



Cape Peninsula
University of Technology

**THE ROLE OF EDUCATION TECHNOLOGY IN TRANSFORMING EDUCATION AT
UNIVERSITIES OF TECHNOLOGY**

by

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Dissertation submitted in fulfilment of the requirements for the degree

Master of Technology: Business Information Systems

in the Faculty of Business and Management Sciences

at the Cape Peninsula University of Technology

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**Cape Town
February 2016**

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ABSTRACT

This study has investigated the role of Education Technology as means to transform education at the Cape Peninsula University of Technology. The department of Office Management and Technology was selected for the case study. The research focused on determining the significance of modern Education Technology on teaching and learning strategies at the Cape Peninsula University of Technology. A quantitative approach was used for data collection, while this was done by using questionnaires, which employed 5 point Likert scales. The responses from 54 participants were recorded and analysed, and these results show that respondents held strong views about the significance of the role of Education Technology in teaching and learning strategies at the Cape Peninsula University of Technology. Furthermore, the results show that Education Technology helps to improve teaching and learning strategies at the institution. The significance of this research is that the results may be interpreted within a broader South African context. The study, therefore, contributes to the body of knowledge concerning the impact of Education Technology at Universities of Technology in South Africa.

ACKNOWLEDGEMENT

I wish to thank my family, for their support during this time, my department and the Faculty of Business and Management Sciences, for giving me time to complete my studies. Most importantly, I would like to thank Dr Michael Twum-Darko, for his enduring support, wisdom, dedication and commitment to ensure that I deliver as expected.

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GLOSSARY

Abbreviation/Acronyms

CPUT

EDI

ET

HE

ICT

IOS

IT

LMS

OMT

SME

SPSS

TAM

TLM

TOE

UoT

Definition

Cape Peninsula University of Technology

Electronic Data Interchange

Educational Technology

Higher Education

Information Communication Technology

Inter-organisational information systems

Information Technology

Learning Management System

Office Management and Technology

Small, Medium Enterprise

Statistics Package for the Social Science

Technology Acceptance Model

Teaching and Learning Models

Technology Organisational Environment

Universities of Technology

CHAPTER ONE: INTRODUCTION

1.1 INTRODUCTION

This research investigates the impact of modern technology on the transformation of education at Universities of Technology (UoT) in South Africa. The Cape Peninsula University of Technology (CPUT) was used as a case study for the investigation. The study begins by introducing background to the research problem and an analysis of the problem statement. The research questions, sub-questions and research objectives are then clarified against this backdrop. An overview of literature, which pertains to the study of Education Technology and transformation in South Africa, is presented, and this is followed by discussion of the research design and methods that were used. The chapter further provides reasons for the selection and use of the research methods. In addition, the sampling procedures, methods of data collection and data analysis are also discussed, while the scope, plans and time scales for the research are outlined.

Last, but not least, the report justifies the research project and also highlights the contributions that the research study will make. The next section describes the rationale of the research, and also gives an overview of the research problem, its background history and reasons for this kind of study.

1.2 RATIONALE

1.2.1 Background to the research problem

The new South African dispensation brought along changes to the structure and nature of higher education, because after 1994, the new government re-modelled the education system in South Africa (Barnard& Rensleigh, 2008:443). Between 2004 and 2005, various institutions of higher learning across the country formed mergers, which resulted in the total number of institutions of higher learning in South Africa being reduced to 23 universities, including UoTs.

During this period, the mergers, incorporations, name changes of universities and technikons, as well as regional collaboration agreements between institutions and rationalization of strategies, began to take effect. This led to new policy formations, which were effective in governing these new institutions. However, Halsall (2013) argues that the central government and higher education bodies needed to clarify and consolidate their policy initiatives. Since the mergers

could present various challenges to the institutions, it was necessary for the emphasis on policy context to ensure that there was smooth transition. Another challenge for some universities was the inherent infrastructure capacity problems, which require a considerable amount of investment.

As mentioned above, the change in the educational landscape came into being owing to the transformational mandate, which was introduced by the new democratic dispensation. The main aim was to help to alleviate the imbalances of the past. To achieve a complete transformational objective in education, the Technology Adoption Model (TAM) for transformation was introduced and linked to the objectives of various institutions in South Africa. This model was imperative for the new services, products and business models at the time, and would play a significant role in terms of ensuring a transformed education in South Africa. The literature, which is presented in Chapter Two, expands more on TAM and its significance.

The quality of teaching and learning, and that of the resources that are used, should be maintained to ensure high quality assurance within higher education. For this to happen, the introduction of external quality assurance could play a major role to ensure the Martin and Stella (2007: 20) “creation of independent structures”. It should be assessed and measured against the objectives, which the institution sets for itself. This includes activities such as the development and delivery of programmes and content, as well as teaching and learning strategies. In addition, it includes processes and outcomes of higher education provision. Therefore, the inclusion of modern technologies would make this important goal attainable. It would advance all the possibilities of transforming higher education to meet the constant needs for good quality education.

Akoojee and Nkomo (2007) believe that higher education transformation requires some mechanism of strategies to address the imbalances of the past. They argue that initiatives that are aimed at improving student access to education and the associated success rates should be evaluated in the context of the transformation of institutions.

In order to advance a cohesive social transformation in HE, Educational Technology (ET) should be prioritised. Furthermore, institutions of higher learning should establish efficient systems to fulfill their respective transformational mandates. Universities should have policy documents,

which indicate how technology can assist in effective policy implementation to erode dysfunctional Apartheid systems and policies, which impede transformation. Again, it is important to note that transformation requires that all stakeholders should develop effective policies for quality and strategic implementation of those policies. Ferrer-Balas, Bruno, de Mingo and Sans (2004) argue that when effecting transformation, government should treat all universities equally in terms of how they conduct their teaching and learning activities, research and facilities, because of their different needs.

It is clear that education transformation at the UoTs faces challenges and problems, as there are various factors, which impede transformation. However, the focus of this study is around modern technology and other factors that relate to teaching and learning. Some of these other factors include research, Education Technology, transformation objectives, staff development, student support, accessibility, quality assurance and some of the higher education policies.

1.2.2 Problem statement

This research addresses the following research statement:

Factors, which impede transformation of education at universities of technology

Transformation in higher education at UoTs is significant. Many argue that the incorporation of modern educational technologies could ensure consistency in quality education and prepares students to compete in a globalized society. This phenomenon can be achieved through technology policies and modern ET for teaching and learning, which are necessary for transformation. However, Kilpatrick and McCarthy (2015: 2039) argue that the system of inequality deprives those schools, which have fewer resources to “show students’ achievements evidenced by standard measures”. In order to avoid a slow process of transformation, higher education must use modern teaching and learning techniques to drive the institution’s transformation. As the world of communications and computing technology begins to expand in developing countries, it creates certain challenges. Some of the problems are imbedded within the system and could be serious challenges, which can impact the transformation of education. If these problems are not addressed, it could lead to poor services by universities, and this may also affect the development and quality of future leaders in South Africa.

O'Donoghue, Singh and Handy (2003) argue that much attention should be given to new instructional technologies to transform the university environment. However, it is necessary for the universities to consider technology infrastructure, training of users, cost and maintenance, and so on. The university should also assess its capacity in relation to consideration of online programs or courses that they offer. As mention earlier, the new technological age is reinforcing the offering of quality teaching and learning across the spectrum. Information Technology (IT) appears to be transforming educational experiences. However, the costs involved will affect all educational providers (O'Donoghue *et al.*, 2003).

Emerging new technologies prompt universities to find ways to meet the needs of students, as students who are at universities and colleges use cellphones to communicate and exchange information.

1.2.3 Research objectives

Given the problem statement, this research project aimed to achieve the following objectives:

- a) To provide a theoretical overview of the impact of transformation at UoTs in South Africa;
- b) To determine contributions of the existing technologies on the work of UoTs in South Africa;
- c) To determine the capabilities of current education technologies and their significance on transformation; and
- d) To propose recommendations regarding the significance of LMS such as Blackboard on the transformation of education.

1.2.4 Research questions

This study seeks to answer the following question:

What is the significance of modern Education Technology at Universities of Technology in South Africa?

A further aim of the study is to answer the following sub-questions:

- a) What are the available modern technologies that might contribute to the work of UoTs in South Africa?
- b) What are the capabilities of current education technologies?
- c) Why is Education Technology such as Blackboard so significant?

1.3 OVERVIEW OF LITERATURE REVIEW

1.3.1 Introduction

ET has a significant impact on the development of curricula and research at UoTs in South Africa. According to Marri (2007), there is a perception that the integration of ET in the classroom would automatically improve students' performance. However, O'Donoghue *et al.* (2003) argue that the immediate effects of ET have only helped to increase the competitive environment, as universities face the challenge of encouraging the use of technology. As indicated previously in the background to the study, TAM could play a significant role in the use of technology. If properly used, a TAM model can define how to go about using modern technologies against the backdrop that some staff and students may not have been exposed to modern technologies. Therefore, it should provide guidelines for exposure and training such as user manuals and user friendliness. The training program should be introduced to assist teachers and support students to adapt to the technological world. This could be seen as intervention mechanisms by universities to drive and encourage the utilisation of ET, both on and off campus. These training programs could be used to train and develop students, especially those who are enrolled for distance education (Cloete, Snyman & Cronjé, 2003).

The enhancement of teaching and learning should be driven by educational technologies, which are imperative for transformation. They must assist to widen and broaden research, as well as teaching and learning approaches, and give more support to established structures. In other words, the strategic planning and development of research should be developed to build research capacity and improve teaching and learning.

Marri (2007) believes that the “optimism for the potential of modern technology in the classroom is not new”. Classrooms should be equipped with teaching and learning resources to improve knowledge generation to assist learners. However, there is a strong need for modern ET as means towards a holistic transformation of education at UoTs. These technologies are highly recommended for the improvement of teachers' performance, students' test scores and for the provision of quality education. Tyack and Cuban (1995) in Marri (2007) believe that the new technology could deal with high failure rates, poor performing teachers, whilst also addressing questions, which relate to the quality of education.

According to Watson and Watson (2013), the need for a systematic change within higher education is imperative, especially if you have placed educational technologists behind this change. Institutions of higher learning are criticised because in spite of the high tuition costs, new graduates continue to struggle to find employment. Anderson and McGreal (2012) believe that the existing full-service higher education model is expensive and continues to increase. This trend is still prevalent even in some western countries and has been considered to be expensive. They argue that public and nonprofit organisations should form coalitions and provide affordable and essential services. However, the suggestion cannot apply to developing economy countries; in other words, it cannot be a blanket decision. In alleviating the situation, the research requires a methodical approach and a transformative change process by those in authority.

1.3.2 Educational Technology (ET)

The concept of ET emerged after the Second World War (Shah and Murtaza, 2012: 1420). Because of its impact on education, it has been used by many institutions of higher learning as an effective means of teaching and learning for the promotion of learning. However, Simsek (2005: 178) holds a different view of ET. He believes that it has been continuously changing throughout the century, and that it seems to be a confusing or incomprehensible concept for most people. Irrespective, some of the goals that are set out in the UN's Millennium Development Goals regarding education, in general, are shown below. ET has fundamental and critical contributions to the development of the education and social well-being of people.

Hernandez-Ramos (2006: 205) believes that technology plays a significance role in education, particularly in less fortunate countries, since peoples' economic and social well-being are underdeveloped. The author goes further to quote the UN's Millennium Development Goals regarding education (Hernandez-Ramos 2006), which are shown below:

- “Expanding and improving comprehensive early childhood care and education, especially for the most vulnerable and disadvantaged children;
- Ensuring that by 2015 all children, particularly girls, children in difficult circumstances, and those belonging to ethnic minorities, have access to and can complete free and compulsory primary education of good quality;

- Ensuring that the learning needs of all young people and adults are met through equitable access to appropriate learning and life skills programs;
- Achieving a 50% improvement in levels of adult literacy by 2015, especially for women, and equitable access to basic and continuing education for adults;
- Eliminating gender disparities in primary and secondary education by 2005, and achieving gender equality in education by 2015, with a focus on ensuring girls' full and equal access to and achievement in basic education of good quality; and
- Improving all aspects of the quality of education and ensuring excellence so that recognized and measurable learning outcomes are achieved by all students, especially in literacy, numeracy, and essential life skills”.

These goals remain the biggest challenge in most developing countries throughout the world today. There are schools and universities, which still face great technological and infrastructure challenges, while developed countries use technology in education for the overall improvement of teaching and learning.

Luppini (2005: 103) asserts that the definition of Education Technology is understood in much the same way across the globe. The definition of this concept is influenced by what he refers to as “the outside discourse”. He highlights the following as the problem of finding independent definitions of Educational Technology, since “certain fundamental concepts required for theoretical grounding any acceptable definition of ET are clouded by discourses taking place outside the field”. In other words, the definition of this term cannot be generalised and it is influenced by other factors. The social science definitions would differ from that of natural science. The engineers may interpret the definitions in relation to the engineering field and this interpretation could differ from that of social scientists. Simsek (2005) believes that there have been many definitions of ET, which are sometimes difficult to associate with each other.

Luppini (2005:103) further defines the term Educational Technology in social science as being useful for “material construction uses, as well as intellectual and social contexts”. There seems to be an independent definition for each field. Given the interpretation and definitions of ET by other authors, this study therefore defines ET as a tool to discover new knowledge and transform existing knowledge in social context.

1.3.3 The significance of Educational Technology

Technology plays a crucial role in globalisation, since it has the ability to change and shape businesses. It has been seen as the most common trend of teaching and learning, whilst transforming higher education institutions. Classes are easily managed and prepared for, and it allows for effective interaction between learners and teachers. The significance is prevalent in the modern era.

1.3.4 Transformational objectives

The research highlights these goals that the company aimed to achieve within certain time frames. They cannot be achieved overnight and require the commitment of every staff member, student and management. These are the set of standard outcomes that encourages one to work towards a specific goal. These specific goals could be transforming the curriculum, teaching and learning resources, teaching methods, introducing new teaching technologies and training for new technologies, and so on. They are mandatory for most of the institutions of higher learning in South Africa.

1.3.5 UoTs' strategies of transformation

1.3.5.1 Introduction

The question that arises relates to how modern technology impacts on transformation. Transformation is one of the charters of the South African higher education sector, and one aspect of this charter is to increase access to higher education for previously disadvantaged communities. Although the literature suggests that there has been improvement in the implementation of this charter, it does not mention how technology has played a role in achieving it. Therefore, this research seeks to, *inter alia*, address this question and indicate that modern technologies could play a significant role in implementing strategies to transform higher education in South Africa. Another aspect is to assess the impact of UoTs' strategies for transformation. This highlights the significance of technology in the classroom as an effective tool for teaching and learning. The 21st century's educational environment should attract attention in as far as technology is concerned. Blignaut, Els and Howie (2010: 555) posit that South Africa should move away from traditional teaching to modernized teaching in order to enhance skills and human capacity, as well as economic growth.

This leads to an argument made by Oloyede (2009: 426) that an “absence of a conceptual apparatus should be designed to address the critical issues of transformation”. This is quite relevant to this study, because if there are no clear guiding policies and strategies, then the transformation will not have immense impact. Oloyede (*ibid.*) further mentions that it is imperative to have significant “meaningful intergroup interaction”. The absence of such an interaction, which is a critical ingredient in learning about differences in perception of reality among diverse groups as distinct from reading about others in texts, is arguably a central issue in the transformation of public higher education institutions. Using the meaningful intergroup interaction as a strategy will create a teaching and learning environment where students can interact with one another without being prejudiced.

1.3.5.2 Transforming educational experience

O’Donoghue *et al.* (2003: 25) believe that new instructional technologies should be used to transform education. Therefore, it is also significant to mention that the traditional way of teaching (face-to-face) lacks opportunity for students’ engagement with real-world issues, as well as for comprehension purposes (Brantmeier, Aragon & Folkestad, 2011: 6). The writers further allude to the fact that it denies students an opportunity to perceive life experiences from their own perspectives. The use of Information Communication Technology (ICT) in pedagogy could promote deep learning and allow educators to respond better to the different needs of different learners (Lau and Sim, 2008 in Chigona & Chigona, 2010: 211). However, it will require commitment from educators and learners to promote teaching and learning, which develops cognitive skills, critical learning skills, as well as access to information. Chigona and Chigona (2010) argue that learners are able to construct knowledge if they are well supported, as this will subsequently enhance their learning skills. They further mention that the scaffolding could be provided by a tutor or computer. This is essential because the type of learning environment could be created by placing a tutor or computer to assist students who are struggling to comprehend learning concepts.

1.3.5.3 Model for Technology education

Niehm, Tyner, Mack, Shelley and Fitzgerald (2010: 498) tested a model based on the Diffusion of Innovations framework and the TAM for small family businesses. Their realisation was that

the family business manager's level of IT use, business location, and so on was crucial to the adoption of IT. Although this model was tested on small firms, it could also be applied to a higher education institution to adopt an educational model for transformation in order to become more competitive in the market. An understanding of how IT adoption impacts the business capabilities and performance of this sizeable business subset can provide insight for academics, consultants, and practitioners to strengthen and sustain these sources of family income Niehm *et al.*, (2010). Pan and Jang (2008: 95) believe that the Technology Organisational Environment (TOE) framework has been widely used for theoretical analysis. They argue that the TOE framework has gained currency over the last decade. They also point out that its usefulness was evident when small business Electronic Data Interchange (EDI) was adopted with its six factors, as well as inter-organisational information systems (IOS) technology. They went on to say that the IOS was adopted in the Danish steel and machinery company industry within the context of TOE. The literature is critical about technology adoption. It shows that technology is important in transforming businesses and its use influences the perception of IT. According to Wallace (2012:1), human dependence on IT represents a significant change in focus from the industrial era.

1.3.5.4 Teaching and learning models

The third pillar of the framework focuses on the existing Teaching and Learning Models, as well as on the importance of business technologies for today's business environment. The significance of ICT teaching models is that it assists students to be able to draw a comparison from more than one variable. It allows them to resource crucial information in order to develop innovation and creativity. Therefore, they make it possible for feedback to be given to students on time. It is also crucial for interaction between students and facilitators inside or outside of the classroom. Ogonnaya (2010: 51) suggests that it instils a curiosity that enables students to learn more. In the process, students become knowledgeable about the subject content and are able to articulate themselves. According to Ogonnaya (2010), this causes the students to be creative by examining changing relationships, allowing them to answer 'what if' questions. Different business organisations make use of different technologies. They assess the impact on transformation, and how it changes business dynamics. A key consideration in the successful delivery of new information systems and applications, is the integration of an IS/IT strategy with a business strategy.

The small to medium-sized enterprises in the developing world, for example, played a significant role in the utilisation of existing technologies (Uwizeyemungu & Raymond, 2011: 141). Uwizeyemungu and Raymond (*ibid*) further argue that it is crucial for organisations and firms to have a strategy to build and manage their ICT resources. Luo, Warkentin and Li (2013: 65) assert that organisations that specialise in mobile technologies are devising strategies for sustainable development and strive to remain relevant in the market. They further argue that the adoption of wireless technology by companies has had positive results and assist the business to achieve its objectives. However, these technologies present challenges to the organisations, as business opportunities are surfacing through value-added services. The anticipation of the overall acceptance of the enterprise model of adoption is still a challenge. IT should play a significant role in making sure that the environment in which these technologies operate allows for such adoptions. Uwizeyemungu and Raymond (2011) further assert that the study on SMEs showed how IT can be adopted in the business. The UoTs can adopt the same model to remain competitive and relevant in order to achieve their objectives by ensuring that the infrastructure for technology is easy to adjust and can provide for the demands of students.

1.3.6 Capabilities of technologies

1.3.6.1 Introduction

Various researches have been conducted regarding the usefulness of technology in education, and have proven that technology has positively influenced school and community environments. Many schools today, including UoTs, use technology to engage learners in cognitive level skills, and to reinforce their learning skills. In some instances, many learners come with a wide range of past experience, knowledge and ability (Bell & Rabkin, 2002: 26). To some extent, these attributes have been a major driving force in the development of nations (Wright, 2000: 17). The author further identified the relationship between technology and development in education and perceived this relationship as an important source of the kind of knowledge-making that underpins progress in science and technology. The literature shows that even so, there were nations whose main challenges were to ensure that they were in a strong position to make systematic use of existing technology to increase economic productivity and improve their population's quality of life. Therefore, countries have concentrated on approaches to increase the gains of better-quality education (Hamidia, 2011: 369).

1.3.6.2 The designed systems for teaching and learning

Lesson planning is crucial designed system for teaching and learning. Where technology is required, there need to be proper steps to be followed determine the appropriate use of technology in teaching and learning (Rice, Johnson, Ezell & Pierczynski-Ward, 2008: 103). Hamidia (2011) supports this argument, and indicates that “evolving the learning environments at the beginning of 21st century, individuals and societies put a heavy responsibility on the shoulders of educational institutions and their traditional structures.”

This led to educational institutions in the developing world experiencing challenges owing to a lack of modern technology to transform the structure of education. To overcome this, there should be sufficient provision of necessary technological infrastructure by UoTs to provide information and support, especially those who offer the same service of technology. Datta and Jessup (2013: 356) postulate that alliances and networks within the same industry and with similar technologies typically enhance innovation incrementally. However, many of the existing technologies are redundant and cannot cope with the daily customer demand (in this case, students and staff); hence there is a perception that they place heavy responsibilities on universities. From the above, it is evident that the developing world can still find a space in the market to continue research to develop other models in terms of the role of Education Technology in transformation. With the utilisation of current and previous literature it is, therefore, possible to model and to re-model the role of Education Technology in UoTs’ transformation.

1.4 OVERVIEW OF RESEARCH APPROACH

1.4.1 Introduction

This research is empirical in nature. It involves vigorous and detailed analysis of data, which was collected from selected UoT students. The Education Technology in use is based on the Office Management and Technology (OMT) department at CPUT. Bhattacharjee (2012) defines unit of analysis as “the person, collective, or the objective that is the target for the investigation”. The first, second and third year students in the OMT department at CPUT formed part of a focus group for this research. Structured questionnaires were used to collect primary data.

1.4.2 Research design

This section outlines the research design and data collection methods that were used for this research. Research methods and designs are the means by which the research is conducted to make sure ensure that the objectives are met. The latter refers to the particular data collection procedures and not the instruments, which were used to collect information. This study follows a quantitative approach, because it allows for the attribute to be measured in numbers. These numbers are used to represent certain objectives. It is easy to encode numbers in order to achieve statistical interpretation of the variables. The findings and results of a sample can be used as a reflection of the general population. Brannen (2005: 175) argues that quantitative research has the power to generalise, if generalisation is taken to refer only to statistical inference.

1.4.3 Quantitative method

As mentioned previously, this research followed quantitative approach. The findings are expressed by means of statistical data. Questionnaires were disseminated to students in the survey area, and participants were required to rate a number of statements according to a five-level Lickert scale. They were instructed to select one of the following responses: 1=strongly agree; 2=agree; 3=strongly disagree; 4=disagree; and 5=not applicable.

The Lickert scale is commonly used to provide a range of responses to a given question or statement (Cohen, Manion & Morrison, 2000 in Jamieson, 2004: 1217).Garth (2008: 3) argues that ordinal data can be placed in an order, but does not have a numerical meaning beyond the order. According to Gliem and Gliem (2003), as individuals attempt to quantify constructs, which are not directly measurable, they often use multiple-item scales and summated ratings to quantify the construct(s) of interest. Although the degree of rating might seem easy to select between 1 and 5, the respondents must select carefully. The data that was collected was analysed by using the Statistics Package for the Social Science (SPSS) version 22.SPSS allows for data to be structured in a way that allows a researcher to carry out research.

1.4.4 Questionnaire

This research project employed deductive approach to test Education Technology phenomenon on the transformation of teaching and learning, with an interest in knowing, which theory works best in the environment where the transformation pace is slow. According to Bhattacharjee

(2012), the scientific inquiry may take one or two possible forms, namely either inductive and/or deductive. For example, inductive research focuses on theoretical concepts and patterns that are known from the observed data. Conversely, deductive research aims to test concepts and patterns that are known from the theory by using new empirical data. Furthermore, it seeks to see how well they match the observed scenario and to build better theories of Education Technology on transformation. It is also understood that deductive or theory-testing research is more productive when there are many competing theories of the same phenomenon (Bhattacharjee, 2012). This section is discussed in more detail in Chapter Three.

1.5 Unit of analysis

1.5.1 Primary data

The Education Technology that is currently in use in the OMT department at CPUOT was the unit of analysis. The questionnaires were distributed to 60 undergraduate students, and they were randomly selected for this purpose. The sample comprises of 20 students at each of the year levels, respectively; however, only 53 questionnaires were completed and returned. The respondents were randomly selected and their participation was voluntarily. The N (population size) was about 210 OMT students, and the n (sample size) was 60 students, which was determined based on the nature and type of the study, and the fact that the total number of the target group was not so large. Most of them have access to university computer and Information Communication and Technology infrastructure, and most receive training on how to use Blackboard at the beginning of each year. The sample group of this study comprised of full time students only.

Population size	1 st year students	2 nd year students	3 rd year students
60	20	20	20

Table 1: Population size of the unit of analysis

1.5.2 Secondary data

The study also undertook to analyse the literature and assessed issues, which were relevant and important. The purpose of analysing literature as secondary data was to ascertain if there are gaps in this area of the research.

1.6 LIMITATIONS OF THE RESEARCH

This research was limited to CPUT students, and a total of 60 students from the OMT department were randomly selected to participate in the study. The reason for selecting this department is because it is one of the departments at CPUT where ET such as Blackboard and Microsoft Office are used throughout the study levels. Given the scope of the research, the population size was confined to 60 students. The emphasis was on the role of Education Technology and its significance in the transformation of education at UoTs. Further limitations are discussed in Chapter Five.

1.7 ETHICAL CONSIDERATIONS

According to Oliver (2010:3), it is important to define terms, which are used in your research. He further mentions that this is because the research and ethics both have concepts, which the participants or respondents would find difficult to comprehend. The use of these terminologies was taken into consideration during the data collection process. They were defined to make it easier for participants to understand. It is imperative to consider ethical issues and the usage of terminology when conducting research.

The research considered ethical issues when it was undertaken, while issues such as confidentiality and disclosure of participant information were also considered. The study was not experimental research; therefore, experimental procedures were not applicable. The participants were given a consent letter, which described the nature of the research and how to participate, and they were required to sign the letter to consent to the terms. The data that was collected from the participants were treated as confidential. The that participants' identities and any other personal information, would be kept safe and would not be divulged, while participants would not be deliberately misled or exposed to potential risk. The agreement was treated with respect while conducting the fieldwork. Furthermore, Oliver (2010) argues that research, which involves human beings, must conform to a high moral standard. The research was conducted under the prescribed ethical processes of CPUT and other stakeholders.

1.8 SUMMARY

The literature that was reviewed indicates that the transformation of education at UoTs in South Africa is crucial. The four-pillars-framework was constructed to guide the collection and

analyses of data, which resulted in the formulation of a general framework, which is covered in Chapter Four. This framework shows the significance of the role of Education Technology in transforming education within the South African higher education sector, focusing specifically on CPUT. The world of technology and education today requires active role players, especially where technology is involved, so that it enables society to be transformed. However, many institutions of higher learning, including colleges, are yet to realise complete technological transformation. It is noted that the lack of appropriate technology at UoTs impact on the transformation of education in South Africa. Studies, which have been conducted around TAM indicate that the research around it is saturated; however, this study shows that there is still a gap on TAM regarding transformation at the UoT. Future research could be conducted on the transformation of UoTs by using modern Education Technology. The change adoption in education is significant, as it impacts on the education landscape and assists in equipping teachers with the necessary skills. The UoT strategies were discussed here, with special reference to meaningful intergroup interaction as the core of the critical issue of the transformation of public higher education institutions, while Teaching and Learning Models (TLM), business technology and capabilities of technology were also discussed.

CHAPTER TWO: LITERATURE REVIEW

2.1 INTRODUCTION

This chapter provides the direction and context for the research that was conducted, and gives a proper understanding of the history of the topic. Mapesela and Hay (2005: 112) argue that a literature review presents researchers with an opportunity to critically engage with and debate issues. Therefore, many of them use a literature review to confirm their arguments. The previous chapter detailed the objectives and rationale of the research, as well as the limitations and ethical considerations of the research. The objective of this chapter is to provide an overview of various research outputs, which have a significant influence on ET at higher education institutions. The aim of this chapter is to discuss existing and current work of scholars, as they influence the role of ET in transformation. Hence, this chapter outlines the current work as (a) Education and Technology, (b) Technology and Transformation, (c) Transformation and Education, and (d) Education Technology in Higher Education Institutions in South Africa. The chapter concludes with a conceptual framework, which was derived from the reviewed literature. The framework was used to guide the design of the data collection instrument, which is discussed in Chapter Three, and the analysis and interpretation of the data, which is discussed in Chapter Four.

2.2 EDUCATION AND TECHNOLOGY

2.2.1 The importance of Education Technology

Education Technology has improved the quality of teaching over the years. Su, Bonk, Magjuka, Liu and Lee (2005: 1) allude to the fact that the inception of computers and sophisticated technologies has dramatically increased and improved how teaching and learning are conducted. Many colleges and universities have introduced online courses, which allow students to study online and independently from a distance. Su *et al.* (2005) further mention that online web-based education is becoming a promising field. UoT retain students through technologies, which allow them to explore and learn at the same time.

2.3 TECHNOLOGY AND TRANSFORMATION

2.3.1 Impact of modern technology on transformational objectives

Transformational objectives seem to be a common agenda for many higher education institutions. However, issues related to how it is implemented and achieved depend largely on

factors such as management oversight, technology, resources, manpower capacity and cultural systems. Significant transformational change, which is visible at some institutions of higher learning include, amongst other things, wireless network at the campus, modern multimedia teaching resources in the classrooms and the use of tablet computers as a requirement in some programs. Chidindi (2012: 1) believes that universities have their own cultural belief systems that may now be threatened by the need to transform themselves to match the new demands. This can be achieved by developing implementation plans, which directly influence these belief systems. However, the process of transformation in HE should be driven by technology innovations (Nworie & McGriff, 2001: 226). ICT should take centre stage and be supported through appropriate strategic planning and administrative support. They further highlight that universities seems to have lessened their resistance to the adoption of ET and are embracing change, which is inevitable.

According to Olaore (2014: 154), a few decades ago there were lots of investments in resources (hardware, software) to improve the quality of education. As a result, the implementation of policies around ICT in education was seen as a “catalyst for change”. However, there are still some challenges, especially in developing economies. Swarts (2006: 1) points out that some of the prominent challenges with ICT in education are the cost, sustainability, optimal use and making teaching and learning meaningful to students. It is further highlighted that the use of ICT in education is often blown up beyond proportion, without mentioning the associated challenges. This notion conforms to what was mentioned previously that the ICT implementation depends on the leadership of the institution, the infrastructure, capabilities, resources and other stakeholders such as teachers and students etc. It has to identify what seems to be challenges, and from there implement the solution and eventually evaluate it if it does what it is supposed to do.

2.3.2 Impacting human capacity

The introduction of ICT for educational transformation should consider the role of the user. It should be aimed at enhancing human capacity and creating an enabling environment, which seeks to improve the lives of teachers and students. A discussion paper for the African Region Post-Summit Workshop highlighted that HE is significant in developing human skills for sustainable economic growth and research (NASULGC 2008:1), particularly in the African continent, where the demand for higher education, as well as ICT integration, is significantly

high. This will require investment in good governance, infrastructure and long term economic growth by the education sector and government. Skills development plays a significant role in economic growth and in combating poverty.

It is evident that human capacity development can be advanced if the private and public sectors invest in technology. However, Swarts (2006) contends that skills such as: 1) the ability to learn how to learn; 2) the ability to reflect; 3) analyse; 4) synthesize, 5) find solutions; and 6) adapt, can be learnt without ICTs. Technology literacy can only be enhanced through ICTs, but only when used appropriately. Many areas of ICTs' development have not been tapped into in depth, especially in developing countries. There remains a great need to improve the access, quality and efficiency of education. Therefore, a strategic policy framework, which uses ICTs, is crucial to revive human capacity along with other mechanisms. A collaborated policy development plan should also be seen as an opportunity towards encouraging knowledge generation, knowledge acquisition, knowledge diffusion, and the development of knowledge, which uses ICT.

2.3.3 Transforming knowledge using ICT

ICT curriculum integration should be developed in a way, which strengthens human capacity in order to transform knowledge. This is essential to develop human capacity in developing countries. However, the understanding is that it has to be integrated along with other mechanisms. Therefore, the integration of ICT in education for knowledge transfer is an essential factor, which plays a significant role in achieving this objective.

In Australia, for example, ICT has been regarded as an important tool to drive education (Jamieson-Proctor, Pual, Burnett, Finger & Watson, 2006, 511). However, the literature shows that it has been understood differently by different countries; hence its impact is often questioned. Conversely, knowledge can be transferred and transformed in many different ways. Mioduser, Nachmias, Tubin and Forkosh-Baruch (2003: 23) postulate that the educational system, which is placed in higher education should bring about significant transformation in teaching and learning processes.

Furthermore, ICT impacts on how people communicate and socialise, trade, look for new information and disseminate information, as well as transfer knowledge. It is, therefore, an

essential part of human life. Organisations and individuals function optimally, and by transforming information into knowledge through various technologies (Steinmueller, 2000: 361). Higher education institutions consider integration of ICT as an advanced step in knowledge transfer and knowledge reproduction.

The usage of educational gadgets, especially in the developing world, is critical because it can influence the decision to introduce technology in underdeveloped countries. Sutherland, Armstrong, Barnes, Brawn, Breeze, Gall, Matthewmann, Olivero, Taylor, Triggs, Wishart, and John (2004: 413) point out that the idea is to use ICT that is readily available in schools and yet underutilised. It is, therefore, also vital for institutions of higher learning to integrate ICT as pedagogy because of its significant impact on teaching and learning. This has been supported by Ferdig (2006:749) who argues that technologies for teaching and learning must be pedagogically sound. However, it also has its own drawbacks. Hew and Brush (2006: 223) argue that its use is generally affected by certain barriers. Jamieson-Proctor *et al.* (2006:11) suggest that 73% of full-time female teachers at the Queensland State School in Australia are significantly less confident in using ICT, as well as in aligning the curriculum with the new technologies than their male counterparts. Extensive research has been conducted on teaching and learning with technology, as well as without technology. However, according to Sutherland *et al.* (2004), there was no systematic research in place when drawing up curriculum policy. Clearly, ICT plays a critical role in knowledge-sharing and transfer, as well as in enhancing the quality of teaching and learning. Policy documents should be in place to ensure the integration of Education Technology into the mainstream curriculum so that it can support all those who will use it. The following section will be looking at ICT from South African perspective.

2.4 TRANSFORMATION AND EDUCATION IN SOUTH AFRICA

2.4.1 Transformation of higher education in South Africa

The transformation of education is not only a prominent phenomenon of South African education. Conversely, Badat (2009: 456) believes that transformation is the dissolution and re-creation of innovation in education. Furthermore, they point out that it has undergone rapid transformation throughout the world in the last 25 years and may be in a period of unprecedented change. For the South African education system to be transformed, it should eradicate the old

legacy of its past education system. It will also require proper policy formulation to deal with illiteracy and to up-skill teachers from the foundation phase up to senior school levels.

2.4.2 Challenges with policy development and implementation

After the dawn of democracy there was a need for the democratic government to develop policies, which seek to redress the imbalances of the past. According to Mapesela and Hay (2005), an objective of the new democratic dispensation was to develop strategic policies to deal with the Apartheid legacy. These policies included the transformation of higher education, which was seen as the best in the world, whilst meeting internationally acclaimed standards. Most of them were thoroughly discussed before being implemented. The foundation for new policies was established in 1996 and 1997, which enabled the government to establish a more directive role for the state.

According to Hall and Symes (2005: 199), the government spent more time to recast the higher education landscape through extensive incorporations and mergers. Therefore, transformation of higher education should be benchmarked with international standards. This can only be achieved through proper policy analyses and implementation, as well as state intervention. Moore (2003: 303) argues that the central ambition of the policies has been to enhance levels of state control over the higher education system in order to steer the system more effectively towards the goals of economic development, social reconstruction and equity. He believes that this can only be achieved through academic programmes, which thus become the unit by which the system will be planned, governed and funded. However, Mapesela and Hay (2005) postulate that higher education institutions in South Africa faces challenges of transforming the socio-political state of the country, as well as transformation to respond to national higher education policy imperatives. Therefore, it might take a while to implement policies, which seek to achieve socio-economic development, socio-reconstruction and equity. Lastly, policy implementation remains a serious challenge to HE in South Africa and impedes the transformation of education. In order for this to be achieved, it will require the incorporation of technology in order to become effective and efficient for implementation.

2.4.3 Openness and transformation

Following the previous section, HE institutions would have to consider the incorporation of modern technology in order to overcome the challenges of policy implementation. However, there are other challenges that HE still faces. According to Vambe (2005: 285), there are two factors, which remain key challenges to South African higher education and they are openness and transformation (Vambe, 2005). These are concepts with which South African HE should deal with in order to advance the concepts of transformation. He argues that, although programmes such as outcomes-based education were meant for educational change, its implementation does not lead to radical opening and qualitative transformation of the South African educational sector. The system still side-lines many of those who are from disadvantaged communities. HE must consider an open system, which caters for all educators, learners, and institutions and, which contributes more towards the economy and to the development of a reliable curriculum.

2.4.4 Curriculum development and globalisation

Education Technology plays a significant role in the development of a global curriculum in the 21st century. The development of a global curriculum should be seen as a vehicle to enable South Africa to understand the role of Education Technology in the transformation of education from an international perspective, so that we are able to assess the progress made thus far.

Although the integration of ICTs in education is understood differently by various people, it has a huge impact on curriculum development as means to achieve quality teaching and learning. Some sections of society might even consider it as a costly exercise without return on investment. However, Wagner, Day, James, Kozma, Miller and Unwin (2005: 6) believe that ICT would support the traditional curriculum in various schools. The facilitation of training on the use of ICT to develop curricula is significant. This should be seen as intervention to assist educators and teachers who seem to be rejecting it, regardless of the attempts to promote it in order to advance the quality of education.

Furthermore, Wagner *et al.* (2005) argue that the new curriculum would improve teaching methodologies, develop teachers, and eventually improve developmental goals. Hence, it is critical for curriculum-orientated technology to be seen as an attempt to curb the level of

illiteracy in developing countries. Conill (2013: 1) further indicates that technological literacy is an effective model to foster social stability, sustainable development and socio-economic growth.

2.5 EDUCATION TECHNOLOGY IN SOUTH AFRICAN HIGHER EDUCATION

2.5.1 Significance of Education Technology in higher education

Education Technology has shaped the face of education and business, more so in developed countries than it has in developing countries. Industries and businesses are expanding owing to the use of new business models and business processes designs. There is a clear shift from labour-centred models to technology-centred models. Furthermore, there was less emphasis on the acquisition of technological skills and the use of technology on their part. Due to the rapid change of technology, HE in developing countries find themselves trailing and not being able to come up with their own developments around technology.

2.5.2 21st Century technology in the classroom

The role of technology is significant and it can ensure that knowledge-sharing, teaching and learning, research and many other important facets of education and business, are improved. Understanding how it works and how it can be implemented could play a great deal in the education environment. Hsbollah and Idris (2009: 54) mention that the introduction and adoption of new technology, particularly e-learning, has created an interest amongst researchers because the technology could lead to the modification of traditional classroom teachings. However, Abrahams (2010: 34) states that technology will silence higher education's critics by making the academia more accessible, affordable and effective. It is, therefore, seen as a future platform for a generation of new ideas, teaching methods and instruments for a better future and to build sustainable businesses.

Companies and individuals rely on technology to transform and also for decision-making processes. Lee, Trimi and Kim (2013: 772) argue that ICT plays an important role in the behaviour of both individuals and organisations, as it continuously introduces new products and services, business models, convergence opportunities, and lifestyles. Some developing countries are more vulnerable than others in respect of international competition through failure to fully utilise the benefits of an ICT culture (Ali & Proctor, 2004: 123). This challenge is still prevalent

even in the higher education sector. This sector should be a vehicle to the development and training of highly technical skills, which are required around the ICT.

Some students from rural and semi-rural areas get to use computers for the first time when they enrol at university. The chances are that some will have serious challenges in the industry without having acquired the proper and relevant ICT skills. Ali and Proctor (2004) assert that the fast moving demand of technology, globally, and its rapid introduction has placed pressure on various schools and businesses to make it compulsory or part of the curriculum. They further allude to the fact that it became not only a subject, but also an effective tool for the study of all other subjects. The adoption of ICT plays a significant role in achieving a competitive advantage in the global market (Razi & Madani, 2012: 171).

2.5.3 Education Technology of the 21st century as a change driver

The role of ICT in society is significant. ICT impacts positive change on the lives of many individuals, organisations, and educational institutions. Its role should be seen as that of assisting educational institutions to develop and encourage students to learn and excel, as well as to assist management to develop high-level but low-cost technologies and innovative competencies in order to enhance social development (Sekiwu, 2010: 1). Furthermore, Sekiwu (2010), states that in the field of higher education, university managers should join the technological revolution by adopting low cost ICT and e-learning facilities, especially in developing countries where infrastructure is still a great challenge. This adoption of low cost ICT should be in line with the needs and requirements of the institution, and should be driven by a desire for change.

Online technology and other technologies such as competence building technology should be at the centre stage of transformation to advance what Norries and Lefrere (2010: 61) refer to as “knowledge-sharing in higher education’s communities”. Furthermore, the authors mention that the required expeditionary change should be based on knowledge-sharing, which facilitates transformation in various aspects of education such as production functions for learning, roles of faculty and mentors, business models, patterns and cadences of interactivity, use of open resources, and the roles of learners. These are fundamental aspects of 21st century education and would require management support, as well as infrastructure. The implementation thereof has a significant impact on how the institution will implement its curricula to address emerging and

important knowledge gaps, thereby increasing students' employability. There is a need across the spectrum for those in charge of teaching and learning to consider leveraging innovation through Education Technology to improve students' outcomes.

2.5.4 Understanding the importance of technological pedagogy

ICT curriculum in education is important because it can be used to enhance knowledge transformation in the classroom. According to Ferdig (2006), it is a complex process, which should involve people in the implementation phase. However, Mioduser *et al.* (2003) believe that the landscape on ET is changing. Therefore, many educational systems worldwide are placing much work into the assimilation of ICT in schools, which is now prompting significant changes in the processes of instruction and learning. This significant change must include the users. They further argue that the changes are as a result of, *inter alia*, the creation of new learning configurations and devices of novel pedagogical solutions, as well as the expansion of knowledge resource space. This means that the teaching and learning environment should be conducive, and that the needs of everyone must be catered for. End users must be involved in any attempt to upgrade the business processes so that users are provided with a sense of ownership. Users of any innovative teaching system must be given a sense of having control. The significance of technological pedagogy will be to determine innovative ways to create authentic and engaging activities for students (Ferdig, 2006). However, Su *et al.* (2005) argues that although interaction is a significant component of online learning, its importance seems to be lacking. Furthermore, Jamieson-Proctor *et al.* (2006) comment that the literature indicates the complexity of rationales and terminology that underwrite various initiatives such as various dimensions and stages of integration. The technological pedagogy must be a realisation of well thought out teaching and learning objectives. Its main aim must be the transformation of pedagogical practices and learning processes, which will improve classroom interaction and students' success.

However, the integration of a technological pedagogy model in education has its own shortcomings. Hew and Brush (2007: 227) highlighted the following challenges:

- a. Lack of specific technology knowledge and skills;
- b. Technology-supported pedagogical knowledge and skills; and

- c. Technology-related-classroom management knowledge and skills.

2.5.5 The use of innovative application

The higher education institutions have market both nationally and internationally due to its focus on on-going students demand. The constant demand of knowledge prompted the emerging of service providers, both in private and public sector which are now focusing on the necessary skills needed and the challenges brought by globalization. The challenges therefore prompted the need for the use of innovative application. The study concurs with Ison, Blackmore, Collins and Furnis (2007) when they argued that “the possibility of transforming the current mainstream identity of educators, project managers and researchers to a position that offers more choices through both epistemological awareness (and pluralism) and the design of learning systems, including SI, as second-order devices”. These stakeholders should eventually be able develop the learning systems which has the capacity to address skills needed globally.

2.6 CONCEPTUAL FRAMEWORK

The following section discusses the learning theories which underpin the conceptual framework developed below. The aim is to have an understanding of how technology evolves over time within the teaching and learning environment.

2.6.1 Cognitive theories of learning

The significance of this theory is that it shows how, Siemens (2014: 1) the “creation of instructional environments” in the absence of technology should be carried out. It focuses on the teaching and learning environment where learners are taught with technology. Siemens (2014) argues further that “learning needs and theories that describe learning principles and processes should be reflective of underlying social environments”. Many authors believe that before the introduction of learning in the class room, “information development was very slow” however, since the integration of technology in learning, there has been “exponential” growth. The cognitive learning theory enable learners not just to recall the information but to understand the process of “symbolic representation” of the processed in their minds. Siemens (2014: 2) cited that cognitivism often takes a computer information processing model. Learning is viewed as a process of inputs, managed in short term memory, and coded for long-term recall”.

2.6.2 Information systems theories of the conceptual framework

The framework came was developed to highlight the significance of Information System (IS) in research. It is anticipated that its validation would assist organization, CPU in particular to assess the IS impact on teaching and learning. This will eventually assist the institution to put more resources for transformation of education.

The constructed framework below indicates the importance of universities of technology to have strategy in place to enhance transformation through IS. However, the university must first deal with external factors such as poor performing global market, legislative framework by department of HE, the calibre of students and the type of technology in use etc. The strategy should assist the to drive teaching and learning models for effective teaching and learning which will eventually determine the type of technology the UoTs should put in place in order to drive transformation of education. The feedback must be shared amongst the university community about the systems in place and its implementation.

With reference to Figure 2.1 below, it is necessary to develop a conceptual framework that seeks to assist in the data collection and analysis of the results. The first pillar of this framework highlights the significance of transformation in higher education. The purpose of the framework is to give meaning and understanding to the role of technology education within transformation education. The literature indicates that there is still a gap in the TAM for the transformation of education. However, Brent (2008: 1) mentions that the literature is so large that one might [say] that there could be no remaining gaps, which could justify undertaking yet another adoption study.

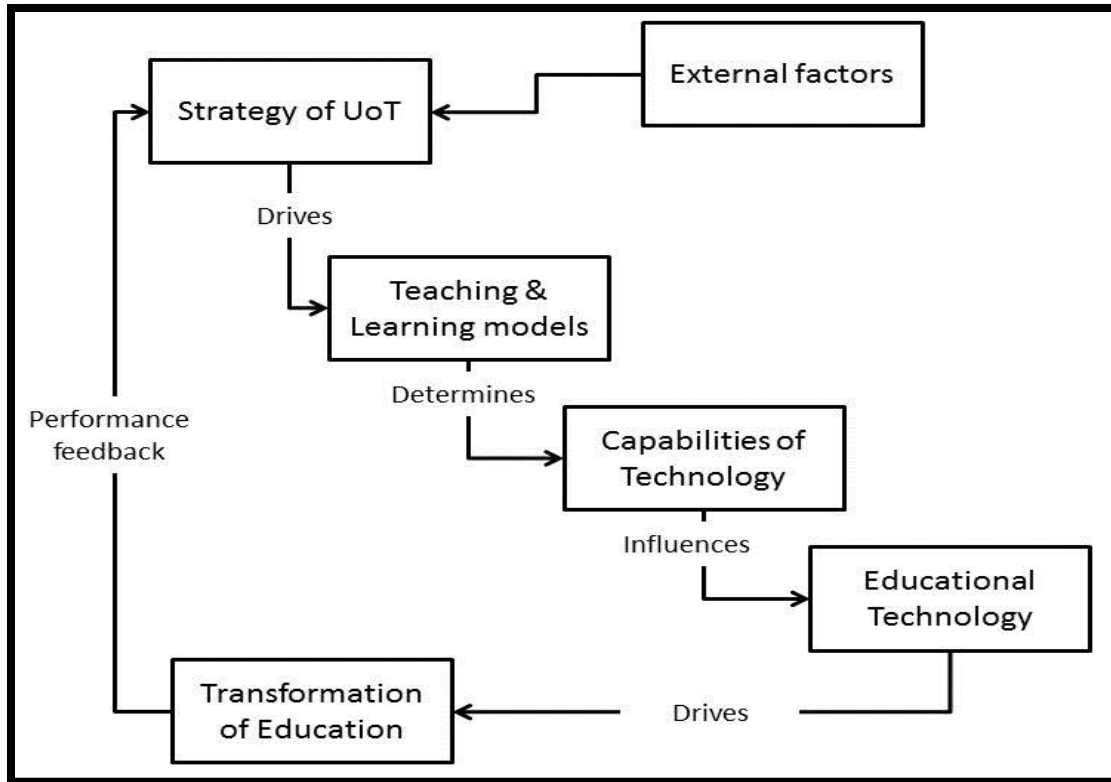


Figure 1 :Problem conceptualization

However, this study shows that there is still a gap in the literature, especially in respect of the TAM for transformation in higher education. Furthermore, in the context of adopting change on educational landscape, Hramiak and Boulton (2013: 91) argue that rapid technological development across Europe requires teachers to be aware of the latest technology in order to improve their skills. Wallace (2012: 1) iterates that the resultant increase in the pace of change has added complexity to business and social environments. He further states that managers, academics and professionals have shown a great deal of interest in ICT innovation in organisations. As mentioned above, the change is essential in secondary schools in Europe and it can be applied to many UoTs in South Africa to develop the skills and knowledge in the education sector. Hamidi *et al.* (2011: 369) believe that educational systems are prone to some alterations. They argue that there should be strategies that are adopted so that education in developing countries does not follow that of developed countries. Instead, education strategies should grow based on its own needs in the path of progress. A further significant issue, which Hramiak and Boulton (2013) point out, is that teachers need to be familiar with the latest technology. This will help them to enhance their teaching and learning skills. There is a need to

align the successful integration of technology in the classroom with the teacher's performance. Furthermore, Hramiak and Boulton (2013) assert that the literature has shown that this is possible with appropriate pedagogy to improve their critical skills, which are necessary for the adoption of modern technology in classrooms.

2.7 SUMMARY

It is evident that teachers without basic technology skills would find it difficult to comply with this integration. The literature shows that 10% of Scottish elementary schools lack basic skills in the use of databases and spreadsheets. In the middle-class schools in the United States, it was found that limited computer knowledge or skills contributed to the lack of technology integration by teachers. Furthermore, teachers have been using ICT infrequently (Chai, Koh, Tsai & Tan, 2011: 1184). Lai and Pratt (2004: 461) mention that in recent years studies have found that with the increase in accessibility, more teachers have better computing skills and are using more ICT in their work than previously. However, the finding further reveals that the ICT curriculum integration remains relatively low.

CHAPTER THREE: RESEARCH DESIGN

3.1 Introduction

The previous chapter presented a literature review pertaining to the role of Education Technology in the transformation of education in South Africa. Furthermore, it explored theories that underpin the integration of Education Technology as a significant tool for the transformation of higher education. The focus of this chapter is on the research design and methodology that was used for the study.

3.2 RESEARCH APPROACH

3.2.1 Introduction

The research philosophy centres around two distinctive schools of thought; qualitative and quantitative techniques. Numerous studies have drawn distinctions between these two methodologies. For example, Sale, Lohfeld and Brazil (2002: 43) argue that the two paradigms do not study the same phenomena, as quantitative and qualitative methods cannot be combined for cross-validation or triangulation purposes. However, they can be combined for complementary purposes. They do so in order to emphasize the different underlying philosophies, as well as to arrive at the intended outcomes of the research.

A five-level Lickert scale questionnaire was developed for the purposes of collecting data. The analysis and interpretation of the responses to the questionnaire are key to answering the research questions. Bhattacharjee (2012) suggests that data could be collected, analysed and interpreted to answer research questions. As indicated in the previous chapter, quantitative research is concerned with numerical data or statistics. A quantitative approach gives the researcher the ability to quantify data so that it can be measured numerically. A summary of the analysis of data and the interpretation thereof will be discussed in the next section.

3.2.1.1 Methods of data analysis

According to Singh (2007) there are two broad categories of statistical methods. These include descriptive statistics and inferential statistics. Lewin (2005: 215) noted that descriptive statistics can be used to describe and summarise data and include measures of central tendency and dispersion. The next section briefly describes how descriptive categories were used in the study.

It is important to note that although inferential statistics is mentioned, it is not necessarily used in the study. Lewin (2005) highlighted that inferential statistics are used to identify differences between groups, look for relationships between attribute and create models in order to be able to make predictions. The following section will look at the descriptive method of data analysis.

3.2.1.2 Descriptive statistics

The descriptive command is useful when you want to look at the distributional properties of any variable. The research employed descriptive statistics to show statistical information about different variables. The data was captured with SPSS on cardinal scale ranging from strongly agree to strongly disagree scale. The numerical results were projected on a table and converted to a graph for further analysis. Tables and graphs make it easy to describe, summarise, and present raw data. Furthermore, data were measured by the mean and mode to determine the central tendency or what we call the location of data. The results were analysed so that they give meaning to the responses on the questionnaire. The following section briefly looks into the reliability and validity of the instrument.

3.2.1.3 Quantitative research

The quantitative research concentrates on the numbers, which resemble a certain opinion. Will, Bertrand and Fransoo (2002: 241) contend that a quantitative approach has been the basis of most initial research on operations. In essence, quantitative research methods is about explaining a particular phenomenon or particular question, and also about collecting numerical data. It is also an effective research method, which is employed to collect data in a numerical format based on the number of statements. For example, where 1 equals strongly agree and 5 equals strongly disagree when using instruments such as questionnaires, while structured interviews and questionnaires are often employed. Researchers have always viewed quantitative research as being equivalent to positivism. Bhattacharjee (2012) states that quantitative research, can be used particularly for experiments and surveys. Amaratunga, Baldry, Sarshar and Newton (2002: 18) argue that illogical positivism uses quantitative and experimental methods to test hypothetical-deductive generalisation. Quantitative methods, therefore, include the following techniques:

- a. Questionnaires;
- b. Observations; and

c. Primary investigations.

3.2.1.4 Qualitative research

This section gives a brief overview of the qualitative technique as a method of research that is used in scientific research. Its primary objective is to collect qualitative data such as interview or observational data. It includes case-study research and ethnographic research. However, there are instances where qualitative data can be collected when the principle of quantitative is applied. For example, the interview comments after the survey has been conducted. There are also quite a number of methods that are used to collect qualitative data. For example, some of these methods may comprise of, *inter alia*:

- a) Records;
- b) Case studies;
- c) Observation by the participants; and
- d) Interviews.

In the following section the chapter reflects on significant differences between quantitative and qualitative methods. The comparison is presented in a table for ease of reference. This was deemed necessary because it illustrates the main reasons for selecting a quantitative approach for this study.

QUALITATIVE RESEARCH	QUANTITATIVE RESEARCH
<p>Qualitative (interpretive) research is based on the assumption that social reality is not singular or objective,</p> <p>It relies mostly on non-numeric data</p> <p>It is not amenable to statistical procedure such as computation of means or regression of coefficient and it employs purposive sampling strategy;</p> <p>Qualitative analysis is holistic and contextual, rather than being reductionist and isolationist;</p>	<p>Quantitative research assumes that the reality is relatively independent of the context,</p> <p>Relies on numeric data;</p> <p>It is amenable to statistical procedure such as data computation and employs random sampling technique;</p> <p>Researcher is considered to be external to and independent of data collection and analytical procedures;</p>

Table 2: Quantitative and Qualitative research (Bhattacharjee, 2012)

The above table illustrates how these two methods are used. The approach within which the two methods are employed to collect data differs significantly. Gelo, Braakmann and Benetka (2008: 268) postulate that quantitative and qualitative research approaches clearly differ in terms of how data is collected and analysed. They argue that approaches also differ particularly with regards to the aims of scientific investigation, as well as the underlying paradigms and meta-theoretical assumptions. Furthermore, they believe that the quantitative approach has found its base in psychological and social phenomena, which comprise objective reality, whilst qualitative is mainly considered reality that is socially and psychologically constructed.

3.2.1.5 Research approach adopted: quantitative

The aim of selecting quantitative research was to describe a particular phenomenon through the numerical sample of data that was collected and analysed. SPSS was used to convert the data into numerical format. The data was collected from a randomly selected sample. It is, therefore, used to address key questions from the research. Quantitative methods can also be used in instances whereby data that should be collected is not quantifiable by nature, but instruments such as questionnaires are designed for such a purpose. In this study the participants were offered an opportunity to respond to a number of statements. Jamieson (2004: 1217) states that the response categories have a rank order, for example, 1 strongly agree, 2 agree, 3 disagree, and so on. Amaratunga *et al.* (2002) suggest that this approach places considerable trust in numbers that represent opinions or concepts. Moreover, the quantitative method was the preferred method for this research because it gave respondents an opportunity to select statements, which best suited their preference.

Social researchers have over the years favoured quantitative over qualitative approaches because of the freedom to choose from a list of options, whichever best described one's views about the variable. This study was motivated by this explanation and followed similar approach. Furthermore, the study preferred to quantify the views of the respondents as opposed to interview.

3.2.2 Questionnaires

A questionnaire is an instrument, which is designed to collect a sample of data. It allows participants to choose an option that best suits a description of their opinion. Somekh and Lewin

(2005: 219) argue that it should have clear aims and objectives. It is quite effective for the collection of primary data. Furthermore, it requires high ethical standards to make it work well. This study follows Denscombe (2007: 159), since it is crucial for the researcher to provide thorough details of background information about the research and the questionnaire before distributing it to respondents. According to Willemse (2009: 13), a statistical study may require the collection of new data from scratch, which is referred to as primary data, or be able to use already existing data, which is known as secondary data. Furthermore, questions should follow certain logic and must be well thought of. The structure of a questionnaire should enable the questions to follow a certain flow from question to question (Willemse, 2009). The structure would allow for logical sections and sub-sections (Somekh and Lewin, 2005). The logic will guide the respondents on how to follow the questions. This study also highlights the fact that the selection of questions is significant because it allows the writer to decide how the questions should be phrased and follow a certain wording to maximize reliability (Willemse, 2009). The following are suggested by Somekh and Lewin (2005):

- a. The question should be clear to the respondent and not open to misinterpretation;
- b. And not use technical language or language that is inappropriate for the respondents (Somekh & Lewin, 2005);
- c. Questions should be short, simple and to the point;
- d. Do not ask many questions or questions that are too long;
- e. Questions should not require any calculations;
- f. Questions should not lead the respondent;
- g. Questions should not be phrased emotively;
- h. Questions should not be offensive or embarrass the respondent;
- i. Wherever possible, a choice of answers should be given; and
- j. Confidentiality should be assured.

They made use of questionnaires because it allows respondents to indicate an opinion of the questions that are asked. It also allows for the recording of answers in written form, and it is an easy form of data collection. However, sometimes it is used to collect data in an interview. The data that is collected form part of the statistical analysis. With the use of questionnaires, a large scale of sample can be reached. Willemse (2009) states that respondents can divulge their

identity or remain anonymous, therefore, they become more open and honest in their opinions. Furthermore, it is useful to collect accurate information about the opinions, which the researcher has in terms of whether to conform or dispute that opinion. It enables the researcher to ask relevant and specific questions about specific matters. Somekh and Lewin (2005) argue that the written questionnaires would emulate the one-on-one interviews that are found in the literature.

Amongst many advantages of using a questionnaire is that it allows for a similar question to be asked in the same format. This assists the researcher to avoid unintended confusion whereby a sample has to answer different questions. A well-constructed questionnaire helps respondents to understand the logical flow of questions. This standard format makes it easy for comments or suggestions to be recorded. It allows for the accurate recording of data and for it to be easily processed. Furthermore, Denscombe (2007) argues that:

- a. The purpose of a questionnaire must be to collect information, which can be analysed into information;
- b. The questionnaire must have a list of written questions; and
- c. The questions must be direct so that the research questions can be addressed.

As mentioned above, a questionnaire makes provision for respondents to register opinions, views and perceptions on a Likert scale. Sapsford and Jupp (2006: 101) suggest that the less simple categorization of responses and one that is more commonly used, is a Likert scale. The responses were ranked between 1 (strongly agree) and 5 (strongly disagree), and were coded on SPSS. Somekh and Lewin (2005) point out that a scale may force a particular response. The predetermined value allows respondents to indicate the degree of agreement, as well as disagreement. In this study the respondents were asked to provide their opinion of the role of education in transforming education at CPUT. The covering letter was attached to each questionnaires and distributed to 60 students who were randomly selected. A total of 20 questionnaires were distributed per year of study. For example, 20 questionnaires were distributed to first year students, 20 to second year students, and 20 to third year students.

The purpose of a covering letter was to introduce the research project and explain the purpose of the study. According to Somekh and Lewin (2005), a covering letter should outline the aims of

the research, highlight the importance of an individual's contribution, assure respondents of confidentiality and encourage their replies. The respondents were requested to voluntarily participate and were made aware that the survey would only take 10 minutes of their time. They were asked to sign the covering letter (consent form), if they agreed to complete the questionnaire. The data collection process lasted for nearly three weeks. The questionnaires were printed and all respondents who participated in this study were randomly selected. The completed questionnaires were kept in a safe place and marked for easy identification. The SPSS version 22 software was used to capture the data. It was also used for the analysis and interpretation of data. According to Kulas (2009: 4), the SPSS software program is created to perform statistical analyses. Somekh and Lewin (2005) concur, as they believe that all calculations can be easily performed by using computer-based tools such as the SPSS. This data manipulative software has been one of the most widely used systems in social science studies. Singh (2007: 239) mentions that it is the most popular quantitative analysis software, which is used today in social research. SPSS was selected for this study because of its advantages, which are discussed in the following section.

3.2.3 Advantages of questionnaires

According to Denscombe (2007), there are various ways to structure questions in a questionnaire. Open-ended questions give respondents time to further state their views. Somekh and Lewin (2005) caution though that it is important to provide clear instructions where such questions are used. It is equally important to consider the overall benefits of those types of questions. This study employed questionnaires owing to the following advantages, as argued by Denscombe (2007).

- a. Questionnaires are economical: they can provide a large volume of data at a lower cost rate in term of materials, money and time.
- b. They are easier to arrange: you can arrange with the respondent before distributing them and ask for the time to be returned to you.
- c. Questionnaires supply standardized answers: this is because respondents are being supplied with the same questions and there is a small chance of data being affected by interpersonal factors.

- d. Pre-coded answers: it encourages pre-coded answers and as a result, it is quick to capture and analyse such data.
- e. Data accuracy: human error is likely to happen when automated data entry machines are used.

3.2.4 Disadvantages of questionnaires

Although questionnaires have disadvantages, as cautioned by Denscombe (2007), its purpose suffices in this study. The main disadvantages of questionnaires are outlined as follows:

- a. Sometimes questions on the research questionnaires can be frustrating, which could lead to answers being deterred;
- b. There is a possibility that questions are biased towards the researcher; and
- c. Finally, there is minimal chance for the researcher to verify the answers.

3.2.5 Reliability and Validity of instruments

Golafshani (2003: 598) argues that reliability means that the idea of replicability or repeatability of results or observation. The results of the study should stand a test of time and produce the same outcome are being considered reliable. If someone repeats this research and come to the same results then the instrument is reliable. Unlike reliability, validity seeks to find Golafshani (2003: 599) “whether the research truly measures that which it was intended to measure or how truthful the research results are”. In this study, numbers in Likert scale were assigned Kimberlin and Winterstein (2008: 2276) “to observations in order to quantify phenomena”. There was a consultation of the supervisor and statistician before the implementation of the instrument.

3.3 SUMMARY

This chapter discussed the research design and methodology, which were employed in the study. It further distinguished between quantitative and qualitative methods and discussed why a quantitative approach was selected for this study. The study also highlighted the advantages of quantitative methods, which led to the selection of questionnaires. The chapter that follows presents the results and a discussion of the research.

CHAPTER FOUR: ANALYSIS AND INTERPRETATION OF DATA

4.1 Introduction

This chapter presents an analysis of the data that was collected for the study. Essentially, the study concerns the role of Education Technology in transforming education at a UoT. The OMT department at CPUT was the unit of analysis. The conceptual framework that was developed for the study will be reintroduced and briefly discussed in this section.

4.1.2 Frequency distributions

Lewin (2005) mentions that frequency distribution is used to describe data, which indicates the frequency of all categories or ranks, either in a tabular form or in a graphical form as a bar chart. It allows two variables to be compared with a cross-tabulation as long as each variable does not have too many categories and each category is mutually exclusive. The study employed frequency distribution to compare and summarise data. Graphs were used to display the statistical data so that it is easy to define and explain. For example, statistical information about the participants' knowledge of application was displayed on the graph and it was hence easy to compare and analyse the results.

4.2. Knowledge of applications

Figure 4.1 below illustrates the knowledge, which the participants have of different software, which is used by CPUT. The results show that all respondents have knowledge of MS Office applications. Therefore, MS Office Application is the most used office application at CPUT. Furthermore, the results show that of 53 respondents, 43 indicated that they have knowledge of Blackboard (LMS). Once again, this shows that a majority of students at CPUT use LMS for teaching and learning purposes, and that most of them know how to use it. However, it is important to note that there were no responses, which indicated knowledge of other applications. Therefore, there is a need for CPUT to introduce or to expose students and teachers to other Education Technology, which may be deemed necessary for transformation. The results concur with Alavi and Leidner (2001:1) who argue that the web-based courses are crucial to allow students an opportunity to study from home. The authors further state that in the knowledge economy there is a high demand for highly skilled employees to contribute towards the production of new knowledge. They further state that the quality should match the quantity for

all students. This should be combined with a strong penetration rate, which information technologies present at an extraordinary potential for the transformation of educational and learning processes.

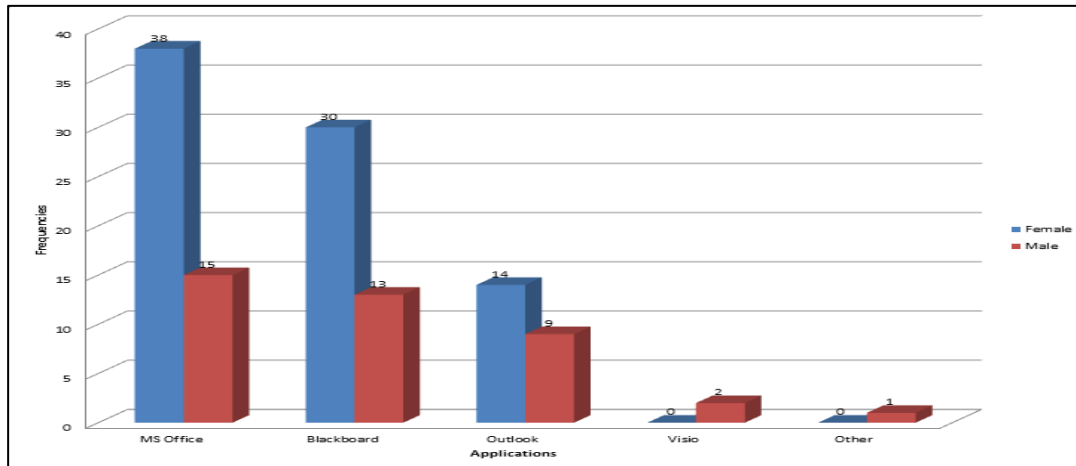


Figure 2: Knowledge of Application

4.2.3. Frequency statement (1): I use the learner management system (Blackboard) for my studies.

From the above graph it is clear that most students have knowledge of the LMS application. Here respondents were asked to rank the above statement on the Likert scale of 1 to 5. The primary objective was to establish whether the respondents use this learning tool and whether it impacts on their level of performance. The results are shown in the table below.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	24	44.4	45.3	45.3
	Agree	28	51.9	52.8	98.1
	Strongly Disagree	1	1.9	1.9	100.0
	Total	53	98.1	100.0	
Missing	System	1	1.9		
Total		54	100.0		

Table 3: The use of Learner Management System

Table 4.1 shows that 53 responses were projected as follows: 52.8% of 53 respondents agreed that they use Blackboard as an education tool to manage their academic work. This percentage indicates that most students rely on LMS to do their academic work. It signifies the role of

Education Technology in the transformation of education at CPUT. Therefore, this learning tool should be improved so that it remains relevant at all times. The results further show that 45.3% of 53 respondents indicated that they strongly agreed that they use LMS for teaching and learning purposes. It seems that the majority of students see a need for this tool within teaching and learning. The highest percentage, as argued by Alavi and Leidner (2001), is attributed to the fact that the application of technology to education and training underscores a fundamental need to understand how these technologies improve the learning process. It further shows the significant impact that the increased use of web-based learning tools such as LMS could have on the transformation of education at CPUT. It is important for learners to use LMS for educational purposes, as well as to improve their technology skills. However, its usage depended largely on whether the teacher/educator is instructing students to use it by placing reading material on it. Therefore it is important for educators to communicate to learners regarding the significance usage of such material.

4.2.4 Frequency statement (2): I easily upload and download work on Blackboard

This statement was intended to ascertain whether students are confronted with challenges when uploading and downloading material from Blackboard. The Table 4.2 below illustrates statistics from the responses to the statement above.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	15	27.8	28.3	28.3
	Agree	27	50.0	50.9	79.2
	Disagree	10	18.5	18.9	98.1
	Strongly Disagree	1	1.9	1.9	100.0
	Total	53	98.1	100.0	
Missing	System	1	1.9		
Total		54	100.0		

Table 4: Uploading and Downloading from Blackboard

Table 4.2 shows that 28% of 53 responses strongly agreed that they do not have challenges with the uploading and downloading of work to and from Blackboard. However, 50.9 % of 53 respondents indicated that they agreed that they are able to upload and download material from Blackboard. These two percentages indicate that most students at CPUT still engage or rely on

Blackboard to access material and use it effectively. However, about 2 % of the 53 respondents strongly disagreed with the statement. According to Barr and Miller (2013: 5), some students may feel isolated and disconnected with the technology during the learning experience. Although the percentage is significantly less, it is a cause for concern that there are still students who cannot access material from Blackboard when they need it. According to Yuen, Law and Wong (2003: 158), the ICT innovation should bring about students' capacity for self-learning, problem solving, information seeking and analysis, critical thinking, and the ability to communicate, collaborate and learn. The lack of access to this learning tool implies that those who cannot access information cannot collaborate or communicate effectively.

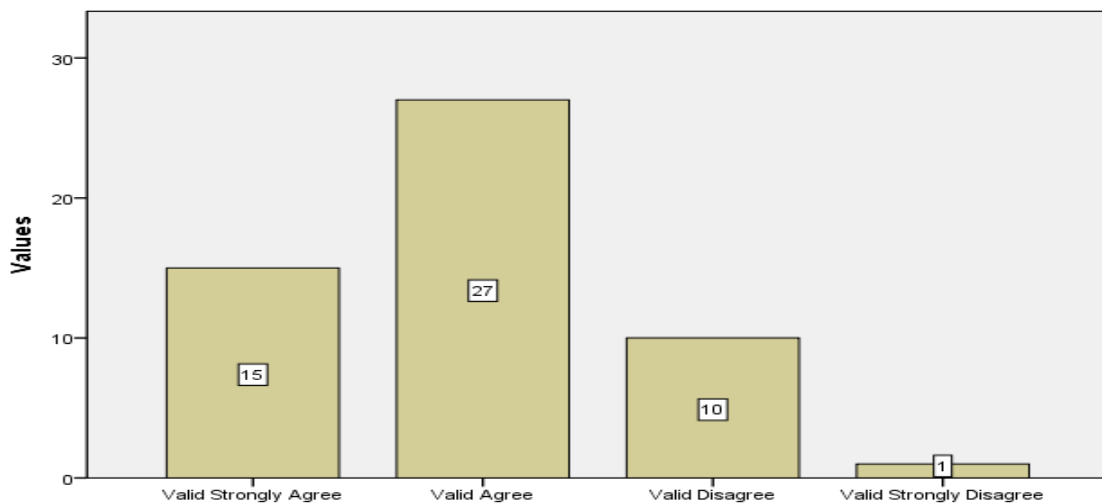


Figure 3: Uploadind and downloading on Blackboard

As indicated in the graph above, most of the participants believe that Education Technology is significant and important for the transformation of education. The significance of Blackboard is that it has evolved over time. Some of its features have been advanced and more experience and skills have been gained in the process. Furthermore, the results confirm the lack of modern technology prohibits the transformation of education at CPUT.

4.2.5 Frequency statement (3): I have received adequate training on Blackboard

This statement was intended to ascertain whether the respondents had received Blackboard training. The importance of training is to maintain and improve levels of skills. Tsai and Tai (2003: 151) observed that employees who are ordered to attend the training had a higher

motivation for training. This means that the technical training is mandatory and could enhance skills. The table below shows statistics regarding how responses were given.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	4	7.4	7.5	7.5
	Agree	24	44.4	45.3	52.8
	Disagree	20	37.0	37.7	90.6
	Strongly Disagree	5	9.3	9.4	100.0
	Total	53	98.1	100.0	
Missing	System	1	1.9		
Total		54	100.0		

Table 5: Blackboard training

The table above indicates that 7.5% of 53 respondents strongly agreed to have received adequate training on Blackboard, while 45.3% agreed to have received training. The statistics show that most of the students have received training, which could be the reason why many were able to access it and download material, as indicated above. A total of 37.7% of respondents disagreed with the statement, while 9.4% strongly disagreed. The fact that the margin between the agreed and disagreed is not that big somehow shows the lack of provision of ongoing training to students. Training is perceived as a motivating factor. However, Tsai and Tai (2003) argue that the ability to learn the content of a course may fail to benefit from training because of low motivation. These results could mean that in order for students to fully understand the functions of ET such as Blackboard and any other teaching and learning tools, they need to undergo continuous training.

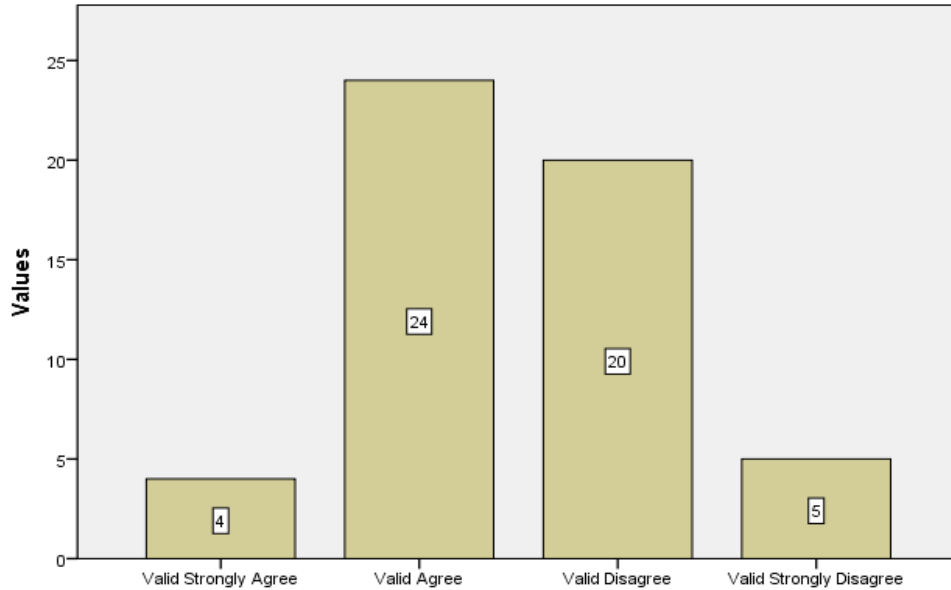


Figure 4: Blackboard training

As illustrated in the above figure, 24 of 53 respondents agreed that they have received adequate training on Blackboard. However, a total of 20 disagreed with this statement. The gap between those who agreed and those who disagreed is not wide. It tells that there is no consistency around the provision of training at CPUT in this regard. Adequate training is essential as means to deal with a lack of skills and competence in ET. Bingimlas (2009: 235) contends that confidence, competence and accessibility are profound to ICT adoption. Therefore, technical support and training should be provided to students and educators. It will fast-track and transform the acquisition of new skills and develop the application of knowledge. According to Buabeng-Andoh (2012: 136), it is crucial to know the extent of the barriers affecting individuals and institutions so that you are able to deal with them.

4.2.6 Frequency statement (4): Technology usage should be encouraged to advance transformation and equality within the institution of higher learning.

CPUT has objectives, which are derived from the vision and mission statement that were crafted to give direction in terms of what they want to achieve. This study was not aimed at addressing all the objectives, but rather to consider how technology can be utilised to advance the transformation of education and equality within the institution. The focus was on the issues of teaching and learning or classroom management. To answer the sub-question above, the statistical table was developed to present participants' responses in relation to the question.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	43	79.6	81.1	81.1
	Agree	9	16.7	17.0	98.1
	Strongly Disagree	1	1.9	1.9	100.0
	Total	53	98.1	100.0	
Missing	System	1	1.9		
Total		54	100.0		

Table 6: Technology usage

The results above indicate that 81.1% 53 respondents strongly agreed with this statement (4). This clearly shows that the institution should do much more in order to transform education and ensure equality of providing ICT resources across all its campuses. Furthermore, the results can also be interpreted to mean that technology usage should be one of the strategic objectives of the institution to support its mission of being “at the heart of technology in Africa.” According to Hong, Thong and Tam (2006: 1819), many organisations are beginning to consider user’s IT adoption and usage as key factors, which influence levels of production. Furthermore, the table indicates that 17% of 53 respondents agreed. This shows how seriously participants consider the impact of technology on the transformation of education, whilst achieving its objectives. Only about 2% of the 53 respondents strongly disagreed. However, this percentage does not make much impact because most of the respondents indicated that they want to see the transformational objectives of the new CPUT taking effect. The results are shown on the graph below.

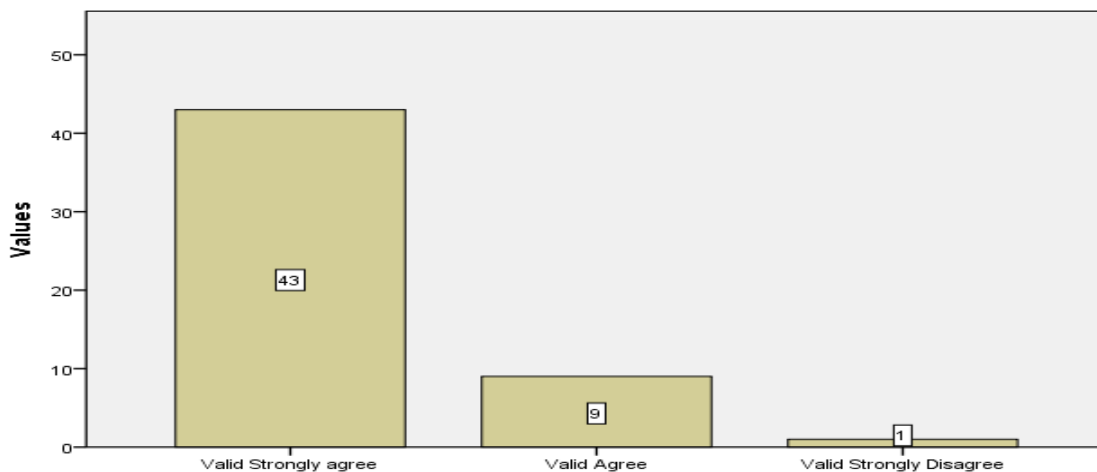


Figure 5: Technology usage

Figure 4.4 above indicates that 43 of 53 respondents strongly agreed with the statement (4). This shows that there were commonalities amongst the participants in relation to how technology should be used to transform education at CPUT. This figure further indicates how low the responses were of those who agreed (9) and strongly disagreed (1) with the statement (4). This implies that the institution should increase their investment in IT. Subscribing to more web-based learning will increase access to quality education outside of the classroom. In addition, it will further assist the institution to develop a model that will encourage technology usage in the area of IT such as TAM. Hong *et al.* (ibid) describe TAM as a “widely accepted powerful tool” to change the perception of employees of organisations, as well as to drive technology orientated services with the institution.

4.2.7 Frequency statement (5): Transformation Policy is shared through educational technology

The modern educational tools that are employed at CPUT allow students and staff access to the latest policy documents. This will further enable them to make informed decisions, as well as to on service delivery. The responses to statement (5) are recorded in the table below.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	5	9.3	9.8	9.8
	Agree	27	50.0	52.9	62.7
	Disagree	17	31.5	33.3	96.1
	Strongly disagree	1	1.9	2.0	98.0
	Not applicable	1	1.9	2.0	100.0
	Total	51	94.4	100.0	
Missing	System	3	5.6		
Total		54	100.0		

Table 7: Transformation is share through educational technology

Table 4.5 illustrates responses to the statement (5) mentioned above. It shows that 9.8% of the 53 respondents strongly agreed with the statement, while about 52.9% agreed, 33.3% disagreed, and only 2% of respondents strongly disagreed with the statement. These results signify that the university should more often use ICT for information sharing. It further highlights the role of technology tools in the education system where information sharing is eminent. Furthermore, it is an indication that most of the participants in this study understand why information should be made available to everyone, as well as how it should be accessed. Li and Lin (2006: 1641) contend that an organization must ensure accessibility to its information in order to improve the

effectiveness and efficiency of its business. They further argue that information sharing will bring the organisation a competitive advantage in the long term.

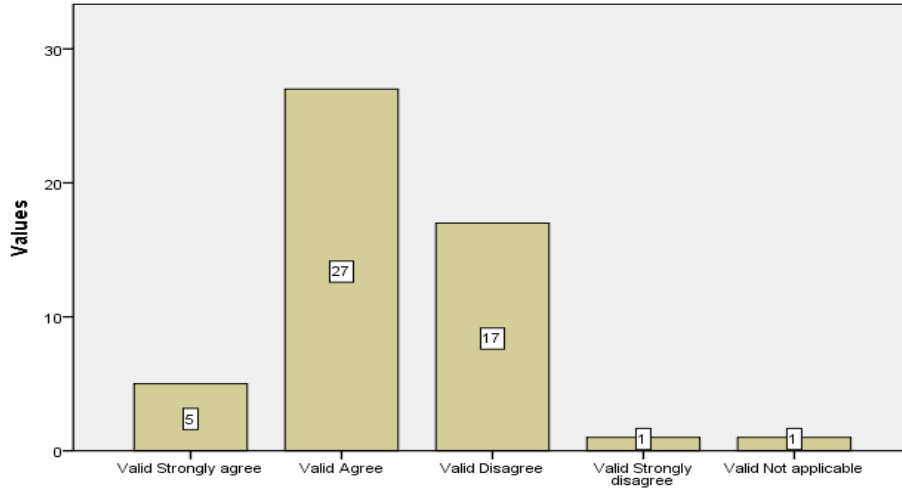


Figure 6: Transformation of higher education

Figure 4.5 shows that most of the responses that were recorded agreed with the statement. However, it is important to note that the strong view (strongly agreed) received the second lowest responses. This shows that CPUT does make its transformation policy available to all students all the time.

4.2.8 Frequency statement (6): The selected UoT uses technology to drive transformation.

CPUT prides itself on being a University of Technology whose vision is “To be at the heart of technology in Africa”. Participants were asked to rank this statement and to give their views regarding to what extent the institution uses technology to drive transformation. It is important to note the responses in the table below. Table 4.6 illustrates statistics from the responses of participants in relation to this statement.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	13	24.1	25.0	25.0
	Agree	32	59.3	61.5	86.5
	Disagree	5	9.3	9.6	96.2
	Strongly disagree	2	3.7	3.8	100.0
	Total	52	96.3	100.0	
Missing	System	2	3.7		
Total		54	100.0		

Table 8: Technology to drive transformation

The table above shows that 32 of 53 respondents agreed with this statement (7). This means that 62% of students are aware that transformation is taking place at CPUT. This result confirms what Buabeng-Andoh (2012) alludes to when he states that ICT is increasingly becoming a significant tool in our daily lives, as well as in business. A total of 13 (25 %) respondents indicated that they strongly agreed with the statement. However, it is important to note that 3.8% views disagreed and 9.3% strongly disagreed with the statement. Change is required to help those who are not aware of transformation to finally see it. However, the overall results show that most students at CPUT are aware of management’s intention to transform the institution, and to make it a University of Technology for the future. Further statistics are shown in Figure 4.6 below.

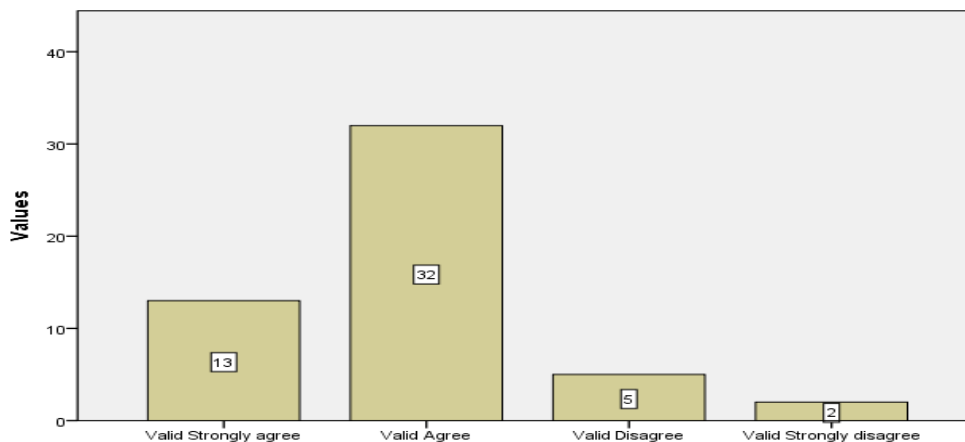


Figure 7: Technology to drive transformation

4.2.9 Frequency statement (7): Education technology is an important part of teaching and learning strategies.

CPUTs teaching and learning strategies are significant for the transformation of education. The learner-centred approach enables students to engage with the problem. Individuals accept responsibility for seeking relevant information and bringing that back to the group to help inform the

development of a viable solution (Savery, 2006: 13). This section presents and discusses responses to statement (7). The results are shown in Table 9 below.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	31	57.4	59.6	59.6
	Agree	19	35.2	36.5	96.2
	Disagree	2	3.7	3.8	100.0
	Total	52	96.3	100.0	
Missing	System	2	3.7		
Total		54	100.0		

Table 9: UoT strategies

The results in the table above show that out of 53 respondents, 59.6 % strongly agreed that Education Technology is an important part of teaching and learning strategies. A total of 36.5% of respondents also indicated that they agreed with statement (7). Both percentages represent the biggest percentage of those who hold positive views about the above statement. Therefore, these results imply that the modern day class should be equipped with technology that will enhance teaching and learning to ensure that strategies are implemented. As Su *et al.* (2005: 7) points out, modern technologies should be the driver of education in modern day classrooms. This statement affirms the responses as per the statistics above. Therefore, it is correct to say that Education Technology, as one of the teaching and learning tools, has played a significant role in the transformation of education at CPUT. The next section presents a summary of the data analysis and the interpretation of data that was discussed in this chapter.

4.3 Summary of data analysis and interpretation

The role of Education Technology in the transformation of education at CPUT is significant and should be seen as a key driver towards quality education. A conceptual framework was used to guide data collection. The data reveals that, Blackboard should continue to be used at CPUT, and all students should be exposed to it. Furthermore, data shows that there is a strong belief among students that technology drives transformation. However, the role of education technology to transform education is the responsibility of all stake holders, namely educators and students. The advancement of transformation, especially issues of teaching and learning, requires everyone’s contribution. Most importantly, it requires leadership and resources. There is a need to ensure skills development and to encourage classroom interaction to close the

knowledge gap and to transform education at CPUT. The results further show that the UoTs strategy is to further ensure that it intensify socio-cultural innovation. The significance of social innovation in teaching and learning is to develop student learning styles. It is, therefore, important for this strategy to drive the teaching and learning models, which speak to diverse learning styles. Rice, Johnson, Ezell and Pierczynski-Ward (2008: 104) argue that students may need different tools to learn, however, it is important to consider technology that can work best for students before learning commences.

Therefore, this study recommends and affirms the framework and proposes that it could be applied to similar situations at other Universities of Technology in South Africa.

4.4 Summary

This chapter discussed the methods that are used to collect data, as well as descriptive and frequency distributions. This was followed by a brief discussion of the conceptual framework model for data collection. An outline of participants' responses was also presented and discussed. Finally, the researcher gave a brief summary of the data analysis and an interpretation of the research study's data.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This research focused on the role of Education Technology in transforming education at CPUT. The theories that underpin Education Technology were analysed and interpreted. Li, Whalley, Zhang and Zhao (2008: 2) postulate that transformation embodies significant changes in an organisation. Organisations and educational institutions must learn to accept and adapt to change because change is inevitable. The literature shows that different organisations around the world have adopted TAM; however, some have had a difficult time employing it effectively. Li *et al.* (2008) argue that countries like China have been driving major transformation in higher education since 1999. They assessed its potential global impacts. In Australia, for example, the integration of ICT curriculum in education has been regarded as the essential goal for future educational initiatives. In South Africa, since the introduction of the new dispensation in 1994, the education system took different shapes and forms. There was no concrete and sustainable education model for the future.

These challenges and other drawbacks have led to the inception of this study. The aim was to analyse the role of Education Technology in the transformation of education at CPUT. Furthermore, the study aimed to ascertain the impact of the existing technologies and their capabilities on the work of CPUT. Ferdig (2006) argues that technologies that are used by CPUT must be pedagogically sound. In other words, CPUT must develop the capacity to support teaching and learning in and outside the classroom. The introduction of Education Technology as an educational adoption model for transformation is significant, especially in developing countries. However, Buabeng-Andoh (2012) believes that ICT adoption and integration in teaching and learning has been limited. This chapter proposes recommendations to address the challenges, which were presented in Chapter One.

5.2 RESEARCH CONTRIBUTION

This chapter assesses the contributions that were made, as well as practical implications of the research. This is necessary because it highlights important factors about the study, which contributed to the body of knowledge around Education Technology.

5.2.1 Theoretical contributions

The theoretical contribution is attributed to the literature that was studied and reviewed, which led to the development of a conceptual framework model. This framework was effective in guiding the direction that the research had to follow in order to collect and analyse the data. The study revealed that most CPUT students use the learning tool, Blackboard, to access teaching and learning resources. However, there is a lack of continuous training to enable students and academics to use this tool more effectively. Furthermore, it shows that there is a need for advanced technology in the classrooms to properly transform education at CPUT.

5.2.2 Methodological contributions

The study employed a quantitative approach for easy interpretation of quantified results and opinions. It was used to explain the phenomenon about the research questions. The views of the participants were quantified and projected in the table and graphs for the purpose of interpretation and analysis, as well as to test hypothetical-deductive statements.

5.2.3 Practical contributions

This study provides a practical contribution in light of the weaknesses/gaps that are found in the role of Education Technology in the transformation of education at CPUT. There is a serious need for management at CPUT to introduce and employ modern-day technology in the classrooms to help to transform education. Moreover, educators and students should be exposed to extensive training on how to use education technologies more effectively. The results of this study serve to index the role of Education Technology in relation to the transformation of education at UoT within a broader South African context.

5.3 Recommendations

The role of Education Technology is significant in the 21st century's education sector. Business organisations and institutions of higher learning should consider the new teaching tools to ensure the successful transformation of education. The study recommends that the Education Technology that is proposed should be analysed before and during the process of implementation. Furthermore, it recommends that students at CPUT should be exposed to

various tools of learning. The management of CPUT should ensure that they receive continuous training on how to use these tools. The training that is provided should ensure that they are able to access teaching and learning material on time, while also being able to access important policy documents, which deal with transformation. The management of CPUT should further ensure that they also establish training programs for educators. In Singapore Chen, Tan, and Lim, (2009: 1) teachers improved the process of adopting technology in education through different stages. Educators must be well informed about the new change that will take place and should receive proper training on how to use the new technologies.

Furthermore, this study recommends implementation of the general framework (see Figure 4.7) that was developed, based on the conceptual framework and the literature that was reviewed, as well as the data analysis. The general framework should be used to assist CPUT, especially the OMT department, to employ education technologies, which support the transformation of education.

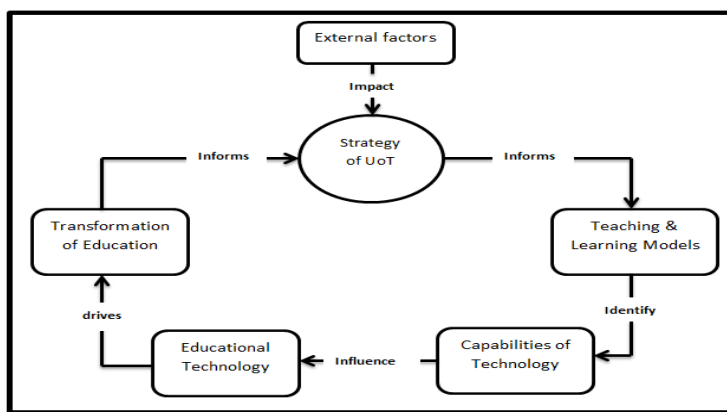


Figure 8: Proposed General Framework

5.3.1 Strategy of UoT

Institutions of higher learning and business organisations should strive to reposition themselves in the market and craft a sound strategic plan/vision, which will make them unique. They should do this in conjunction with ICT curriculum support system to strengthen and enhance education. Tosun and Baris (2011: 223) state that the strategy should define the skills that educators should possess in ICT. Furthermore, Shuva (2010: 495) believes that it is significant for teachers to do more practical training to demonstrate knowledge of ICT application in the classroom to ensure that the investment will not be wasted. Therefore, UoT should ensure that there are ICT

resources in place to strengthen teaching strategies, which are more learner-centred and focus on addressing the needs of learners. In Singapore, for example, there has been strives towards the integration of Digital Technology into curriculum, pedagogy and assessment (Yeung, Lin, Tay, Hui & Low, 2014: 136). The aim of this integration was to transform students' competencies in the classroom by integrating the Ministry of Education, which was responsible for developing ICT policies and the National Institute of Education, which was a "sole provider of initial teacher education and schools." Hence, this dissertation argues that it is important for UoTs in South Africa to consider educational strategies, which have the ability to drive TLM to transform education. And, finally, the university should ensure that the implementation of strategies is followed by a monitoring, evaluation and feedback process for the purpose of quality assurance.

5.3.2 TLM for UsoT

The TLM for UsoT should be directives for strategic transformation and development of education in the classroom. Miller, Rodrigo, Pantoja and Roem (2004: 30) recommended that colleges should use the results of their work to improve teaching in their own classroom. It is, therefore, imperative for TLM to play a significant role in ensuring the effective delivery of curriculum, and also to allow greater participation from all learners. Prior to the implementation of TLM, the management of UsoT should consider establishing the capabilities of ICT infrastructure. According to Rahimnia, Polychronakis and Sharp (2009: 246), for planning and implementation to take place, the decision-makers must play an active role. This is to allow management to better understand the capabilities of these technologies. Therefore, the adoption of a strategy model shown in Figure 4.7 above, for UsoT, should be aimed at assisting decision-makers to improve learning environments.

5.3.4 Capabilities of technology

Another important element for the management of the selected UoT is to consider the effectiveness of the technologies that are employed for the transformation of education. These technologies should enable the institution to carry out its mandate without any challenges. Petrova and Claxton (2005: 27) argue that in order to maintain student skills development, as well as to ensure technology capabilities, the universities should consider industry related learning models such as cooperative education to keep up with demanding technology developments. Alampay (2005: 4) asserts that ICT has been regarded as an important means for

development and to measure the capabilities of other existing technologies. The necessary training should also be provided to users (educators and students) of education technologies. This will ensure that there is preservation of the required skills at the institution. Furthermore, the technology capabilities must influence the Education Technology that is in place, or that of the future.

5.3.5 Education Technology

The integration of teaching and learning technologies is significant for UoT and for the transformation of education in South Africa. In Sweden, for example, higher engineering education was the driving force for economic growth, global competitiveness and the sustainability of welfare state (Hallström, Hultén & Lövheim, 2014: 121). Therefore, it is necessary for this Education Technology to be recommended for the selected UoT in order to advance and improve students' level of competence. In order to achieve this, the education technologies should be influenced by the capabilities of existing technologies, as well as by the ICT infrastructure in place within the UoTs. It is important for this research to consider Potgieter's (2013, 969) argument that the management of the UoTs should consider "the instructional strategy for the particular technology education programme to be adapted to include the Education Technology-based learning outcomes" for teaching and learning. If these components are not in place the implementation of Education Technology may not be achieved. Therefore, it is important for the managements of UoTs to review the existing technology, and then make a decision as to which technologies to employ for teaching and learning.

5.3.6 Transformation of education

The higher education sector should develop so that the set goals can be achieved. This is important, especially in developing economies such as South Africa. The framework mentioned previously shows that transformation is driven by the nature of Education Technology that is employed to improve teaching and learning. Sutherland *et al.* (2004) argue that when ICT is integrated into specific subjects, the teachers can use it to develop themselves to transform their own knowledge. However, it is important to note that there are external factors, which often impede the transformation of education. Often, these are factors, which teachers and management have no control over. ICT has brought about drastic changes to education systems globally. This change has prompted HE to be aware of the following external factors:

government policies; migration; new technology; declining economy; learning environments; and so on. Therefore, it is important for the management UsaT to consider all these factors when developing strategies for educational transformation.

5.4 Summary of the chapters

Chapter 1: The chapter began with an introduction to the study, rationale of the research study, which comprised of a background to the research problem, problem statement, research questions, and research objectives, overview of the literature review, overview of the research approach, delimitations and a chapter summary. Furthermore, the conceptual framework was developed and discussed, while the research methodology that was used was also discussed.

Chapter 2: In this chapter the researcher reviewed literature on the role of Education Technology in the transformation of education. Furthermore, the chapter reflected on the commitment of the South African government towards issues around the transformation of higher education since 1994. The theoretical overviews of other TAMs were reviewed. Finally, the general framework that was underpinned by the literature was developed.

Chapter 3: This chapter discussed the research design and research approach that were employed in this research project in order to investigate the research problem and to answer the research questions. A summary and reasons for the applicable method for this research were indicated, as well as reasons why the quantitative research method was the appropriate method for this study. Furthermore, the chapter discussed why questionnaires were used to collect data, and why SPSS software was used to analyse data.

Chapter 4: This chapter concerned the analysis and interpretation of data and the results. The results were projected and analysed through the use of tables and graphs. The results also underpinned the decisions to recommend the general framework that was developed in Chapter 2.

Chapter 5: The chapter concludes the study and presented recommendations in respect of the role of Education Technology in the transformation of education at UsaT. Furthermore, it recommended the adoption of the general framework that was developed following the review of

the literature in Chapter Two and quantitative data analysis in Chapter Four. The recommended general framework was adapted to fit this study and it was briefly discussed. Lastly, the chapter made recommendations for future research in respect of Education Technology.

5.5 Future research

It is recommended that further research, which deals with Education Technology should be undertaken to develop teaching and learning strategies at UoT to advance transformation in other fields of social science. There is still a challenge on how best Education Technology could be employed without resistance and without it being too costly.

5.6 Summary

This chapter discussed the contributions of the research, and further discussed the adopted general framework in relation to the role of Education Technology in the transformation of education. The study proposed and discussed recommendations for the selected UoT and, furthermore, made a recommendation for future research around Education Technology. The chapter concluded by discussing overviews of all the chapters within the study.

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