questions

The questions asked during the focus groups interviews were determined after the online survey questionnaires data had been gathered and a provisional analysis had been made. Upon completion of providing the instructions for the focus group interview, I first asked the following broad and open question during both focus groups:

- *Please explain your own experiences and perceptions of e-assessment in the teaching and learning of IT subjects at CTI?*

I hoped that the focus group members, in their answers to this broad open question and the discussion that followed, would touch upon most of the issues relating to the research focus that I had already identified as important for this study. I therefore subsequently only asked a selection of fourteen (14) open, but more specific questions for the IT students and a selection of eleven (11) open, but more specific questions for the IT lecturers. The questions selected related to issues not covered in the groups discussion of the first broad and open question (for the interview questions, see Appendix B3.2 and B3.3).

D1.2 Demographic characteristics of the focus group interviews

During the focus group interviews, seven (*N=7*) IT students and five (*N=5*) IT lecturers from the Faculty of Information Technology at CTI, were engaged in the interview discussions. The participants were from the Vanderbijlpark campus. The majority [85.7%, (6)] of the focus group student participants were male. On the contrary, the majority [80%, (4)] of lecturer participants were female. Although the males dominated in the student participant group and the females dominated in the lecturer group, the aim of this research study was not to distinguish between the findings with regards to gender but to seek confirmation of the findings of the questionnaire surveys by using the focus group interviews as participant review sessions.

D2 DISCUSSION OF THE FINDINGS FROM THE FOCUS GROUP INTERVIEWS

Data collected from the focus group interviews were transcribed and analysed thoroughly to identify the details of what the participants said. The focus group interview data/results were compared with the questionnaire survey results. I summarized the interview results and questionnaire results in a table format. Both results were placed next to each other in the same table. I then highlighted and explained the major differences between the two sets of data in my discussion. This comparison was done to identify both new information and confirmation information found by means of the questionnaires. All the data/results from both focus group interviews are discussed below. The aim of this is to provide an overall view of all the data/results that emerged from the focus group interviews.

D2.1 Lecturers participants' responses to their focus group interview

This section reports on how the lecturer participants responded to the different questions in their focus group interview. For the sake of brevity and to avoid repetition of findings, I will only discuss the new findings (with their verbatim comments) that emerged from the lecturer participants and add to what has already been found during the first round of data collection (i.e. the questionnaire survey). All the new findings that will be discussed, will be italicized. The information in each question that is not discussed and italicized indicates that it is a confirmation of the information provided by the lecturer participants in both the pilot survey and the questionnaire survey (see 6.3.1; 6.5.1; Appendix C2.1) which has already been discussed.

D2.1.1 Lecturers' own experiences and perceptions of e-assessment in the teaching and learning of IT subjects at CTI

The lecturer participants were asked a broad and open question regarding their own experiences and perceptions of e-assessment in the teaching and learning of IT at CTI

The responses provided by the lecturers to the broad question were a clear indication of the *value* and *challenges* of e-assessment. Please note that many of the participants confirmed more than one value and challenges of e-assessment.

All the lecturer participants [100%, (5)] confirmed that they have had some "positive" experiences (i.e. the value) with e-assessment. Reasons provided were that e-assessment is flexible (i.e. anytime and anywhere accessibility) [60%, (3)]; and that it saves paper due to the ability to upload the materials instead of printing them [100%, (5)].

Some participants reported that e-assessment platform *provides security because students are not able to remove and/or edit materials that have been uploaded [20%, (1)] and that lecturers are able to hide and/or unhide the e-assessment tasks that students have to do (i.e. the lecturers have control over what students can see on the e-assessment platform) [20%, (1)]* (see 3.3.12.7). Thus, lecturers had control over what students are allowed and/or not allowed to see on myLMS.

L P1: "…with myLMS what comes in is basically once you upload your stuff a student cannot remove that stuff if it is materials and or other resources unlike you using other platform like drop box if you upload something a student deletes that information you might not be aware of that. So, I think it is a good platform it is being lets me say it's useful as an e-learning tool."

L P3: "you can personalize it, so you can already set up from the first day. They can just put everything and what you don't want student to see you can unhide or hide it"

I believe this was a good addition to the value of e-assessment that emerged because now, institutions will be motivated to use the system without the fear of their e-assessment tasks being leaked as it usually happens in traditional assessment tasks (see 3.3.1). Due to the high security and control on e-assessment platforms, lecturers can conduct high stake assessment tasks on the platform (see 3.3.3; 3.3.4).

All the lecturer participants [100%, (5)] however, also confirmed that they had some "bad" experiences (i.e. challenges) with the e-assessment platform (i.e. myLMS). Some of the participants [60%, (3)] reported that the lack of adequate network infrastructure (such as internet issues) makes it difficult for them to perform e-assessment tasks. Some lecturer participants mentioned that they rarely used the e-assessment platform (i.e. myLMS) because they have no training [100%, (5)] and knowledge [20%, (1)] of how to use myLMS in assessing their IT students. One participant [20%, (1)] mentioned that her lecturing workload (i.e. about 28 – 30 hours per week) does not permit her to frequently use myLMS since she was aware that it is time consuming to create e-assessment tasks.

One participant [20%, (1)] indicated that the *user interface of the myLMS platform still has some bugs.*

L P2: "… myLMS – the user interface still at this stage have some bugs – it needs some cleaning up from the IT perspective."

The CTI IT faculty need to ensure that before an e-assessment platform goes "live" it is tested and all errors corrected for the effective use of the system (see 3.3.12.10). The institution needs to ensure that they have qualified technical staffs to assist lecturers and students with the errors that they encounter with the system (see 3.2.9, 3.3.12.9).

Due to the fact that the lecturer participants' responses did not touch upon most of the issues relating to the research focus that I had already identified as important for this study, I therefore subsequently only asked a selection of the eleven (11) more specific questions below, namely those relating to issues not sufficiently covered in the discussion of the first broad and open question (i.e. 1 to 11):

D2.1.2 Students' assessment through paper-based tasks and/or e-assessment tasks

The lecturer participants were asked to provide (with reasons) the number of times that they assess their IT students through paper-based tasks and/or e-assessment tasks (i.e. assessment tasks on myLMS)

Majority of the lecturer participants [60%, (3)] indicated that they assessed their IT students through paper-based tasks. Reasons provided included that *it is quicker to use since they did not have to deal with any technical problems; that they were not trained on how to develop assessment tasks on myLMS; and it is faster to mark long questions on paper-based since myLMS was not able to automatically mark the students' responses and they had to mark them on the system which was in turn time wasting and consuming.*

L P1: "With me most of the time I use paper based tasks - it's like I said in terms of assessing using myLMS we just lack training or knowledge of how to use myLMS."

L P3: "I also use paper based tasks - much quicker and I don't have to worry about any technical problems like internet or computers not working and students not able to login."

L P5: "Paper based is what I use because it saves my time when marking long questions."

I can deduce that these three reasons evolve around lecturers' lack of training and support in the use of the e-assessment platform. The e-assessment system should have technical support (see 3.2.9, 3.3.12.9). Also proper and adequate training (see 3.2.8.11, 3.2.9.3, 3.3.12.9) should be provided to lecturers to enable them use and benefit fully from the implementation of e-assessment. I am of the opinion that, long questions can be marked electronically (see 3.2.4.1, 3.3.3, 3.3.4) on an e-assessment and therefore lecturers should be trained on how to do that in order to save more time.

With regards to e-assessment tasks, all the participants [100%, (5)] stated that although they rarely did e-assessment tasks, *they sometimes assess their students using another commercial e-assessment platform (i.e. Socrative).* Reason included that *it was easier to create e-assessment tasks on Socrative more than on myLMS*.

L P1: "…I sometimes use Socrative because it easy to use."

L P2: "I use Socrative - it is easy to manage, easy to use, and sometimes now even, especially when it is multiple choice questions you can use Socrative."

L P3: "…However I sometimes use Socrative for multiple choice because it is more easier to use than myLMS."

L P4: "…Then for theory based what I normally use is Socrative – that is more of true/false and multiple choice questions."

L P5: "…even if I conduct e-assessment tasks, like true/false questions, I use Socrative and not myLMS."

One participant [20%, (1)] stated that she used e-assessment in her programing modules where she marked the students' coding electronically because it was quicker and saved her a lot of time. I would entreat the CTI IT faculty that since myLMS is based on Moodle (which is an open source tool), the institution can customize it to fit lecturers' and students' needs (see 3.3.3, 3.3.12.10), an institution's need, policies, procedures and regulations (see 3.3.3). For lecturers to use myLMS, the institution should have the necessary requirements in place (see 3.3.12). Guidelines, procedures and policies on the use of the e-assessment platform (i.e. myLMS) should be shared among the lecturers in order for them to know how the system works (see 3.3.12). I believe that lecturers will be interested in using myLMS for e-assessment tasks (and not Socrative) if the institution creates an easy-to-use interface (see 3.2.8.4).

D2.1.3 Forms of assessment used in assessing IT students

The lecturer participants were asked to report on the forms of assessment they use to assess their IT students as well as when and why they use it

All the lecturer participants [100%, (5)] confirmed that they used diagnostic assessment, baseline assessment, formative assessment, summative assessment and peer assessment. However, only two participants [40%, (2)] mentioned that they used self-assessment.

All the lecturer participants [100%, (5)] reported *that baseline assessment and diagnostic assessment worked the same at CTI*. Reason provided was that they used both forms of assessment to determine the strengths and weaknesses of their students. One participant [20%, (1)] specified that she used both forms assessment to determine the basic knowledge of her IT students in the IT modules she was teaching. All the participants [100%, (5)] used baseline and diagnostic assessment at the beginning of the semester.

L P1: "…It is the same as diagnostic."

L P2: "yah is like a baseline assessment or diagnostic at the beginning of a semester." L P3: "I think we can combine the diagnostic assessment with the baseline assessment."

L P4: "…Baseline or diagnostic is used when the semester begins to see the students' strengths."

L P5**:** "…Baseline or diagnostics at the start of the semester."

However, I suspect that the lecturers are confused about the purpose of diagnostic assessment and baseline assessment. The CTI IT lecturers should learn and know that diagnostic assessment is used to identify the strengths and weaknesses of students, whereas baseline assessment is used to determine students' knowledge level and competence of the IT module before teaching takes place.

All the participants [100%, (5)] confirmed that they used formative assessment. Furthermore, all the lecturer participants [100%, (5)] mentioned that at CTI, *they use the term continuous assessment for formative assessment*. Some participants used formative assessment *throughout the academic year in order to encourage students to learn more* [40%, (2)] and to determine if students understood the work taught in class [40%, (2)]. One participant [20%, (1)] mentioned that the assessment tasks she used for the formative assessment were *class activities, tests (both theory and practical) and homework.* She further stated that upon completion of every chapter, she gave students some exercises to do where she provided them with feedback. She mentioned that this practice, *forced the students to revise every chapter she completed in class*.

L P1: "…Formative assessments or continuous assessment I definitely use throughout the year to make students to learn."

L P2: "…Formative we still providing that as continuous assessment."

L P3: "Formative assessment is called continuous assessment – I use a range of assessment methodologies including class tests - I give home activities – I also give practical activities. I can also give them class activity which they can be conducted as a group work or individual and then assess. I do this to so that my students will be forced to learn what we have done in class."

L P4: "…I also do continuous assessment or formative assessment to check my students' progress."

L P5: "…continuous or formative assessment to check if my students are learning throughout the year."

The reasons that emerged from formative assessment is a good practice that all IT lecturers are encouraged to follow because formative assessment comes with constructive feedback (see 2.9.2) and if it is done throughout the year, it will help students to be up-to-date with their studies and subsequently help them to monitor their progress in the learning process (see 2.9.2.4, 3.2.9.10). The other new information that emerged was that class activities, tests (both theory and practical) and home activities were the assessment tasks used for formative assessment. I encourage the IT lecturers to use such varieties of assessment tasks as confirmed by literature (see 2.9.2.4) to enhance their students' learning.

Pertaining to summative assessment, all the participants [100%, (5)] reported that they used examination and semester tests. Reasons for using summative formative assessment include *to determine the students' predicate at the end of the semester (i.e. dual performance);* and to determine whether students can progress to the next level of their studies.

L P1: "…Summative assessments like test and exams, as well as informal semester test that I scheduled that will count for their DP marks."

L P2: "…Summative assessments are the tests, exams and assignment to determine their predicate."

L P4: "…Summative assessments such as exams and semester test are compulsory and are used to determine students' DP."

The term *predicate* corresponds to final grades that appeared in lecturers' pilot and final survey (see Appendix C2.1.5, 6.5.1.6). Since decisions made by lecturers in summative assessment may affect the students' future (see 2.9.1), they need to ensure that predicates awarded to students are valid, fair and reliable (see 2.6.2.1, 2.6.2.2, 2.6.2.3; 3.3.6.1, 3.3.6.2, 3.3.6.3).

The lecturer participants used peer assessment at the end of every semester where students *had to deliver their final presentations for their software development projects [60%, (3)] and when they had present their final networking assignments [40%, (2)].* Reason provided for using peer assessment were that it helped students to share ideas with their peers [60%, (3)]; to learn better from each other [20%, (1)]; *and to obtain valuable feedback from their peers [20%, (1)]*.

L P1: "…Peer-assessments I sometimes - so once at the end of the year or twice a year I make use of that to validate especially with the software projects or something nice they can enjoy and learn from each other - I mean they are able to provide valuable feedback for each other."

L P2: "…Peer assessment – I do them once a year for their networking final project."

L P3: "…I am not a huge fun of peer assessment but we do it with our Software development project at the end of the year."

L P4: "…I only use peer assessment when conducting networking presentations at the end of the year."

L P5: "…Peer assessment is used for my software development students when they complete the module."

One participant [20%, (1)] further stated that, although he/she used peer assessment, he/she had observed that not all her students took this form of assessment seriously because the students feel that it is not fair for their peers to assess them.

The assessment task (i.e. presentations) used for peer assessment is confirmed by literature (see 2.9.3.2). However, my advice is that lecturers should do this often and not only at the end of the semester so that students may learn more from each other and have a feel that they are part of the assessment process (see 2.9.3.2). Furthermore, although the students obtain valuable feedback from their peers, it is the responsibility of the lecturer to ensure that the students act on the feedback.

Four participants [80%, (4)] confirmed that they used self-assessment. They all mentioned that students used the exercises at the end of each chapter/unit for self-assessment. However, one of the four participants reported that *since students are reluctant to do this form of assessment, he/she (i.e. the lecturers) has also stopped using it.*

L P1: "…Self-assessment are basically exercises at the end of a chapter."

L P2: "…For self-assessment I create exercise for them after every chapter."

L P4: "I used to create exercises for them after every unit but since my students are reluctant in using self-assessment, I have also stopped."

L P5: "…For me I encourage my students to use the practice exercise I provide at the end of a chapter as their self-assessments tasks."

I suspect that the students' reluctance to use self-assessment tasks could be linked to a lack of appropriate assessment training for lecturers on how to use and manage self-assessment tasks. I encourage the lecturers to conduct more of this form of assessment because self-assessment enables students to focus on their own work in order to enhance their own performance when they identify the gaps between their "current and desired performance (see 2.9.3.2). Furthermore, students are able to critically think about their own work and become life-long learners (see 2.9.3.2).

D2.1.4 Assessment tasks used in assessing IT students

The lecturer participants were asked to report on the assessment tasks they use to assess their students, why they use them, and how often they let their students do these tasks

Please note that many of the participants confirmed using more than one type of assessment tasks in their teaching of IT.

The types of assessment tasks confirmed by some participants are semester tests [80%, (4)], examinations [60%, (3)], assignments [40%, (2)], *programming practical [20%, (1)], case studies [20%, (1)],* multiple choice questions [40%, (2)] and true/false questions [40%, (2)]. One participant [20%, (1)] reported that in his/her programming class, *practical exercises (i.e. coding) are provided for the students in order for them to have hands-on experience*. One participant [20%, (1)] mentioned that he/she often use *case studies in his class which in turn enables the students to think critically and come up with solutions to real-world problems.*

L P1: "I think it all depends on the module – with my programming class I give them practical exercise like coding for them to have the required experience."

L P4: "I only use a lot of case studies for practical which they need to interpret that as well – it helps students to think critically and obtain solutions to real-world problems"

The reasons provided by the participant regarding the assessment tasks that they use in assessing their IT students are important in IT because IT is more practical and requires that assessment tasks provided to students should provide them with the necessary IT skills (i.e. practical experience) and should be based on authentic learning (see 2.3.3).

D2.1.5 Deadlines and time limits for assessment

The lecturer participants were asked about their opinion and/or experience about setting deadlines and time limits for the submission and completion of assessment tasks in IT

All the lecturer participants [100%, (5)] confirmed the importance of setting deadlines for the submission of assessment tasks and the need for setting such time limits. Reason mentioned was that it taught students good time management. One participant [20%, (1)] reported that deadlines and time limits are *principles of employability and as such students need to get used to it now*. One participant [20%, (1)] mentioned that deadlines and time limits *work better when assessment tasks are delivered through myLMS platform because students do not have another choice than to adhere to deadlines and time limits since deadlines and time limits can be set on the platform in order to reject late submissions*.

L P2: “Usually when students are submitting hardcopy assignments there is always late assignment submission and so I guess with myLMS will be very useful in terms of if you have set a deadline they can’t submit after that and that will make sure they will submit on time.”

L P4: “I do think it is necessary – I mean you cannot give them assessment forever. In practice, that is teaching them the principle of employability.”

Assessment tasks that are delivered through myLMS platform would indeed ensure and enhance time management (see 3.2.6). Employers require graduates who value time and are able to meet deadlines at the workplace (see 2.5.4). For this reason, I entreat the IT lecturers to ensure that all their assessment tasks have realistic time limits and deadlines (see 2.6.2.4), which in turn, will prepare the student for the working environment. However, in order for the students to meet deadlines and complete tasks on time, the lecturers need to ensure that myLMS has the necessary stability and speed (see 3.3.12.6), reliable internet connection and a server that is up and running (see 3.3.12.1).

D2.1.6 Relations between IT students’ marks and how and what they have learned

The lecturer participants were asked to explain their experiences and/or views about the relation between their IT students’ marks, and how and what they have learned

All the lecturer participants [100%, (5)] confirmed that there is a correlation between their IT students’ marks and how and what they have learned. One participant [20%, (1)] reported that when students put in more effort in their studies they obtain better marks. Some participants mentioned that students obtain marks based on how they learn [20%, (1)]; the lecturer’s teaching methods [40%, (2)]; students’ interest in the IT modules that they are doing [40%, (2)]; and the type of questions that are asked in assessment tasks [20%, (1)]. One participant [20%, (1)] *warned that lecturers should appropriately use the verbs in the BLOOMs taxonomy when developing assessment tasks in order for their students to obtain better marks*.

L P4: **“**I think also if students can pass well, the type of question you ask should be appropriately based on the verbs in the bloom taxonomy. That types of question you should also see if the student understand or the way that you asked the question.”

I believe that if lecturers create engaging assessment tasks and encourage their students to do them, and then students will be motivated and show interest in their IT modules (see 2.2.6.3, 2.2.6.4, 2.3.1, 2.3.2, 2.4.8, 2.4.9, 2.5, 2.5.1, 4.3.1.4). Regarding the verbs used in BLOOMs taxonomy, lecturers need to be adequately trained on how to develop student assessment tasks and are encouraged to use active verbs (such as explain, argue, justify, examine, apply, reflect and evaluate) in their assessment tasks (see 2.2.6.3, 2.7.3.1). When such verbs are used in assessment tasks, students are able to apply a deep learning approach which in turn, will enable them to achieve better marks (see 2.2.4.1, 2.2.4.2, 2.2.6.3).

D2.1.7 IT students' knowledge of the content that they will be assessed on and/or assessment criteria according to which they will be assessed

The lecturer participants were asked to report on their own experiences and/or opinions about informing IT students in advance of the content that they will be assessed on and/or assessment criteria according to which they will be assessed, and why?

All the lecturer participants [100%, (5)] agreed that it was good for the students to be informed in advance of the content that they will be assessed on and the assessment criteria according to which they will be assessed. Motivations for their agreement include that it enabled them to study well; it helped them to focus on the important concepts; and that it made assessment fair. Some participants mentioned that for any assessment tasks, students should be *aware of the breakdown of the assessment tasks (i.e. the mark allocation) [20%, (1)]; the type of questions (i.e. short questions or long questions) [20%, (1)]; and the chapters/units the assessment tasks will cover [20%, (1)]. One participant [20%, (1)] advised that the information provided to students should not be the exact questions in the assessment tasks.*

L P1: "I feel that students should know exactly what they should study and also what type of questions they should study because they study differently for different types of questions."

L P3: "…you know we can just say the assessment is from chapter 5-9, multiple choices 10 marks and so on."

L P4: "The problem I have with this is that some lecturers give the same questions they will ask in the assessment which I feel it is not right."

The type of information that the lecturer participants mentioned are very important. As mentioned earlier in the first survey (see 6.5.1.12, 6.5.1.13), lecturers should provide their IT students with the content (i.e. “what”) and the assessment criteria according to which they will be assessed if they want their assessment tasks to be fair (see 2.6.2.1; 3.3.6.3), valid (see 2.6.2.2; 3.3.6.1) and reliable (see 2.6.2.3; 3.3.6.2). I also support the advice provided by L P4 (i.e. students should not be the exact questions in the assessment tasks) because when this happens, the students tend to replace in-depth understanding of concepts with memorization, which is a surface learning approach (see 2.2.3, 2.2.3.1) and such a practice should be frowned upon.

D2.1.8 Providing feedback to IT students and possible effect on their performance in assessment tasks

The lecturer participants were asked to report their experiences and/or opinions of providing feedback to their IT students about assessment tasks they have performed and the possible effect that the feedback they provide might have (or not have) on their IT students’ performance in their assessment tasks

All the lecturer participants [100%, (5)] clearly confirmed the importance of providing feedback to IT students about their performance in the assessment tasks they had to do. Some participants reported that they *provided feedback to students in class by going through class activities, assignments, test with them [40%, (2)];* where students make the necessary corrections to the questions they attempted wrongly [60%, (3)]. One participant [20%, (1)] mentioned that *the memorandum of assignments and class exercises are uploaded on the campus server for students*. However, the participant *observed that the students rarely go through the memorandum because they feel they have already obtained the marks and nothing can change those marks*.

L P1: “…I usually discuss the exercises I have done with them in class for correction purposes.”

L P2” …We discuss every class exercise, assignments and test in class.”

L P3: “… My feedback on activities is normally done in class.”

L P5: "…Sometimes I also share the memorandum with them on the network. Some students do make use of that; other students do not bother to go through because they know that the marks cannot change. Assignments, semester tests when they get it back we sort of go through and explain the answers to them in class."

The information provided by the lecturer participants regarding how they provide feedback to students are good practices but I entreat lecturers to provide personal constructive and constant feedback (2.9.2). I feel that not all the students will pay attention when the solutions are being discussed in class or will have access to the memorandum on the server. Again, since these types of feedback are not continuous and personal, the lecturers will not be able to determine if a student understands clearly what he/she needs to improve on (see 2.9.2.1.3).

All the participants [100%, (5)] confirmed that the feedback they provided to their IT students in their assessment tasks had a positive effect on their students' learning and/or performance. Three participants [60%, (3)] reported that feedback enable students to identify their mistakes and correct them; and one [20%, (1)] indicated their feedback enabled students who did not do well to improve on their work and those who did well are motivated to work harder [20%, (1)]. One participant [20%, (1)] *warned that feedback should be timely in order to have a positive impact on students' performance.* I believe this is a good advice because students tend to ignore feedback that is provided long after an assessment task (see 2.9.2.1.3).

L P2" …the timeliness of feedback is important. Feedback provided on time will be effective and improve the performance of the students."

D2.1.9 Application of the principles of e-assessment in e-assessment tasks

The lecturer participants were asked to report their experiences and/or opinions of the extent to which the e-assessment tasks they let their students do, are fair, practicable/feasible, reliable and valid.

Please note that many of the participants provided more than one reason why they think that the e-assessment tasks that students had to do, were fair.

The majority of the lecturer participants [80%, (4)] confirmed that the e-assessment tasks that students had to do, were fair. Reasons they provided were that all the students were assessed on the same content [60%, (3)]; the same assessment tasks [20%, (1)]; under the same condition [20%, (1)]; myLMS is available 24/7 [20%, (1)] and that the same time to complete the tasks [20%, (1)]. One participant [20%, (1)] reported that the *e-assessment tasks that students had to do, was unfair because the e-assessment platform favors other students*. In other words, some students are more knowledgeable and experienced with the use technology than other students and as a result most of his students are not able to complete their tasks on time.

L P5: "I think e-assessment can be unfair and favour some students – let's say you have students who are not familiar with information technology and struggles to use computer or any other device, it might be of a disadvantage to that student because now they have to study for the work and cope with working with the computer or the device. – they don't finish on time."

Lecturers need to determine their students' level of technology experience before implementing e-assessment tasks; otherwise it becomes unfair and students perform poorly (see 3.2.8.8, 3.2.9, 3.2.9.5, 3.2.9.6, 3.3.8). However, I believe that lecturers might not be able to ensure that all their students' are technologically experienced before implementing e-assessment tasks. For this reason, lecturers might start by doing assessment tasks that do not carry marks on myLMS which will help the less technology privileged students to gain some computer skills before doing assessment tasks that carry marks.

The majority of the lecturer participants [80%, (4)] confirmed that *the e-assessment tasks that students had to do, were not always valid*. Reason provided was that *they want their IT students to learn beyond the IT modules requirements*. However, one participant [20%, (1)] reported that the e-assessment tasks that students had to do are always within the content covered in class in order for the e-assessment tasks to be fair.

L P2: E-assessment tasks are not always within the content that has been covered because I want them to learn more on their own in order to prepare them for the real world." L P3: "I want my tasks to prepare students for the world so I sometimes stretch them to see how they will answer tasks that we have not done in class."

L P4: “For me it is not always valid because some of the things I want them to learn on their own and they can only do that if I assess them and they see that they could not answer then they find out more about it.”

L P5: “Not always because students to know more than what we teach them. They need to apply what they learn in different situations.”

I encourage lecturers to try as much as possible that their e-assessment tasks (especially the tasks that carry marks and contributes towards students predicate) should be within the content that has been covered, otherwise students might fail. Although some lecturers argue that students tend to use a surface learning approach when their e-assessment tasks do not go beyond their course requirements (see 2.2.3.1); my advice is that lecturers might use e-assessment tasks that do not carry marks for this purpose.

All the participants [100%, (5)] confirmed that their e-assessment tasks that students had to do, were reliable. Reasons provided were that their students had the same outcomes [20%, (1)]; the same rubric and marking scheme were used for the students [20%, (1)]; their students were assessed the same way [20%, (1)]; their students’ results of e-assessment tasks were consistent [20%, (1)]; and that the same decision for e-assessment tasks were made for all their students [20%, (1)] (see 2.6.2.3; 3.3.6.2). No new information emerged from this question but confirmed what the lecturer participants said in the first survey.

L P1: “All my assessment tasks for my groups have same outcomes and I mark them fairly.”

L P2: “Yes they are reliable because I use the same rubric and marking scheme for all my students.”

L P3: “My students are assessed equally.”

L P4: “I always have consistent results for tasks I give to my different groups because I mark them with the same standard.”

L P5: “…similar decisions are made for all students.”

The majority of the lecturer participants [80%, (4)] confirmed that that their e-assessment tasks that students had to do, were not practicable/feasible. Reasons provided include that *there is lack of infrastructure [20%, (1)];* lack of adequate resources [20%, (1)]. One participant [20%, (1)] reported that the e-assessment tasks that students had to do, were practicable because students could access the e-assessment tasks anytime. This view was disagreed by one participant [20%, (1)] who said that *although e-assessment tasks are available to students all time, not all the students have enough mobile network data to do the assessment tasks when they are off campus.*

L P1: "Lack of infrastructure such as the internet and computers make it difficult to do e-assessment."

L P4: "I think it is true that the tasks are available all the time and practicable, some students do not have data to download the materials and do the tasks at their homes."

L P5: "The current infrastructure we have makes it very difficult for online assessment."

The problems identified by the participants are confirmed in the literature as the possible barrier to the effective implementation of e-assessment tasks (see 3.2.8, 3.3.11). The CTI IT faculty need to ensure the required resources and infrastructure are in place before conducting e-assessment tasks (see 3.3.12).

D2.1.10 Lecturers' prior experience of and knowledge about student assessment

The lecturer participants were asked to report their views of the extent to which they agreed (or disagreed) that it is necessary for them to have prior experience of and knowledge about student assessment before they try to implement e-assessment in their teaching of IT

All the lecturer participants [100%, (5)] confirmed that they needed to have prior experience of and knowledge about student assessment before they could implement e-assessment in their teaching of IT. Reason provided included that it will enable lecturers to develop quality assessment tasks. One lecturer participant [20%, (1)] *specified that lecturers' experience of and knowledge about student assessment would allow them to appropriately apply the verbs in the BLOOMs taxonomy in their e-assessment tasks*.

L P3: "For me I think it is important because you are able create assessment tasks that students will understand by applying the verbs in the Blooms taxonomy."

The concept of verbs in BLOOMs taxonomy has been discussed in section 6.5.1.11. I believe that assessment is very critical in students' learning and for that reason; lecturers need to have prior experience of and knowledge about student assessment in order to develop quality e-assessment tasks (see 6.5.1.18).

D2.1.11 The value of e-assessment for the teaching and learning of IT

The lecturer participants were asked to report their experiences and/or perceptions pertaining to the value of e-assessment for their own teaching of IT and their IT students' learning

Please note that many of the participants provided more than one reason why they think that e-assessment tasks are valuable.

All the lecturer participants [100%, (5)] confirmed that value of e-assessment. Reasons provided were that it eases lecturers' marking time due to automatic marking performed by the e-assessment platform [60%, (3)]. One participant [20%, (1)] reported *that e-assessment enable lecturers to develop diverse assessments (such as simulations) which in turn, help students to apply their knowledge of what they have learned and improve on their problem solving skills (i.e. authentic learning)*. This confirms that variety of assessment tasks can be created on e-assessment platforms (see 3.3.4, 4.7.2) and these assessment tasks can also assess students higher order thinking (see 3.3.4, 4.7.2).

L P1: "With e-assessment you are testing application of knowledge and that is one thing – you are testing problem solving. You are not testing only knowledge based questions and that is what we need. That is what we call the authentic learning which prepares the students for the career field that they want to work in. It helps students to be used to technology and career options will be via IT such as communication, collaboration.

Some participants specified that e-assessment is flexible (anywhere and anytime assessment) [40%, (2)]; students are able to submit their assessment tasks on time because of the fear that the e-assessment tasks they had to do, have time limits and they might not be available if they do not adhere to the time limit [20%, (1)]. Two participants mentioned that e-assessment exposes students to technology [40%, (2)]. With e-assessment, students are indeed able to acquire and/or improve on their computer skills (see 3.3.8) and up-to-date with technology (see 4.2).

L P1: “With e-assessment you are testing application of knowledge and that is one thing – you are testing problem solving. You are not testing only knowledge based questions and that is what we need. That is what we call the authentic learning which prepares the students for the career field that they want to work in. It helps students to be used to technology and career options will be via IT such as communication, collaboration.

L P3: “I think any exposure they get through myLMS helps them to broaden their horizon because myLMS is a technology.”

D2.1.12 Suggestions and recommendations regarding e-assessment

The lecturer participants were asked to provide some suggestions and recommendations pertaining to how lecturers could assess their students through using computer/network technology (i.e. e-assessment / myLMS)

The suggestions and recommendations provided by the lecturer participants were very resourceful. I summarized the suggestions and recommendations identified by the participants. The suggestions and recommendations that are italicized, represents the new information. These are as follows:

- *Lecturers should be encouraged to do e-assessment tasks at least twice per semester or once a month because the constant practice of the use of the technology (i.e. myLMS) will help them to effectively use the system [40%, (2)].*
- *For lecturers to effectively use the e-assessment platform, the IT administrators in charge of maintaining the platform should simplify it because as it is now, it is more for administrative purposes than a learning platform [20%, (1)].*
- *Lecturers’ workload must be reduced in order for them to have some time to develop e-assessment tasks [20%, (1)].*
- Lecturers should be adequately trained on how to use myLMS in assessing their IT students [100%, (5)]. This suggestion was provided by all the participants.
- Adequate resources must be in place for the lecturers in order for them to use myLMS effectively [40%, (2)].

L P1: “Lecturers need to start implementing e-assessment. At least they should try one or two e-assessment in a semester. They should use the technology that they have. If you don’t try you will not know. They should use their off time and play around with it and see how it goes.”

L P2: “The lecturers should use myLMS often. They need to learn how to develop e-assessment tasks at least if not always, once a month – this practice will help them with how to use the system.”

L P3: “As it is now, there are a lot of teaching hours and so if they want us to use myLMS they should reduce the hours.”

L P5: “…I feel like myLMS is not a learning platform but an administrative platform because so many things are happening there. If the administrators can improve on the system then I think the lecturers will use it effectively.”

The suggestions and recommendations provided by the lecturer participants were very important as they are all confirmed in the literature consulted (see 2.4.11.9, 3.2.1, 3.2.6.1, 3.2.7.1, 3.2.8.2, 3.2.9, 3.2.9.3, 3.2.10.1, 3.3.4). Of particular importance is that the CTI IT lecturers need to embrace the change of e-assessment, take part in assessment development training and implement e-assessment tasks that will improve their students’ learning.

D2.2 Students participants’ responses to their focus group interview

This section reports on how the student participants responded to the different questions in their focus group interview. For the sake of brevity and to avoid repetition of findings, I will only discuss the new findings (with their verbatim comments) that emerged from the student participants and add to what has already been found during the first round of data collection (i.e. the questionnaire survey). All the new findings that will be discussed, will be italicized. The information in each question that is not discussed and italicized indicates that it is a confirmation of the information provided by the student participants in both the pilot survey and the questionnaire survey (see 6.3.2; 6.5.2; Appendix C2.2) which has already been discussed.

D2.2.1 Students’ own experiences and perceptions of e-assessment in the teaching and learning of IT subjects at CTI

The student participants were asked a broad and open question regarding their own experiences and perceptions of e-assessment in the teaching and learning of IT at CTI

All the student participants [100%, (7)] confirmed that they had some “positive” experiences (i.e. value) with e-assessment. Reasons provided were that e-assessment is convenient (i.e. anywhere and anytime accessibility); it saves time; it provides prompt feedback; and results are obtained immediately upon completion; and *it is easy to conduct forum discussions on the e-assessment platform because they could do the discussion from anywhere*. He/she further reported that his/her lecturer *used Socrative (which is also an e-assessment platform) to conduct e-assessment tasks*.

S P1: "… the only thing we have done was a forum discussion, but it was informative and convenient, you could discuss at any place at any location, didn't have to come to class specifically. Let's say Socrative, that's a very good platform to do a quick online test."

When discussion forums are created on an e-assessment platform, students are able to take control of the discussion and freely/ genuinely express their views without any intimation (i.e. making e-assessment to be flexible and user-friendly) (see 3.3.8, 3.3.10). I therefore encourage lecturers to create more of such tasks. The participant further mentioned that Socrative was used for the online tests. In my opinion, myLMS will be effectively used if the institution creates a user-friendly and an easy-to-use interface for the system (see 3.2.8.4).

Please note that many of the participants provided more than one reason why they had positive experiences with e-assessment.

All the student participants [100%, (7)] however, also confirmed that they had some "bad" experiences with e-assessment. Reasons provided were that it has *password problems (e.g. login issues) [57.1%, (4)]; the difficulty of downloading materials [14.2%, (1)]; e-assessment tasks did not cover what has been taught [14.2%, (1)]; and that they limited in the way they answer questions [28.5%, (2)];* and the inability to change answers [28.5%, (2)].

S P1: "…But for me, myLMS specifically, is lacking. Because I know, for example, this year I'm not even enrolled on a course on my-LMS so I can't download my materials. Sometimes my password doesn't want to work and it frustrates me."

S P3: "I agree with that. Paper-based and exams are a bit better, because like, let's say maybe you have a question, you can even draw a diagram or something with this question, which can explain much better."

S P4: "Online assessments are sometimes limiting in the way of answering. I do agree with that one."

S P5: "…But there was a problem because they kept changing the log in platform, so sometimes you have to come and make a new password but it does not work."

S P6: “…ever since my-LMS was launched né, they tell you that your password has expired and then when you change it, it doesn’t like give you confirmation that your password has been changed, it says, incorrect password.

S P7: “…but the password is a problem, because there was a time when I forgot my password and I had to wait for.. I think forty-eight hours.”

I can conclude that these are technical problems. The institution should ensure that they have technical support team for the students and they should be prompt in responding to such issues (see 3.2.8.4, 3.3.12.9). When students get frustrated with technical problems, they are not motivated to use the system. The issue of students’ inability to answer questions the way they want on an e-assessment platform is a clear indication of students’ lack of support and adequate training from the institution (see 3.3.12.9). E-assessment can assess any type of questions and there are drawing tools on the platform that students can use to draw diagrams to support their explanations (see 3.3.4).

Due to the above-mentioned negative experiences and perceptions, all the participants [100%, (7)] specified that they are assessed through paper-based assessment tasks. Reasons provided included that they are able to *express themselves very well; and that they did not face any technical problems*.

S P1: “Most of the time, it’s done paper-based.”

S P3: “…And another thing they do is that like, if they actually give us a test on my-LMS, it would take like half of the class like.. to make sure that everyone in the class like, can connect to my-LMS and then to make them, waste a lot of time. But when doing a test on paper there is no internet problems. So I think the paper is alright.”

S P4: “I think like, they prefer paper-based questions because like, all of them, they’ve got this question paper, you can like define like, what they are saying, much more. If they ask you a question, you can actually elaborate.”

S P7: “I think they use paper-based, because in paper-based exams, you can write something and erase and start over.

One participant [14.2%, (1)] reported that he/she thinks *that some of the lecturers are not aware of how to do e-assessment tasks on myLMS and/or they prefer the paper-based tasks because it is the traditional method of assessment and the lecturers are reluctant to change*.

S P2: “I think the paper based more because of experience, you know, not all the lecturers are aware that you can do assessments like that on my-LMS, or maybe they just don’t want to, they prefer paper-based themselves, because it’s a traditional method of assessment and we are creatures of habit, we don’t really like change. It’s something they know how to do, they do it well, so why change.”

In my opinion, if the institution put in place appropriate infrastructure and adequate resources they will encounter no or few technical issues and both students and lecturers will be motivated to use the system (see 3.3.12). Furthermore, training is required for lecturers to use and know the importance of e-assessment (see 3.3.12.9). There are some lecturers who have little or no experience or prior knowledge of technology, and without training they will be reluctant to use the system (see 3.2.8.3, 3.2.9.1, 3.2.8.11, 3.2.9.3, 3.3.4, 3.3.10, 3.3.11). It is the institution’s responsibility to provide training to its lecturers in order for them to effectively use the e-assessment platform. The issue of inability to explain concepts with diagrams has been discussed above.

Due to the fact that the student participants’ responses did not touch upon most of the issues relating to the research focus that I had already identified as important for this study, I therefore subsequently only asked a selection of the fourteen (14) more specific questions below, namely those relating to issues not sufficiently covered in the discussion of the first broad and open question (i.e. 1 to 14):

D2.2.2 The need for assessment

The student participants were asked to report on their views on why their IT lecturers need to assess them

All the student participants [100%, (7)] confirmed the need for assessment. Reasons provided included that it determines whether or not they understood the topics/content that was taught in class [57.1%, (4)]; to identify students’ own problem areas [14.2%, (1)]; to determine students’ ability to recall concepts (i.e. information synthesis) [14.2%, (1)]; and it helps lecturers to adjust their teaching methods (where necessary) [14.2%, (1)]. No new information emerged from this question and indicates a confirmation of the information gathered from the surveys.

D2.2.3 The knowledge of what and how you will be assessed

The student participants were asked to report their experiences and/or views on how their knowledge of what and how they will be assessed on, influence their own learning and performance or not.

All the student participants [100%, (7)] confirmed that their knowledge of what and how they will be assessed, sometimes influenced their own learning and performance positively and sometimes negatively. Reason provided for students' knowledge of what and how they will be assessed influencing their own learning positively was that it helped them to focus on important areas [71.4%, (5)].

Some participants reported that when such information is provided to them, it influences the way they study [14.2%, (1)] and makes them lazy [42.8%, (3)]. One participant [14.2%, (1)] reported that some lecturers provide them inadequate information about the assessment tasks that they had to do. No new information emerged from this question and indicates a confirmation of the information gathered from the surveys.

D2.2.4 Forms of assessment

The student participants were asked to report their experiences and/or views about tasks that carry marks, tasks that do not carry marks, peer assessment, self-assessment, and baseline assessment. They were also asked to identify their preferred form of assessment.

All the student participants [100%, (7)] confirmed that they are satisfied with assessment tasks that carry marks (i.e. summative assessment). Reasons provided were that it enables them to deal with problem solving scenarios [14.2%, (1)]; it provides students with research skills (e.g. assignments) [14.2%, (1)]; *it sets a standard and benchmark for students [14.2%, (1)];* and *it prepares them for the real life situations [28.5%, (2)];* One participant [14.2%, (1)] however, reported that *not all the assessment tasks that carry marks prepare them for the corporate world because some of the tasks are purely theoretical and they have no practical content.*

S P1: "I think they really help, because it sets a standard and a benchmark for you to quickly be assessed yourself in terms of the world standard."

S P2: "I think that they do help. Semester tests and exams, like they prepare you for the real life like reality challenge."

S P3: "I actually prefer assignments, because that's more real world scenarios."

S P6: "Yes, I think assessment that carry marks, are there to test us based on what was covered on the semester. But not there to prepare us for corporate world because sometimes you reach a point where you have a degree, but you don't know what is. You passed all the tests and exams, but when you get to the company, there's nothing you can do... They are very serious."

In my opinion, the problem-solving scenarios and practical activities should be encouraged since it depicts authentic learning (see 2.2.3). When students are able to practice the knowledge that they have acquired they become employable because IT is more practical (see 4.4.1, 4.5.1.5, 4.5.2.2, 4.5.3.2, 4.5.3.3). Regarding the participant who mentioned that not all the assessment tasks prepare them for the real-world due to its theoretical nature, I can state that, IT assessment tasks should be created in a way that students will enable students to acquire both theoretical and practical knowledge because without theoretical knowledge, students' practical knowledge will be outdated (see 4.2, 4.3.1.2).

The majority of the participants [57.1%, (4)] reported that they were happy about assessment tasks that do not carry marks (i.e. formative assessment). Reasons provided included that it prepares them for assessment tasks that carry marks (see 4.6.2.1 to 4.6.2.3) [28.5%, (2)]; it improves their knowledge [14.2%, (1)]; it forces them to study [14.2%, (1)]; it helps them to know whether or not they are studying [14.2%, (1)]; and it provides self-improvement [28.5%, (2)]. However, three participants [42.8%, (3)] reported that such assessment tasks is sometimes a waste of time. No new information emerged from this question and indicates a confirmation of the information gathered from the surveys.

The majority of the student participants [85.7% (6)] confirmed that they were not happy about peer assessment (see 2.9.3.2, 2.9.3.2.1). The reason being that they feel their peers will not be fair in the assessment process [71.4%, (5)]; and *might cause conflict among peers when they feel they have been unfairly assessed [14.2%; (1)].*

S P2: "I will actually say I don't like that assessment because I think that creates some sort of a conflict if other students feel that they were not fairly assessed. Destroy relationships."

However, one participant [14.2%, (1)] reported that peer assessment helps him to learn from his peers.

For conflicts and unfair assessment to be avoided in peer assessment, lecturers need to ensure that students are randomly selected and their decisions should be hidden from each other (see 2.9.3.2).

The majority of the participant [57.1%, (4)] confirmed that they do not "like" self-assessment. Reasons provided included that it is boring [14.2%, (1)]; and that they don't take it seriously [14.2%, (1)]. Two participants [28.5%, (2)] reported that *they are not motivated to such assessment tasks.*

S P3: "I cannot assess myself because I will not be motivated to do that."

S P4: "I am not motivated to do them. I don't like it."

However, three participants [42.8%, (3)] confirmed that they were happy about self-assessment. Reasons included that it enables them to determine whether or not they know their work [28.5%, (2)]; and it provides self-improvement [14.2%, (1)].

The reason of students' lack of motivation to do self-assessment is confirmed by the lecturer participants (see 6.5.1.6). Since self-assessment enables students to focus on their own work in order to enhance their own performance when they identify the gaps between their "current and desired performance, they are encouraged to do them (see 2.9.3.2). Furthermore, with self-assessment, students are able to critically think about their own work and become life-long learners (see 2.9.3.2). In other words, students will indeed become better learners and improve on their learning if they do self-assessment.

All the student participants [100%, (7)] confirmed that they were satisfied with baseline assessments and it takes place at the beginning of every semester. Reasons provided included that it determines what students' know about the IT modules [2.8%, (3)]; it helps students to identify the important content of the IT module [14.2%, (1)]; and it helps lecturers to determine an appropriate teaching method [14.2%, (1)]. Two participants [28.5%, (2)] mentioned that it *helps lecturers to identify the students' problem areas with the IT modules [28.5%, (2)].*

S P2: "The lecturers do it when we start the semester. It helps lecturers to know where the trouble areas are."

S P4: "Baseline assessment is good because the lecturers do them when the semester begins and it helps them to know how much the students understand the module and their problems."

I believe that this is important because lecturers need to know the type of students they have in their classroom (see 2.4.10) and how they can assist them overcome their difficulties in their learning (see 4.5.2).

All the student participants [100%, (7)] indicated that assessment tasks that carry marks were their preferred form of assessment. Reasons provided were that such assessment tasks motivate them to study hard [28.5%, (2)]; and help them to obtain their dual performance grade (i.e. predicate) [71.4%, (5)]. This was followed by assessment tasks that do not carry marks [28.5%, (2)]; baseline assessment [14.2%, (1)]; peer assessment [14.2%, (1)]; and self-assessment [14.2%, (1)]. No new information emerged from the reasons why they preferred a certain assessment tasks and this indicates a confirmation of the information gathered from the surveys. Their preferred forms of assessment correspond to that of the responses obtained from questionnaire survey (see 6.5.2.9).

S P1: “Assessment tasks that carry marks.”

S P2: “Assessment tasks that carry marks.”

S P3: “Assessment tasks that carry marks.”

S P4: “Assessment tasks that carry marks, tasks that do not have marks, baseline, peer and self-assessment.”

S P5: “Tasks that carry marks.”

S P6: “I become more serious with my studies when doing tasks that carry marks. Baseline assessment is also cool.”

S P7: “I like assessment tasks that carry marks. I also like tasks that do not have marks.”

D2.2.5 Types of assessment tasks that IT students do

The student participants were asked about the types of assessment tasks that they do; the format of instructions for the assessment tasks and whether or not these tasks test their knowledge and skills of IT.

The types of assessment tasks identified by all the participants were tests [57.1%, (4)]; examinations [71.4%, (5)]; projects [28.5%, (2)]; java practical [14.2%, (1)]; multiple choice questions [14.2%, (1)]; and assignments [42.8%, (3)]. No new information regarding the types of assessment tasks emerged from this question and this indicates a confirmation of the information gathered from the surveys.

Please note that many of the participants mentioned more than one type of assessment tasks.

The majority of the participants [71.4%, (5)] confirmed that the types of assessment tasks that they had to do, test their knowledge and skills of IT. Reasons included that it provides them with real world/practical experience (e.g. assignments and projects) [57.1%, (4)]; and that it helps them to acquire problem solving skills [14.2%, (1)].

However, two participants [28.5%, (2)] reported that *these assessment tasks do not always test their knowledge and skills of IT.* One of the two participants indicated that *most of the time the questions provided in the assessment tasks are not real life scenarios and does not require critical thinking but just recall.*

S P2: "I think sometimes they don't help, because maybe on the examination they can test, you... With the different things than a real life situation and you only memorise without critically thinking about them. So exams are normally theory which is not practical and so no critical thinking is needed. We just memorise and write the answers. In real life situation, maybe you know how to do some of the things, but what they ask you on the exam, that's not what you know."

S P3: "Like I think they don't help sometimes."

Lecturers should try as much as possible to avoid assessment tasks that only require recall (i.e. surface learning approach) (see 2.2.3, 2.2.3.1, 2.2.3.2) as students tend to forget about it once the assessment task has been completed.

The participants mentioned that they received their instructions for their assessment tasks on paper [28.5%, (2)], in pdf format [42.8%, (3)] and on myLMS platform [28.5%, (2)]. No new information regarding the format of instructions emerged from this question and this indicates a confirmation of the information gathered from the surveys.

D2.2.6 Types of question in assessment task

The student participants were asked to report their experiences and/or opinions about short answer questions and whether or not they tested their level of understanding of what they have learned.

The majority of the student participants [71.4%, (5)] confirmed that short answer questions do not test their level of understanding of what they have learned. Reasons provided were that *it is too easy [14.2%, (1)]; it is confusing due to the related possible answers in the questions [14.2%, (1)]; it limits students thinking abilities [14.2%, (1)]; and that it does not ensure critical thinking since students only have to recall answers [14.2%, (1)].*

S P4: "I also think sometimes they are confusing, because there was this time, they ask us to choose two questions and we don't know what to choose."

S P5: "I don't like it, it's too easy. It simplifies everything way too much. I mean what exactly you're assessing."

S P6: "I think they limit our thinking skills because of the nature of the question they ask."

S P7: "It doesn't help towards your critical thinking, it just helps with recall. If I can recall then ja, I can."

Two participants [28.5%, (2)] confirmed that such questions test their level of understanding of what they have learned. Reasons provided are that it is a quick way to obtain marks [14.2%, (1)]; and that it saves time [14.2%, (1)].

I believe that short answer questions can still assess students' higher order thinking if they are well created (see 3.3.4). IT lecturers need to have time to create questions that will help students in their learning (see 3.3.4). Regarding the confusion of related answers in short answer questions, students need to apply a deep learning approach (see 2.2.4, 2.2.4.1, 2.2.4.2) instead of recall (see 2.2.3, 2.2.3.1, 2.2.3.2). When they do this, they will be able to choose appropriate answers without being confused.

D2.2.7 Students' knowledge about what will be assessed and how it will be done

The student participants were asked to report on the extent that their IT lecturers inform them about what they would be assessed on, how the assessment would be done and the assessment information they were provided.

All the participants [100%, (7)] confirmed that some of the lecturers inform them about what they would be assessed on and how the assessment would be done. The majority of the participants [85.7%, (6)] reported that they receive this information from their lecturers in class.

One participant [14.2%, (1)] specified that *some of the lecturers do not specifically provide them with specific assessment information but whiles teaching, they will inform them to take note of certain content*.

S P7: “I think that they some do in terms of what the lecturers tell you in class, if it is made on a particular aspect, in class but as a student, some student can take note, but some can’t. So if you can’t take note while listening to the lecturer then that will be a problem.”

Two participants [28.5%, (2)] complained that *some of the lecturers provide them with wrong information.*

S P5: “Some of the lecturers give you like direct scope in class né Sir, and then when you get to the exam, you find out like, they tricked you yes.”

S P6**:** “Some lecturers will say, why did you listen to me, it was more of a guideline. No it’s not, you said it was scope. They give to us when teaching in class.”

The assessment information that the participants receive for their assessment tasks are the date [71.4%, (5)]; the time [85.7%, (6)]; the venue for the assessment tasks [71.4%, (5)]; the chapters/units that they should cover [57.1%, (4)]; and the format of the assessment tasks (i.e. the types of questions and the mark allocation) [100%, (7)]. No new findings regarding the information that students receive from their lecturers emerged from this question and this indicates a confirmation of the information gathered from the surveys. Please note that many of the participants mentioned more than one assessment information that they receive for their assessment tasks.

In my opinion, students should be fully aware of the assessment criteria and the content on which they will be assessed on, as mentioned in the first survey (see 6.5.1.12, 6.5.1.13, 6.5.2.14). This practice will make assessment task to be fair (see 2.6.2.1; 3.3.6.3), valid (see 2.6.2.2; 3.3.6.1) and reliable (see 2.6.2.3; 3.3.6.2). Students concern that they are sometimes given wrong information should be avoided by lecturers. I suggest that a lecturer should truthfully inform the students that he/she has no knowledge about the assessment tasks rather than to lie to them. However, the institution should provide the assessment criteria and content (i.e. what) of what the assessment covers to all the relevant IT lecturers in order for the students to be aware of such information.

D2.2.8 Feedback and its impact on students' learning

The student participants were asked of the type of feedback that they get from their lecturers on their performance of assessment tasks and the feedback influences what and how they learn

All the student participants [100%, (7)] confirmed that they did receive feedback about their performance in the assessment tasks they had to do and these are received in class. One participant [14.2%, (1)] reported that lecturers provide feedback in the form of comments on the answer booklet. One participant [14.2%, (1)] mentioned that the feedback that he/she receive helps him/her to reflect on his/her mistakes and make the necessary corrections. However, one participant [14.2%, (1)] specified that he/*she was not satisfied with the feedback he/she received from lecturers because they were too vague and the feedback information was insufficient*

S P7: "The feedback is given in class. Most of the lecturers, they tell you to redo a certain question in an assignment, that you got wrong. Is... Okay, I will redo it, but the reason I did it the way that I did it, was because I thought it was right. What did I do wrong? I mean I wouldn't have done it, if I knew it was wrong. So I say that lecturers... One thing to give you an assignment back, okay do question one all over again. Like yes, but tell me how I should try to do it differently, and what exactly did I do wrong, why is this question wrong? Information is not enough and the feedback is not clear. That is something they usually don't do."

In my opinion, when a student does not understand the feedback provided to him/her, then the feedback is of no importance (see 2.9.2, 2.9.2.1.3, 2.9.2.2.3, 2.9.2.3, 2.9.3.1). Lecturers need to ensure that their feedback is well understood and students should be able to improve on their work based on the feedback provided.

D2.2.9 Fairness of e-assessment tasks

The student participants were asked if the e-assessment tasks that they had to do, were fair, and why or why not.

The majority of the participants [71.4%, (5)] confirmed that the e-assessment tasks that they had to do, were fair. Reasons provided were that all the students were given the same time to complete [42.8%, (3)]; all the students were given the same questions [42.8%, (3)]; and that all the students wrote the assessment tasks under the same conditions [14.2%, (1)]. Please note that many participants provided more than one reason why their e-assessment tasks that they had to were fair.

One participant [14.2%, (1)] mentioned that sometimes during e-assessment tasks, the network fails or the computer freezes and a student has to redo the assessment tasks under limited time. When this happens, then the e-assessment task becomes unfair.

Another participant [14.2%, (1)] reported that the e-assessment tasks that *he/she had to do, were not always fair*. The reason is that *sometimes lecturers do not inform them in advance that there will be e-assessment tasks, and as such, they do not prepare well for them*.

S P1: "In the situation, they usually get asked them when we are unprepared or just a quick assessment. In that way, I think it is unfair."

Lecturers need to understand that assessment tasks should not be a "surprise". Students should know when an e-assessment task is taking place in order for them to adequately prepare (see 2.6.2.1, 3.3.6.3).

D2.2.10 Content that e-assessment tasks cover (i.e. validity)

The students were asked if their e-assessment tasks that they did, tested the content that they have covered in their IT module

Majority of the participants [85.7%, (6)] confirmed that their e-assessment tasks covered only the content they had covered in the module. However, one participant [14.2%, (1)] mentioned that *sometimes the questions provided in the e-assessment tasks had not been covered in class.*

S P7: "We sometimes get strange tasks when we are not aware of the content."

This was confirmed by the lecturer participants and a discussion has already been provided (see 6.5.1.16). Lecturers need to learn and know that e-assessment tasks are valid (see 2.6.2.2; 3.3.6.1) if it tests the content that have been covered (see 2.6.2.1; 3.3.6.3).

D2.2.11 Comparison of marks obtained for the various e-assessment tasks and with paper-based assessment tasks (i.e. reliability)

The student participants were asked about the relation between the marks that they obtain in different e-assessment tasks and the relation between the marks that they obtain in e-assessment tasks and paper-based assessment tasks

Regarding the relation between students' marks for the various e-assessment tasks, three participants [42.8%, (3)] reported that their marks were consistent. Two of the three participants indicated that they study hard for all their e-assessment tasks. Some participants mentioned that the marks depend on the types of questions in the e-assessment tasks [42.8%, (3)]; and their level of understanding of the IT modules (i.e. the type of IT modules) [14.2%, (1)]. No new information emerged from this question and indicates a confirmation of the information gathered from the questionnaire survey.

In terms of the relation students' marks they obtain in e-assessment tasks and paper-based assessment tasks, the majority of the participants [85.7%, (6)] reported that they usually have higher marks in paper-based assessment tasks than in e-assessment tasks. Reason provided were that they have *the flexibility of explaining their answers in detail [28.5%, (2)]; and that there is always enough time to complete paper-based tasks [28.5%, (2)].*

S P3: "…whereas where it's paper-based, I can write based on my own experience, and not have to confine to somebody's understanding. Paper-based are higher."

S P4: "My paper based are always higher. You hardly have time to think about online tests, you know they are always short.

S P7: "For me, I get higher marks in paper-based questions, né. Because like, even if I don't know the definition for something, I can give an example and then if the lecturer is not strict enough, they will understand that I understand what's being asked, né. Whereby when is electronic, I don't get a chance to do that. The time is not enough."

One participant [14.2%, (1)] reported that he/she *performs better in practical assessment tasks, but most of their e-assessment tasks are theoretical and as a result of that, he/she obtains low marks*.

S P6: "…e-assessment is usually theoretical, I'm more of a practical person, but give me a scenario where I can explain what I'm doing, by all means and that is why my marks are better when on paper and my online marks are low."

However, one participant [14.2%, (1)] mentioned that *he/she usually obtains higher marks in e-assessment tasks because they are short answer questions and requires only recall.*

S P5: "I think I was getting high marks on the e-assessment test, because you just choose, you don't have to think - you follow your gut and you recall."

The issue of students' inability to explain their answers better has already been discussed (see 6.5.2.22). Regarding the limited time, lecturers are entreated to provide adequate time for their IT students to complete the e-assessment tasks. When inadequate time is provided, then the e-assessment tasks do not adhere to the principle of practicability/feasibility (see 2.6.2.4) and students tend to take a surface learning approach (see 2.2.3, 2.2.3.2). One participant mentioned that he/she obtains higher marks in e-assessment tasks because they only require recall. I encourage lecturers to develop e-assessment tasks that will help students to apply a deep learning approach which in turn, will improve on their learning (see 2.2.4, 2.2.4.1, 2.2.4.2).

D2.2.12 Types of assessment task that mostly improve student learning

The student participants were asked to identify the types of assessment task that they think can help most in improving their own learning

The types of tasks that the student participants confirmed that they improved student learning were practical assignments (e.g. programming, database and networking) [57.1%, (4)]; projects [28.5%, (2)]; multiple choice questions [14.2%, (1)]; true/false questions [14.2%, (1)]; and examinations [14.2%, (1)]. Reasons provided were that these assessment tasks (e.g. assignments and projects) provide them with real-world/practical experiences [28.5%, (2)] and skills in IT [14.2%, (1)]. One participant [14.2%, (1)] reported that multiple choice questions, examination and true/false questions also improve his/her learning because he/she acquires the theoretical knowledge from such tasks in order to apply them practically. No new information emerged from this question and indicates a confirmation of the information gathered from the questionnaire survey.

D2.2.13 Recommendations for the use of e-assessment in the teaching and learning of IT

The student participants were asked to report their views of the extent to which e-assessment should be used (or not used) in the teaching and learning of IT

Although all the participants [100%, (7)] agreed that e-assessment should be used in the teaching and learning of IT, they all had some recommendations. I summarised the suggestions and recommendations identified by the participants as follows:

- *E-assessment cannot assess high stake assessment tasks (e.g. exams)* [14.2%, (1)].
- *E-assessment should only be used for baseline assessment, self-assessment* [14.2%, (1)].
- *E-assessment should be used for class activities and not for assessment tasks that carry marks* [14.2%, (1)].
- *A mobile application should be created for myLMS in order to provide easy access* [14.2%, (1)]
- E-assessment provides anywhere and anytime accessibility of e-assessment tasks [57.1%, (4)].

S P1: "E-assessment is a better way to assess what the students know and you can practise multiple choice, true/false, you know, but you can't test as much broader knowledge as the basis of a more natural exam but it can be done at any place."

S P3: "Although students do not have to be on campus to do their tests, I think it can be used for only, baseline assessment and self-assessment because it will help the lecturers to see what the student understand or don't understand."

S P4: "I think it will be good if they use it as a class activity, not for assessment tasks that carry marks."

S P6: "I think there should be a mobile application for myLMS instead of the website in order to make it easier for students and lecturers to access"

I completely disagree with the participants who mentioned that e-assessment cannot assess high stake assessment tasks (e.g. exams); e-assessment should only be used for baseline assessment, self-assessment; and that e-assessment should be used for class activities and not for assessment tasks that carry marks. This is because Wikis, blogs, self-review, peer-review, scenario questions, simulation software, role plays, and observations can all be used in e-assessments to assess students' higher order thinking abilities as well as their hands-on skills (see 3.3.4, 4.7.1, 4.7.2) and therefore e-assessment should not only be restricted to certain tasks. I think the participant who suggested that there should be a mobile application for myLMS, made a viable recommendation. I will entreat the CTI institution to consider this in future because with the mobile application, both students and lecturers will be able to log into the system at ease.

D3 CONCLUSION

This chapter analysed and discussed the different perceptions of CTI IT lecturers and IT students regarding the role of e-assessment in their teaching and learning respectively. Chapter 7 further addresses the research questions by compiling a preliminary framework for the implementation of e-assessment in the teaching and learning of IT at CTI Education Group by integrating the data obtained from the literature review and the lecturer and student findings presented in this chapter, as well as the feedback from the expert panel in the second round of data collection who evaluated and provided feedback on the semi-final proposed framework.

APPENDIX E:

SUMMARY OF FINDINGS FROM THE FIRST ROUND OF DATA COLLECTION

E SUMMARY OF THE MAJOR FINDINGS FROM THE FIRST ROUND OF DATA COLLECTION

This appendix provides a summary of the major findings from the first round of data collection (i.e. the questionnaire surveys and focus group discussions) for both the IT lecturers and IT students.

Table E1: The value of e-assessment for the teaching and learning of IT

Findings from the IT lecturers	Findings from the IT students
• Prompt feedback to learners. • Flexibility (i.e. anywhere and anytime assessment). • Reduces marking time. • Diverse assessment. • Secures tests and results. • Assessment is fair • Immediate evaluation of e-assessment tasks • Time-saving due to the ability to re-use questions in the question bank. • Automatic and authentic marking. • Easy upload and setting questions. • Ensures the possibility to randomize questions. • The e-assessment platform provides security because students are not able to remove and/or edit materials that have been uploaded and that lecturers can hide and/or unhide the e-assessment tasks that students must do (i.e. the lecturers have control over what students can see on the e-assessment platform). • Some participants mentioned that e-assessment expose students to technology	• It enables some students to access and/or practice assessment tasks anytime and anywhere • Enables some students to interact with technology which boosts their confidence • Enables some students to solve more advanced questions (e.g. simulations, practical-based questions, etc.) which in turn provides them with real-world experience • Enables some students to receive immediate feedback and result of assessment tasks • Enables some students to exhibit knowledge in different ways due to the different types of questions available on myLMS. • One participant reports that e-assessment tasks that he/she did, did not add value to his/her learning due to the inability to change answers that had already been entered. • One participant mentioned that it is easy to conduct forum discussions on the e-assessment platform because they can do discussion from anywhere. • A participant reported that his/her

Findings from the IT lecturers	Findings from the IT students
	lecturer use Socrative (which is also an e-assessment platform) to conduct e-assessment tasks.

Table E2: The need/purpose for assessment

Findings from the IT lecturers	Findings from the IT students
• For academic records. • To provide students with constructive feedback for improvement. • To adjust lecturers' own teaching methods. • To adjust the difficulty level of assessment tasks (if required). • To provide students with their grades. • To determine students' predicate. • To increase/decrease workload. • To determine students' performance and progress. • To determine if a student has passed/failed a course. • To determine students' level of understanding in the module.	• To test students' knowledge and level of understanding in the IT modules. • To monitor students' performance and/or progress and guide them where the need be. • To obtain better grades/marks. • To prepare students towards examinations. • To identify students' strengths and weaknesses. • To determine students' competencies. • To determine whether the lecturers are using the best teaching approach. • To improve on students' practical experience. • To ensure that students have met all the assessment criteria in the module.

Table E3: Forms of assessment

Findings from the IT lecturers	Findings from the IT students
Formative assessment	
• To determine the concepts that students have mastered. • To monitor student learning and provide ongoing feedback. • To help evaluate students understanding of what has been done. • To provide "great" opportunity for	• Some participants reported that such formative tasks prepared them for other tasks that carry marks (e.g. examination). • Some viewed these tasks as a tool to increase students' knowledge and understanding due to the extra reading and research they require.

Findings from the IT lecturers	Findings from the IT students
learning. • To determine students' performance and progress. • Formative assessment is used throughout the academic year in order to encourage students to learn more. • One participant reported that formative assessment forces students to revise what has been completed in class.	• Some mentioned that besides these tasks improving their own learning, these tasks reflect their learning progress. • These tasks create an opportunity for some students to ask questions and seek for clarifications on some specific topics. • Formative assessment tasks provide opportunity for some students to identify their problem areas. • Such tasks assisted some students to practice constantly in order to know the content of the module better. • Some participants complained that some lecturers tend to ask easy questions in these assessment tasks which do not reflect what will appear in assessment tasks that carry marks. • A participant indicated that he/she is not motivated to do them since it does not add any mark to the predicate.
Summative assessment	
• To provide formal grades for their students. • To determine students attained knowledge and skills • To determine whether or not students have met the learning outcomes. • To determine if students have met the assessment criteria. • The assessment tasks that some lecturers mentioned include class tests, assignments and examinations. • Summative assessment enables students to determine their predicate at the end of the semester (i.e. dual performance).	• Some specified that summative assessment tasks motivate them to study hard (i.e. put in an extra effort) and stay committed. • Some reported being motivated improve their marks and performance. • Some indicated that such summative assessment tasks determine whether or not they have passed or failed the module • Some participants reported that the marks obtained reflect their progress and performance in the module. • Some refer to summative assessment tasks adding value to their learning due to the research they are required to carry out for certain assignments.

Findings from the IT lecturers	Findings from the IT students
	• A participant felt that such summative assessment tasks are stressful if insufficient time was given to them to complete the assessment tasks. • Another participant reported that some lecturers also fail to provide them with enough information about the content and assessment criteria that the assessment tasks would cover. • Some participants reported that it prepares them for the real-life situations. • A participant stated that it sets a standard and benchmark for students. • One participant reported that not all the summative assessment tasks prepare him/her for the corporate world because some of the tasks are purely theoretical and they have no practical content.
Peer assessment	
• It helps students to learn better from each other. • It enforces team work and sharing of ideas which in turn improved students' learning. • It reveals students' own level of understanding and knowledge. • It helps some students to elicit creative questioning of topics. • It enables students to identify their own mistakes in a softer context. • One participant uses it for assessment tasks where the answers required need not to be interpreted, for example, true or false questions. • A participant mentions that it is unfair assessment because students tend to be biased. • Some lecturer participants reported	• Some specified that such assessment tasks ensures team building • Enables some students to learn from each other (i.e. share ideas) • Enables some students to receive constructive feedback from peers who may be more knowledgeable about the task. • Some reported that peer assessment tasks help them to identify their own strengths and weaknesses of the task being assessed. • A participant mentioned that such assessment tasks is not fair since students tend to assess based on their emotions and/or friendship • A participant reported that his/her peers are not experts in the module they were assessing

Findings from the IT lecturers	Findings from the IT students
that they use peer assessment at the end of every semester where students have to deliver their final presentations for their software development projects and when they had present their final networking assignments. • One participant said that peer assessment helps students to obtain valuable feedback from their peers.	• A participant said that he/she struggles to concentrate since he/she is working with his/her peers. • One participant reported that peer assessment might cause conflict among peers when they feel they have been unfairly assessed.
Diagnostic assessment	
• To identify students' weaknesses and strengths in order to plan my lecturing accordingly. • To assess students' understanding of the work done. • To determine areas that need to be focused upon in revision classes. • To identify the weaker students through observation • Class exercises are used for this assessment.	• This form of assessment was not applicable to the student participants
Baseline assessment	
• Baseline takes place at the beginning of a module. • To test students' level of understanding. • A participant reported that it is not an appropriate way to determine students' strengths and weaknesses.	• Some specified that such assessment tasks prepare them for assessment tasks that carried marks. • It assists some students to determine their performance and progress of their own learning • It helps some students to identify their own strengths and weaknesses • It helps some students to identify their own level of understanding in the module. • Some refer to baseline assessment assisting their lecturers in determining the teaching approach to use in class. • A participant was of the view that the content of baseline assessment is most of the time out of the scope of the module that they are doing.
Self-assessment	
• For students to test themselves during self-study.	• It enables some students to identify their own strengths and weaknesses

Findings from the IT lecturers	Findings from the IT students
• To evaluate their students' own level of understanding. • A participant mentioned that assessment tasks are provided in a database or test bank and at the end of every unit for students. • Some indicated that students are not motivated to do them.	• Some students are able to determine their own progress in the module • It enables some students to know their own level of understanding and knowledge. • Some students reported that such tasks motivate them to learn harder • It enables some students to take responsibility for their own learning • It prepares some students for assessment tasks that carry marks (i.e. examination, tests etc.). • A participant reported that he/she finds it difficult to identify his/her own mistakes or problems when doing self-assessment tasks. • A participant mentioned that he/she tend to be lenient on himself/herself and did not take these assessment tasks seriously. • Some participants reported that they are not motivated to do such assessment tasks.
Preferred form of assessment (in order of preference)	
• This question was not applicable to the lecturer participants	• Summative assessment (i.e. assessment tasks that carry marks). • Self-assessment • Baseline assessment • Peer assessment • Formative assessment (i.e. assessment tasks that do not carry marks)

Table E4: Assessment tasks used in assessing IT students

Findings from the IT lecturers	Findings from the IT students
Presentations	
• It improves students' communication skills. • It allows students to learn from each other. • It allows students to be involved in the	• Not mentioned by any student participant.

Findings from the IT lecturers	Findings from the IT students
assessment task since they could ask the student presenters some questions for obtaining clarity.	
Case studies	
• It allows lecturers to determine if the students could apply what they had learned. • A participant mentioned that he/she often use case studies in his class which in turn enables the students to think critically and come up with solutions to real-world problems.	• This task was not mentioned by any student participant.
Assignments	
• It improves students' skills in IT. • It enables students to be well prepared for the world of work due to its practical content.	• Some student participants indicated that assignments/projects help them to improve on their research skills • It helps some students to acquire practical experience of the module which in turn prepare them for the real world.
Projects/Group Projects	
• It allows students to learn from each other and share ideas.	• Some student participants indicated that assignments/projects help them to improve on their research skills • It helps some students to acquire practical experience of the module which in turn prepare them for the real world.
Examinations and Tests	
• To test students' level of understanding and knowledge of what they had learned.	• It prepares some students for the real world (i.e. the IT industry) • It assists some students in identifying the difficulties that they faced in studying the module. • Some reported that such types of assessment tasks motivate them to study well • It enables some students to acquire more knowledge about the module • It enables some students to assess their knowledge and own level of

Findings from the IT lecturers	Findings from the IT students
	understanding (i.e. competency) • It enables some students to assess their own performance. • One participant mentioned that he/she is sometimes not given enough time to do these tasks which makes him/her to obtain low marks.
Short-answer questions (e.g. multiple choice questions, true/false questions, quizzes, etc.)	
• It improves the students' own level of understanding due to the constant practice which ultimately enhanced their learning. • It is easy to mark due the automatic evaluation by myLMS.	• Some indicated that they adequately prepare for such assessment tasks which in turn help them to acquire knowledge • It helps some students to boost their confidence to tackle long answer questions • Some students save their time in answering such questions. • Some reported that with short answer questions, marks are easily obtained. • The impact of lower marks does not affect the predicate since marks allocated for these types of questions are not much • The assessment is fair • It is a good alternative way to improve student learning. • Some participants indicated that short answer questions did not test their knowledge and competence because answers could easily be guessed and that students could easily memorize concepts just to pass without understanding these concepts • One participant advised that lecturers should develop short answer questions based on the nature of the module that they teach since short answer questions are not suitable for all modules. • Some students reported that these types of questions are too easy; confusing due to the related possible answers in the questions; and that it limits students thinking abilities. • A participant mentioned that it did not ensure critical thinking since students only have to recall answers.

Findings from the IT lecturers	Findings from the IT students
Programming practical	
• One participant reported that in his/her programming class, practical exercises (i.e. coding) are provided for the students for them to have hands-on experience	• This task was not mentioned by any student participant.
The extent that the assessment tasks test students' knowledge and skills in IT	
• This question was not applicable to the lecturer participants	• One participant mentioned that the assessment tasks enables him/her to understand his/her capabilities. • It enables some students to apply what he/she had learned (e.g. assignments/projects) • It prepares some students for the industry (e.g. assignments/projects) • Some reported that their time management skills, report-writing skills, leadership skills and communication skills are improved through peer assessment tasks (such as presentation), assignments/projects and deadlines that came with the assessment tasks. • One participant mentioned that tests and examinations provide him/her with the theoretical background required to do the practical work. • A participant mentioned that the continuous assessment tasks assists him/her to gain an in-depth understanding and knowledge about the module since it covered all the content of the module in bits. • One participant stated that the different formats of the assessment tasks improves his/her skills and knowledge of IT since they tend to learn something new from time to time. • One participant indicated that most of the time the questions provided in the assessment tasks are not real life scenarios and did not require critical thinking but just recall. •

Findings from the IT lecturers	Findings from the IT students
Format of instructions for assessment tasks	
• This question was not applicable to the lecturer participants	• Some students mentioned that they download the instructions from myLMS for easy accessibility (i.e. anytime and anywhere). • Some students stated that resources required for their modules are uploaded on myLMS by lecturers. • Other suggestions indicated that instructions are received in printed format in lecturer slides, verbally and on the server.
Types of assessment tasks that mostly improve student learning (in order of participants' preference)	
• This question was not applicable to the lecturer participants.	• Assessment tasks that carry marks/summative assessment (e.g. tests, examination, assignment). • Self-assessment tasks • Group projects • Practical assessment tasks • Role plays **Reasons some student participants provided included:** • The assessment tasks provide some students with the necessary experience required for the IT industry (e.g. assignments) • The assessment tasks help some students to study and develop an understanding of the module • Some students gain more knowledge about the module.

Table E5: Students' knowledge about what (i.e. the content) they will be assessed on and how (i.e. the assessment criteria) according to which they will be assessed

Findings from the IT lecturers	Findings from the IT students
• It helps some students to focus on the important concepts. • It enables some students to prepare adequately (i.e. they could then take control of what they would be assessed on). • Some students tend to be lazy with their work because they only focus on what has been given to them and ignore the rest of the content. • Some students do not attend classes after obtaining the content (i.e. scope). • Some students hardly study on their own. • It narrows what the students will study (i.e. they will then focus on the relevant areas). • It makes the assessment fair. • It ensures an alignment between teaching, learning and assessment. • Some participants reported that students should be aware of the breakdown of the assessment tasks (i.e. the mark allocation); the type of questions (i.e. short questions or long questions); and the chapters the assessment tasks will cover. • One participant advised that the information provided to students should not be the exact questions in the assessment tasks.	• It provides some students with enough time to prepare adequately. • It provides an opportunity to consult some of their lecturers on content that they did not understand. • It enables some students to focus on the important content in order to achieve better marks. • Some lecturers inform their students of the chapters to concentrate on for the assessment tasks. • The content ("what") provided by some lecturers is too vague and did not help them in any way. • Some lecturers discuss the criteria against which the assessment task would be marked and rubrics were sometimes attached to the assessment task. • Some lecturers go through past examination papers with them. • Some lecturers create mock tests that were in examination format for them to attempt in class. • Some lecturers provide their students with the types of questions they should expect. • Some mentioned that their marks subsequently improve due to better preparation • Some indicated that it reduces their workload (i.e. time saving) • Some participants stated that it assists them to apply specific learning methods or techniques in order to learn better. • Some participants are of the opinion that, even though it helps them to focus on some concepts, it is not sufficient to enable them to cover all the important contents of the module. • One participant specified that some of the lecturers did not specifically provide them with specific assessment information but whiles teaching, they will inform them to take

Findings from the IT lecturers	Findings from the IT students
	note of certain content. • Some participants complained that some of the lecturers provide them with wrong information.

Table E6: Assessment information provided to students in advance and how it was conveyed

Findings from the IT lecturers	Findings from the IT students
• This question was not applicable to the lecturer participants.	• The content that the assessment would cover • When the assessment would take place • The marks allocation • The question types • The criteria to be assessed • The rubrics • The chapters that the assessment tasks would cover • The structure of the assessment tasks. • Assessment information is conveyed to some students in class, through e-mails, campus server and/or print outs.

Table E7: Problems with e-assessment tasks (i.e. assessment tasks conducted on myLMS)

Findings from the IT lecturers	Findings from the IT students
• Time consuming to set up the assessments. • Not practical (i.e. too administrative rather than educative). • Restricted modes of questioning for makes it difficult for Maths in IT. • Some students' inability of how to use the system. • Usability and efficiency problems (e.g. login issues). • One participant indicated that the user interface of the myLMS platform still has some bugs.	• Power failures which cause students to lose their work • Compatibility issues • Some students' inexperience with the e-assessment system (i.e. myLMS) • Unstable network (i.e. internet) which makes it difficult for students to meet deadlines and time limits • Some students' inability to access/open e-assessment tasks due to server problems • Some students find it difficult with navigating through the e-assessment tasks

Findings from the IT lecturers	Findings from the IT students
	• Some students reported that there is instability of the e-assessment platform (i.e. sometimes the e-assessment site crashes) • Some students mentioned their inability to change answers that have already been inputted • Some student participants said that students cheat during e-assessment tasks by browsing through the internet for answers. • Password problems (e.g. login issues) • The difficulty of downloading materials from myLMS • Limited in the way they answer questions

Table E8: Setting deadline dates for the completion/submission of assessment tasks

Findings from the IT lecturers	Findings from the IT students
• It prevents students from coming up with an invalid excuse for not submitting a task or submitting a task late. • It teaches students good time management. • It ensures that students take responsibility for their own learning. • It ensures fairness since all the students will have the same time to submit a task. • Some participants advised that deadlines should be reasonable in order to allow the students enough time to achieve the intended results.	• This question was not applicable to the student participants.

Table E9: Setting duration limits (i.e. limiting the allowed duration) for the completion of e-assessment tasks

Findings from the IT lecturers	Findings from the IT students
• It ensures fair assessment. • It helps some students to prepare	• This question was not applicable to the student participants.

Findings from the IT lecturers	Findings from the IT students
themselves for the working environment. • It forces some students to think and set targets on the achievement of their tasks. • It enables students to take responsibility for their own learning. • Some participants advised that factors such as the complexity of the assessment, the types of questions being asked and possible technical issues (i.e. slow internet, unreliable computers) need to be considered.	

Table E10: Relationship between IT students' marks and how and what they have learned

Findings from the IT lecturers	Findings from the IT students
• Students obtain better grades when they take their studies seriously and learn well (i.e. by using deep learning approach). • A participant mentioned that IT requires practical demonstrations and as such marks do not reflect what students have studied. • Students who just memorize concepts (i.e. by using surface learning approach) tend to achieve low marks. • It depends on the lecturer's teaching methods and the type of tests and/or IT modules. • One participant warned that lecturers should appropriately use the verbs in the BLOOM's taxonomy when developing assessment tasks in order for their students to obtain better marks.	• This question was not applicable to the student participants.

Table E11: Feedback to IT students about their performance in assessment tasks

<table>
<tr><th>Findings from the IT lecturers</th><th>Findings from the IT students</th></tr>
<tr><td>

It enables students to improve on their work by learning from their mistakes.
It ensures positive enforcement of their performance among the students.
It enables the students to take note of their own strengths and weaknesses.
It assists in enhancing their students' learning curve.
One participant reported that there is no time available to provide students with proper feedback.
Some students fail to attend one-on-one sessions for obtaining feedback.
Some students did not reflect on the feedback since their only interest was always in the marks they scored.
Some participants reported that they provide feedback to their students in class by going through class activities, assignments, and tests with them.
One participant mentioned that the memorandum of assignments and class exercises are uploaded on the server for students.
However, the participant observed that the students rarely go through the memorandum because they feel they have already obtained the marks and nothing can change those marks.

</td><td>

Some participants reported that feedback is received from their lecturers in class (i.e. verbally); individual appointments; through comments attached to their assessment tasks (i.e. in writing); and via the myLMS platform (i.e. electronically)
Some participants indicated that their lecturers use the memorandum to make corrections in class and through scheduled one-on-one consultations.
Some participants specified that feedback on student performance in assignments and tests are discussed with the students in class and information on how to improve on the assessment tasks was provided by the lecturer.
One participant specified that he/she is not satisfied with the feedback he/she receives from lecturers because they are too vague and the feedback information is insufficient.

</td></tr>
</table>

Table E12: Possible effect of feedback on IT students' performance in their assessment tasks

Findings from the IT lecturers	Findings from the IT students
• It provides "positive" effect on students' learning curve. • It creates learning opportunities for the students. • It enables students to identify their own competency levels. • It enables students to obtain high marks which in turn encouraged them to work harder • It enables the students to take responsibility for their own learning when they went through the feedback, made the necessary corrections and learned from their mistakes. • One lecturer participant warned that feedback should be timely in order to have a positive impact on students' performance	• It improves students' study approach. • Enables some students to determine their mistakes and subsequently correct them • Some students are motivated to work harder for better grades • Enables some students to pay attention to the areas that they struggled with and improved on them • Enables some students to get a clearer understanding of the assessment task which in turn helped them to do better in subsequent assessment tasks. • Some reported that the feedback did not influence their way of learning since it is not detailed enough.

Table E13: Principles of good e-assessment

Findings from the IT lecturers	Findings from the IT students
Fair (or not)	
• The content and assessment criteria are made known to the students. • The content that is assessed is within the scope of the module. • The e-assessment task is not biased (i.e. did not favour certain students). • One lecturer participant indicated that he/she is adequately trained on assessment development. • The e-assessment platform (i.e. myLMS) did not award marks for the steps that students follow in order to arrive at the final answer. • It forces some lecturers to develop lower level questions. • One lecturer participant reported that the e-assessment tasks that students	• The same opportunity is given to all the students • The same e-assessment tasks are written by all the students • The same resources are provided for all the students • It did not favour specific group of students • The same information about the e-assessment is given to all the students • There is a consistent marking by the system for all the students. • One participant reported that the e-assessment task (e.g. test) that they did is not fair because the infrastructure that they have (i.e.

Findings from the IT lecturers	Findings from the IT students
had to do, is unfair because some students are more knowledgeable and experienced with the use of technology than other students and thus most of his students are not able to complete their tasks on time.	internet) is not reliable. • A participant mentioned that some lecturers do not inform them in advance that there will be e-assessment tasks, and as such, they do not prepare well for them.
Practicable/Feasible (or not)	
• All the necessary infrastructure (such as internet, computers) and resources (i.e. physical, human and financial resources) is readily available for students. • The environment in which the students write their e-assessment tasks is conducive to avoid unnecessary pressure. • One lecturer participant reported that he/she is adequately trained (i.e. experience) on assessment development to ensure feasibility/practicability of e-assessment tasks. • Programming and Math are not feasible/practicable in e-assessment due to some restrictions on the e-assessment platform. • One participant reported that there is lack of infrastructure. • A participant mentioned that although e-assessment tasks are available to students all time, not all the students have enough mobile network data to do the assessment tasks when they are off campus.	• This question was not applicable to the student participants.
Reliable (or not)	
• Students did the same assessment tasks under the similar condition. • Students' results or outcome of e-assessment tasks are consistent. • Marking in e-assessment is more consistent. • One lecturer participant mentioned that he/she is adequately trained in the development of assessments.	• Some students mentioned that their marks are consistent because they prepare adequately for all their e-assessment tasks • Some mentioned that their marks are true reflection of what and how they learned. • Some participants reported that their marks are inconsistent based on type of module; the lecturers teaching method; and the type of questions asked in the e-assessment tasks.

Findings from the IT lecturers	**Findings from the IT students**
	• One participant reported that lower marks are obtained because of his/her inability to go back to correct an answer on the e-assessment platform (i.e. myLMS). • Some participants reported that their marks in paper-based assessment tasks are higher than that of e-assessment tasks because some lecturers award marks for their effort or attempt and are sometimes lenient on them when marking. • Some participants mentioned that their marks in paper-based assessment tasks are lower because lecturers sometimes mark unfairly (i.e. based on emotions or moods). • One participant indicated that the marks he/she obtains depend on the module • Most of the participants reported that they usually have higher marks in paper-based assessment tasks than in e-assessment tasks. • Some indicated that they have the flexibility of explaining their answers in detail • Some student participants mentioned that there is always enough time to complete paper-based tasks.
Valid (or not)	
• E-assessment tasks are set according to the requirements of the module and that it only covers the content of the module. • Some participants reported that their students have shown sign of improvement in their grades/marks after completing their e-assessment tasks • Some participants' feel that their IT students need to learn beyond the IT modules requirements hence their tasks are not always valid.	• Some participants specified that their tests, assignments and examinations are always within the scope of the content that they have been taught. • One participant reported that he/she learns the content of the assignment over time since the assignment covers most of content that had not been covered in the module. • Some participants mentioned that not all their e-assessment tasks cover the content that has been done in class.

Table E14: Examples of e-assessment tasks and paper-based assessment tasks

Findings from the IT lecturers	Findings from the IT students
• This question was not applicable to the lecturer participants.	**E-assessment tasks:** • Tests. • Continuous assessment tasks. • Software development • Programming (i.e. coding). • Database practical tests. • Simulations. • Multiple choice questions. • Surveys. **Paper-based tasks:** • Tests. • Assignments. • Examinations.

Table E15: Quality e-assessment

Findings from the IT lecturers	Findings from the IT students
• When errors and unfairness are avoided in the e-assessment process • When e-assessment tasks are fair, relevant, reliable, valid, and practicable. • When students' knowledge of the module are assessed in-depth. • When marks are awarded correctly and fairly. • When students' outcomes meet the initial objectives. • When students are informed of the content and assessment criteria that the e-assessment tasks will cover.	• This question was not applicable to the student participants.

Table E16: Prior experience of and knowledge about student assessment

Findings from the IT lecturers	**Findings from the IT students**
• Lecturers need to design assessment that meet students' needs. • Lecturers prior experience of and knowledge about student assessment will help them to link teaching to assessment • Lecturers need to have prior experience and knowledge of assessment because moving from paper-based to e-assessment involves new technology refinement and upgrades. • Prior experience will help them to adapt to the change. • Lecturers will have the knowledge and skills required for designing and implementing quality e-assessment tasks • Some participant mentioned that there is no need because e-assessment is just an automation of assessment and that it is only a different format. • One participant stated that lecturers' experience of and knowledge about student assessment will allow them to appropriately apply the action verbs in the BLOOM's taxonomy in their e-assessment tasks.	• This question was not applicable to the student participants.

Table E17: Suggestions and recommendations regarding e-assessment

Findings from the IT lecturers	**Findings from the IT students**
• Lecturers must be creative and come up with exciting assessment. • Lecturers must use a variety of e-assessment methods. • Adequate resources and training should be provided for lecturers. • Lecturers need to constantly practice and use the available e-assessment technology. • Lecturers should try and avoid the habit of developing too many	• Some participants suggested that for the effective use of e-assessment in the teaching and learning of IT, there should be proper resources and IT infrastructure available • Some students reported that they should be trained on how to use the technology in their learning • Some indicated that e-assessment should be done if the security of the e-assessment tasks is in place

Findings from the IT lecturers	Findings from the IT students
true/false questions and multiple choice questions in order to minimize their marking load. • Lecturers need to adapt to change and embrace technology. • Lecturers must avoid assessing only lower order skills and rather focus on higher order thinking skills. • Lecturers need to design interesting e-assessment tasks. • Lecturers should be encouraged to do e-assessment tasks at least twice per semester or once a month because the constant practice of the use of the technology (i.e. myLMS) will help them to effectively use the system. • For lecturers to effectively use the e-assessment platform, the IT administrators in charge of maintaining the platform should simplify it because as it is now, it is more for administrative purposes than a learning platform. • Lecturers' workload must be reduced in order for them to have some time to develop e-assessment tasks.	because some students can cheat. • Some students said that lecturers should have the knowledge about the technology to assist students who might face challenges when doing e-assessment tasks. • Some participants reported that e-assessment tasks should be done in a controlled environment. • Some participants advised that e-assessment tasks should test students' understanding and progress. • A mobile application should be created for myLMS in order to provide easy access.

APPENDIX F:

FINAL PROPOSED FRAMEWORK

Table F1 presents the final proposed framework for the implementation of e-assessment in the teaching and learning of Information Technology at CTI in a single table.

Table F1: Final proposed framework for the implementation of e-assessment in the teaching and learning of Information Technology at CTI

A: CHARACTERISTICS AND/OR REQUIREMENTS FOR THE SUCCESSFUL IMPLEMENTATION OF E-ASSESSMENT	
A1: The delivery system for e-assessment should be appropriate. This requires the following considerations:	
A1.1	The IT server must be in place.
A1.2	The delivery system should have stable Internet connectivity.
A1.3	Students should be able to access e-assessment tasks on any browser and on any operating system (there should be interoperability and compatibility).
A1.4	The system should be able to randomise questions/tasks.
A1.5	The system should be able to award marks automatically for students' answers.
A2: The control mechanisms for e-assessment should be appropriate. This requires the following considerations:	
A2.1	The e-assessment system should enable an assessor to set a time limit (duration limit) for the completion of any e-assessment task.
A2.2	The e-assessment system should allow a cut-off time/date for access to e-assessment tasks after deadline submission dates.
A2.3	The e-assessment system should allow candidates to revert to previous questions/tasks and make amendments.
A2.4	The e-assessment system should limit the number of times a student can re-attempt a task.

A2.5	The e-assessment system should allow switching between synchronous and asynchronous modes of e-assessment.
A3: The system feedback for e-assessment should be appropriate. This requires the following considerations:	
A3.1	The e-assessment system should allow assessors to turn feedback on an e-assessment task on or off.
A3.2	The e-assessment system should be programmed to provide appropriate feedback when an answer is correct or incorrect.
A3.3	The e-assessment system should allow assessors to provide feedback per question.
A4: The stability and speed of the e-assessment system should be appropriate. This requires the following considerations:	
A4.1	The e-assessment system should be stable while the assessor is compiling the task.
A4.2	When students are (simultaneously) completing the e-assessment task the system should remain stable.
A4.3	In case of a power failure when students are completing the e-assessment tasks, there should be an alternative/emergency power source in the relevant computer laboratory and server room.
A4.4	There should be a means of saving answers so that if there is a disruption such as a power failure, students will be able to continue from where they were interrupted.
A4.5	The delivery of relevant tests, videos, graphics, and e-assessment tasks from the server to the student's computer should be fast and not be delayed.
A5: The security of e-assessment should be appropriate. This requires the following considerations:	
A5.1	Only students who are registered for the module should be able to access an e-assessment task.
A5.2	The e-assessment system should allow for the e-assessment task to be scheduled for a pre-specified date and time (it should allow a synchronous mode, if required).
A5.3	The e-assessment system must allow assessors to set the number of times students will be allowed to access an e-assessment task.

A5.4	The time a student logs on and off, the system/e-assessment task should be recorded and made available for the lecturer to monitor.
A5.5	Before an e-assessment task is uploaded and ready, the student's login and password should be operational.
A5.6	Students should be authenticated (by using their own unique usernames and passwords, random password or biometrics) when accessing an e-assessment task.
A6: The recording and reporting of e-assessment results should be appropriate. This requires the following considerations:	
A6.1	The e-assessment system must be able to download, report, and export data such as student numbers, names, and marks into Excel, Word or any other relevant text format.
A6.2	The e-assessment system must be able to record, calculate, and report results per topic per student.
A6.3	The e-assessment system must be able to report an individual student's average performance or achievement.
A6.4	The e-assessment system must be able to report the average time spent by a student to complete an e-assessment task.
A6.5	Item analysis reports should be available to allow assessors to continuously monitor and evaluate their questions/items in the question bank.
A7: Appropriate support and training opportunities about the e-assessment system should be available for staff and students. This requires the following considerations:	
A7.1	Technical support must always be available for lecturers and students in the institution.
A7.2	A mobile application (e.g., Moodle application) needs to be used for the e-assessment system to ensure easy access for all.
A7.3	Proper and adequate training (e.g., video tutorials) should be given to both students and staff to enable them to use and benefit fully from the implementation of e-assessment.
A7.4	In the event of a technical problem, there should be a prompt response by the technical support team.

A7.5	A legal service agreement should be in place.
A7.6	IT administrators need to ensure that there are proper add-ons and no restrictive modes of capturing typed information (the e-assessment should allow lecturers and students to type mathematical formulas and symbols).
A7.7	The necessary technological infrastructure (such as computers, Internet connections, etc.) should be available for all students.
A7.8	The required resources (physical, human, and financial resources) should be readily available.
A8: An evaluation of the e-assessment system should be in place. This requires the following considerations:	
A8.1	An institution should first implement the e-assessment system on their network for pilot testing.
A8.2	An institution should obtain permission to use the e-assessment system in a “live” test/assessment situation for a specified period of time.
A8.3	Evaluation of the e-assessment system should be done by consulting different stakeholders, e.g., students, lecturers, ICT staff, and other relevant stakeholders.
A8.4	All the relevant e-assessment policies should be made known and be clear to lecturers, students, and all other participants.
A8.5	The institution should have an appropriate e-assessment policy that integrates pedagogical and practical aims.
A8.6	There must be policies and procedures in place to ensure reliability and validity of e-assessment.
B: LECTURERS’ PRIOR EXPERIENCE AND KNOWLEDGE OF STUDENT ASSESSMENT	
B1: Lecturers who are assessors need to have prior experience and knowledge of student assessment. This requires the following considerations:	
B1.1	Lecturers (assessors) need to design e-assessment tasks of which the contexts are related to the students’ socio-economic backgrounds (the tasks must be relevant).
B1.2	Lecturers (assessors) should have prior experience and knowledge of information technology or e-learning.
B1.3	Lecturers (assessors) require prior experience of change in education to enable them to adapt to the change towards e-assessment.

B1.4	Lecturers (assessors) should have the knowledge and skills required for designing and implementing quality e-assessment tasks.
B1.5	Lecturers (assessors) should have knowledge of how to make appropriate use of action verbs (e.g., according to Bloom's Taxonomy) in formulating items and questions.
C: USING IT STUDENTS' E-ASSESSMENT RESULTS FOR DIFFERENT TEACHING AND LEARNING PURPOSES	
C1: Students' e-assessment results should be used for different purposes, for example:	
C1.1	Lecturers should use e-assessment results to provide students with constructive feedback about their learning (feedback on their performance and progress).
C1.2	Students' e-assessment results should enable lecturers to assess their students' progress and performance.
C1.3	Based on the students' e-assessment results, lecturers should evaluate and enhance the efficiency of their own methods of teaching.
C1.4	Among others, the efficiency of the curriculum/programme should be evaluated and enhanced based on the students' e-assessment results.
D: SETTING DEADLINE DATES FOR THE COMPLETION/SUBMISSION OF E-ASSESSMENT TASKS	
D1: Deadlines should be set for the submission of e-assessment tasks. This should be done by considering the following:	
D1.1	Deadlines are necessary to teach students how to effectively manage time, which is a requirement for employability.
D1.2	Deadlines force students to complete e-assessment tasks on time, because they know that the link for submission will not be available once the deadline lapses.
D1.3	Deadlines for completion of e-assessment tasks should be reasonable. For example, unforeseen circumstances (such as server failure or inability to upload e-assessment tasks on the platform) must be taken into account.
D1.4	Deadlines should be appropriate for the type assessment task (e.g., a formative or informal assessment may be open for a longer period of time than, for instance, an e-examination).
D1.5	Deadlines should be set at intervals, with a warning a few days before the cut-off date/time.

E: SETTING DURATION LIMITS FOR THE COMPLETION OF E-ASSESSMENT TASKS	
E1: Setting duration (time) limits for the completion of e-assessment tasks is necessary, but the following should be considered:	
E1.1	Duration limits prepare students for the working environment (to perform tasks within a prescribed period).
E1.2	Duration limits should motivate students to set fixed targets for the achievement of their tasks.
E1.3	Duration limits work well on an e-assessment platform because students are forced to complete the tasks on time, knowing that they will not be able to continue with the tasks once the duration limit expires.
E1.4	Duration limits must suit the complexity of the e-assessment task.
E1.5	Duration limits must suit the types of questions in the e-assessment tasks.
E1.6	Duration limits for e-assessment tasks should be reasonable, in that the assessor needs to make provision for unforeseen circumstances (e.g., technical problems such as a slow Internet connection, unreliable computer software or hardware, etc.).
E1.7	The computer and IT skills levels of the students should be firmly established before setting duration limits for e-assessment tasks.
F: RELATIONSHIP BETWEEN IT STUDENTS' E-ASSESSMENT MARKS AND HOW AND WHAT THEY HAVE LEARNED	
F1: There is a need for a consistent relationship between IT students' e-assessment marks and how and what they have learned. This involves the following:	
F1.1	Students should achieve good e-assessment grades when they apply a deep approach to learning/are actively engaged.
F1.2	Students should not achieve good e-assessment marks if they merely recall what they have learned (if they applied a surface learning approach).
F1.3	**The marks students obtain for e-assessment tasks should be a reflection of the following:**

F1.3.1	The quality of lecturers' teaching.
F1.3.2	The way in which the e-assessment tasks are formulated (whether the assessor used appropriate action verbs that represent the appropriate cognitive levels in Bloom's Taxonomy).
F1.3.3	The assessor's level of leniency or strictness during marking.
F1.3.4	The leniency or strictness built into an automated marking tool.
F1.3.5	Students' interest in the IT module.
G: STUDENTS' KNOWLEDGE REGARDING WHAT THEY WILL BE ASSESSED ON	
G1: Informing IT students in advance of what (the content) they will be assessed on, is important. The following also need to be considered:	
G1.1	Providing students in advance with information about the content that will be assessed, is a principle of good e-assessment.
G1.2	The e-assessment task should assess students' mastery of a representative sample of the content being assessed.
G1.3	The lecturer should not provide students with a reduced "scope" of content (a reduced sample of content).
G1.4	**Besides informing students in advance of the content that will be assessed, the lecturer may also do the following:**
G1.4.1	Discuss/make available previous examination papers.
G1.4.2	Discuss/make available a memorandum for the task.
G1.4.3	Design and discuss mock tests or examination papers with the students.
H: STUDENTS' KNOWLEDGE REGARDING HOW THEY WILL BE ASSESSED	
H1: Informing IT students in advance of how they will be assessed (what the e-assessment criteria will be) is important. However, the following also need to be	

considered:	
H1.1	Students will be made aware in advance of the competencies that they will be required to demonstrate through the e-assessment task.
H1.2	If students are informed in advance of how they will be assessed, they will be better motivated to prepare adequately.
H1.3	If students are informed in advance of how they will be assessed, they will become aware of the alignment between teaching/learning activities, e-assessment tasks and the relevant learning outcome(s) (the constructive alignment of e-assessment tasks).
H1.4	Informing students in advance of how they will be assessed should include how marks will be awarded (what information will be required and what will not, etc.).
I: FEEDBACK TO IT STUDENTS ABOUT THEIR PERFORMANCE IN E-ASSESSMENT TASKS	
I1: Providing constructive feedback on IT students' performance in their e-assessment tasks is important. However, the following should also be considered:	
I1.1	Automated feedback on e-assessment tasks should inform students of the competency levels at which they performed.
I1.2	Automated feedback on e-assessment tasks should be timely (prompt) in order for it to be effective.
I1.3	Feedback provided by lecturers on e-assessment tasks should be timely (prompt) in order for it to be effective.
I1.4	Automated feedback on e-assessment tasks should be detailed so that the students will have a clear understanding of what they did correctly or incorrectly.
I1.5	Lecturer's feedback on e-assessment tasks should be detailed so that the students will have a clear understanding of what they did correctly or incorrectly.
I1.6	Automated feedback on e-assessment tasks must be constructive and/or motivating in order for the students to consider and apply the feedback.
I1.7	The lecturer's feedback must be constructive and/or motivating in order for the students to consider and apply the feedback.
I1.8	Automated feedback on e-assessment tasks should include the general performance of students.
I1.9	The lecturers' feedback on e-assessment tasks should include the general performance of students.

J: FORMS OF E-ASSESSMENT IN HIGHER EDUCATION	
J1: Formative e-assessment is important, but the following should also be taken into account:	
J1.1	Lecturers may design formative e-assessment tasks that will assist in preparing students for forthcoming e-assessment tasks that are awarded marks (summative e-assessment tasks, such as an examination or test paper).
J1.2	E-assessment tasks should be followed up in order to provide an opportunity for students to ask questions and seek clarifications.
J1.3	Questions and instructions in formative e-assessment tasks should motivate students to make an extra effort (e.g., motivate them to do some extra reading and research).
J1.4	It is not necessary to award marks for formative e-assessment tasks, but it is possible to award marks in order to motivate the students.
J1.5	Some summative e-assessment tasks may also be used for formative purposes (if feedback is provided to the student about his/her performance in the e-assessment task, it is also used formatively).
J1.6	Formative e-assessment tasks should be used for providing feedback to the lecturer on how well he/she is teaching.
J1.7	Formative e-assessment tasks should be used for providing feedback to the lecturer on how well the student is learning (how well the student performs and progresses).
J1.8	Feedback on formative e-assessment tasks should be prompt, continuous, and constructive (continuously show the student the way forward in the learning process).
J1.9	If problem-solving scenarios are included in formative e-assessment tasks, they may assist in preparing students for the world of work.
J1.10	If practical tasks are used as formative e-assessment tasks, they may assist in preparing students for the world of work.
J1.11	**The types of formative e-assessment tasks that will best improve student learning include:**
J1.11.1	Online presentations.
J1.11.2	E-group discussions and e-activities.

J1.11.3	E-journal or e-article reviews.
J1.11.4	Online question-and-answer sessions.
J1.11.5	Online discussions between students and lecturers.
J1.11.6	Online quizzes.
J1.11.7	Video chats between students and lecturers.
J2: Summative e-assessment is important, but should take the following into account:	
J2.1	Summative e-assessment tasks should require some research in order to add value to students' learning.
J2.2	Lecturers should conduct summative e-assessment after completing a section or chapter of work, a module, and/or at the end of a semester to determine how their students are learning (how they are performing and progressing).
J2.3	If constructive feedback is provided after summative e-assessment tasks have been done, some students will learn to take the feedback into consideration and not only focus on the marks obtained.
J2.4	If problem-solving scenarios are included in summative e-assessment tasks, they may assist in preparing students for the world of work.
J2.5	If practical tasks are used as summative e-assessment tasks, they may assist in preparing students for the world of work.
J2.6	**The types of summative e-assessment tasks that will best improve student learning include:**
J2.6.1	Online research reports (e.g., academic assignments) for undergraduate students.
J2.6.2	E-tests.
J2.6.3	E-examinations.
J2.6.4	E-portfolios.

J2.6.5	Online presentations.
J2.6.6	E-project reports.
J2.6.7	Online discussions.
J3: Peer e-assessment is important, but should take the following into account:	
J3.1	Lecturers may divide students into small groups and require group members (peers) to assess one another.
J3.2	Peer e-assessment tasks will motivate students to share ideas and learn from one another.
J3.3	Peer e-assessment tasks can be used very effectively during group work.
J3.4	Peer e-assessment tasks should be planned in such a way that they elicit students' creative questioning of topics.
J3.5	Peer e-assessment requires peer assessors to identify their peers' mistakes.
J3.6	Peer e-assessment requires peer assessors to identify their peers' strengths.
J3.7	Peer e-assessment feedback should assist students to identify their own mistakes.
J3.8	Peer e-assessment feedback should assist students to identify their own strengths.
J3.9	If more able students have to give feedback to less able peers, they will also benefit since they have to explain procedures to less able students.
J3.10	Peer e-assessment will make students feel that they own the assessment process.
J3.11	Peer e-assessment will motivate peers to explain their decisions and/or answers to one another.
J3.12	Peer assessors may be selected randomly in order to avoid unfair or biased assessment among peers, where possible.
J3.13	Peer e-assessment can be used at the end of any learning period.
J3.14	Peer e-assessment usually works well if short questions and answers are used.

J3.15	Peers' feedback on e-assessment tasks will motivate student engagement.
J3.16	**The types of peer e-assessment tasks that will best improve student learning include:**
J3.16.1	Peers' e-assignments (undergraduate research reports).
J3.16.2	E-tests.
J3.16.3	Online academic essays.
J3.16.4	Online presentations.
J4: Self e-assessment is important, but the following should also be taken into account:	
J4.1	Self e-assessment tasks should contain questions and/or instructions that enable students to evaluate their own level of understanding of a specific topic or content.
J4.2	Self e-assessment questions and/or instructions should enable students to evaluate their own knowledge of specific topics or content.
J4.3	Self e-assessment tasks should help students to identify their own weaknesses.
J4.4	Self e-assessment tasks should help students to identify their own strengths.
J4.5	Self e-assessment can prepare students for forthcoming assessment tasks that are awarded marks (summative e-assessment tasks such as examinations, tests, etc.).
J4.6	Self e-assessment tasks should encourage students to think critically about their own work.
J4.7	Self e-assessment tasks should be aimed at empowering students in their own learning processes.
J4.8	There should be self e-assessment resources where students can access and choose the self-e-assessment options that they want.
J4.9	**The types of self e-assessment tasks that will best improve student learning include:**
J4.9.1	E-assignments (e.g., research reports).

J4.9.2	E-tests.
J4.9.3	Online academic essays.
J4.9.4	Online presentations.
J5: Diagnostic e-assessment is important, but the following should be considered:	
J5.1	Diagnostic e-assessment should be used to determine what students understand or do not understand at a specific point in time.
J5.2	Diagnostic e-assessment can help lecturers to plan meaningful and efficient teaching methods.
J5.3	Diagnostic e-assessment can also be used as baseline assessment (assessment done at the beginning of a module to establish what the students' knowledge and levels of understanding are).
J5.4	**The types of diagnostic e-assessment tasks that will best improve student learning include:**
J5.4.1	Online activities/exercises.
J5.4.2	Online chapter/unit pre-tests.
K: TYPES OF ASSESSMENT TASKS THAT MAY BE USED IN E-ASSESSMENT	
K1: Presentations in the context of e-assessment is important, but the following should also be considered:	
K1.1	Students should be able to upload their presentation slides on the e-assessment platform.
K1.2	Students should be given the opportunity to ask the online presenters some questions for clarity so that they can learn from one another.
K1.3	If possible, students should be able to upload videos of themselves making their presentations.
K2: Short answer questions can be used in e-assessment, but require the following considerations:	

K2.1	Lecturers should design short-answer questions in a way that requires students to think critically.
K2.2	Lecturers should design short-answer questions that focus on higher cognitive levels.
K2.3	Short-answer questions should be alternated with long-answer questions.
K2.4	Short-answer questions should have specific answers.
K2.5	Lecturers need to design short-answer questions or tasks that will discourage students from merely memorising and regurgitating knowledge.
K3: E-tests and E-examinations may be used, but the following should also be considered:	
K3.1	Lecturers should ensure that the e-test or e-examination paper assesses students' competence pertaining to what they have learned after a particular learning period (use them as summative assessments).
K3.2	If e-tests and e-examinations are appropriately developed, they can also be used to prepare students for the real world (by including IT industry-related/authentic tasks/questions).
K3.3	E-tests and e-examinations must be followed up with constructive feedback so that students will be able to identify their own problems/mistakes.
K3.4	E-tests and e-examinations should be used to determine students' performance at a particular point in time.
K3.5	E-examinations should be written at the end of a semester or year course (for summative purposes).
K3.6	E-tests should be written upon completion of a unit, section, or chapter (for summative purposes).
K3.7	E-tests can be written for formative purposes if they provide continuous and constructive feedback for students.
K4: E-assignments may be used, but the following should be considered:	
K4.1	E-assignments should include practical tutorials in order to develop students' practical experience in IT.
K4.2	E-assignments should be aimed at developing students' skills in IT.

K4.3	Students' research skills will be improved if the e-assignment instructions and/or questions encourage them to read about and apply relevant information/knowledge/skills.
K4.4	Lecturers should set e-assignments in advance (at the beginning of the semester or the year, and not later).
K5: E-group projects may be used after considering the following:	
K5.1	Lecturers need to design e-group projects in such a way that they will enable students to acquire practical experience in IT.
K5.2	Lecturers need to design e-group projects in such a way that they will enable students to acquire the necessary skills in IT.
K5.3	E-group projects should encourage students to apply what they have learned practically in an authentic context.
K5.4	Members of groups doing e-group projects should be heterogeneous in order for the students to learn from one another and share ideas.
K5.5	E-group projects must be designed in advance, namely in the beginning of the semester or the year, and not later.
K5.6	Peer assessment can be used in e-group projects.
K5.7	Lecturers need to ensure that all the students doing an e-group project participate fully.
K5.8	During e-group projects, lecturers should be available for consultation either asynchronously or synchronously.
K6: Case studies may be used in e-assessment after considering the following:	
K6.1	E-case studies must require students to think critically.
K6.2	E-case studies must require students to apply higher cognitive skills.
K6.3	E-case studies must require students to devise solutions to real-world problems.
K6.4	E-case studies should be IT related.
L: PRINCIPLES OF GOOD E-ASSESSMENT	

L1: E-assessment always needs to be fair, and should consider the following:	
L1.1	The content that is assessed through the e-assessment task should fall within the scope of the relevant IT module's curriculum.
L1.2	The e-assessment task does not favour/benefit only certain students.
L1.3	The marking of the e-assessment tasks by the assessor should be consistent.
L1.4	The automated marking of the e-assessment tasks by the system should be consistent.
L1.5	The assessor who sets and/or marks the e-assessment task should be adequately trained to create e-assessment tasks.
L1.6	The assessor who marks the e-assessment task should award marks for the different steps that students must follow in order to arrive at the final answer.
L1.7	The e-assessment task should include both higher order questions/tasks and lower order questions/tasks, particularly if the platform selects questions at random.
L1.8	Students' prior knowledge and understanding should be considered when designing/selecting e-assessment tasks.
L1.9	Students' levels of technology experience should be considered when designing/selecting e-assessment tasks for students.
L2: All e-assessment tasks must be practicable/feasible, and the following must be considered:	
L2.1	The e-assessment environment should be conducive to learning (e.g., it should not cause unnecessary pressure, etc.).
L2.2	Lecturers (assessors) should be trained on how to insert complicated texts such as formulae and symbols that are required in some IT modules (e.g., programming, mathematics, etc.).
L2.3	If possible, lecturers (assessors) could be trained with video tutorials.
L2.4	If possible, students should be trained on how to insert complicated texts such as formulae and symbols that are required in some IT modules (e.g., programming, mathematics, etc.).
L2.5	Students could be trained with video tutorials (if possible).

L2.6	Students should not be overloaded with e-assessment tasks to perform.
L2.7	Lecturers' (assessors') marking load should be manageable.
L3: E-assessment tasks must be reliable. This requires the following considerations:	
L3.1	When similar students do the same e-assessment tasks under similar conditions, they should obtain similar results.
L3.2	The marking of e-assessment tasks by assessors should be consistent.
L3.3	The automated marking of e-assessment tasks by the system should be consistent.
L3.4	The e-assessment tasks should be well aligned with the relevant learning outcomes, assessment criteria, and the teaching/learning activities being used.
L3.5	The types of e-assessment tasks should frequently be varied and/or alternated.
L3.6	E-assessment requires moderation.
L4: The e-assessment tasks must be valid. This requires the following considerations:	
L4.1	The e-assessment task should assess only the content the students were required to study.
L4.2	The e-assessment task should only assess the achievement of the relevant, prescribed learning outcome(s).