A design Framework for E-learning that advances E-skills of students in a South African University of Technology

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Declaration

I, Subashnie Soobramoney, declare that this dissertation is a representation of my own work, both in conceptions and execution. This work has not been submitted in any form for another degree at any university or institution of higher learning. All information cited from published or unpublished works have been acknowledged.

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Dedication

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Publications

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Contents

Definitions

Digital Divide	The distance between those who are able to benefit from ICT and those who are prevented from doing so for various reasons
E-Inclusion	The effective participation of individuals and communities in all dimensions of the knowledge society and the economy through ICT
E-Learning	Teaching delivered on a digital device such as a computer or mobile device that is intended to support learning
E-skills	An individual's competence in the effective use of ICT for the purpose of work, innovation, learning and leisure
Knowledge society	A modern society in which the creation utilisation and dissemination of information and knowledge has become the most important factor of production

Abbreviations

DigEULit	Digital European Literacy framework
EE	Effort Expectancy
FC	Facilitating Conditions
GT	Grounded Theory
ICT	Information and Communication Technology
LMS	Learning Management System
NeSPA	National E-skills Plan of Action
NRI	Network Readiness Index
UOT	University of Technology
PEU	Perceived Ease of Use
PU	Perceived Usefulness
TPACK	Technological Pedagogical and Content Knowledge
UTAUT	Unified Theory of Acceptance and Usage of Technology

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Abstract

Nationwide E-inclusion is yet to be realised in many countries, including South Africa, conceivably resulting in the E-skills diversities that exist in the workplace and amongst university students. Literature confirms diversity of E-skills, however does not provide a strategy to develop these E-skills diversities, such that students may cope with the rapid, countrywide adoption of E-learning by South African universities, which has consequently imposed additional demands on students to use unfamiliar technology for learning. Since E-learning technology is supported by universities, identifying a strategy that incorporates elements of E-learning that may develop E-skills will benefit disadvantaged students and prepare students for a technology dependent economy.

The relative novelty of using E-learning to develop E-skills is underpinned by a constructivist philosophical view that necessitates a qualitative approach for discovery. A longitudinal case study of undergraduate first year students with diverse E-skills levels was conducted to gather qualitative data needed to gain a thorough understanding of how E-learning tasks might be structured towards firstly helping the student cope with technology enhanced learning, and secondly to develop students' E-skills over a prolonged period. Focus group interviews and course assessments were used to gather data from participants and Straussian-grounded-theory methods were employed to ensure a rigorous, structured analysis of student experiences with technology and their related E-skills development. Elements of E-learning design that influence E-skills were identified as concepts and categories using Straussian grounded theory coding techniques.

Emerging categories show that diversity may be addressed by introducing carefully designed incrementally complex E-learning tasks, stimulating the student to achieve the next level of E-skills competency. This incremental digital development may be achieved through strategic manipulation of elements, such as providing support for development, motivation for technology use, creation of opportunities to use the technology, acknowledging challenges in access to technology and providing optimal time for tasks to encourage E-skills development and minimise competence related anxiety. Complemented by instructor interventions,

beginning with instruction, then involvement, thereafter facilitating interaction and finally encouraging independence to stimulate E-skill development from fundamental to strategic levels, builds an effective platform to develop E-skills.

Increasingly complex tasks need increasingly complex technologies. It provides a framework that an instructor may use as a strategy to improve the adoption of E-learning and address E-skill diversity in the classroom in a way that can develop student E-skills on multiple levels, so that they will be equipped to meet the demands of the university environment and ultimately the technology driven workforce.

CHAPTER 1 - INTRODUCTION

1.1 Background Information of the Study

The information age is all about access to information, development and sharing of knowledge, and creating a knowledge economy. Consequently, developments in ICT capabilities create a demand for a greater skill set from employees to enable them to make effective use of ICT tools (Álvarez-Flores, Núñez-Gómez and Crespo 2017). This set of skills has been consolidated into terms such as E-skills, digital competence, digital fluency and digital literacy, all referring to an individual's ability to use ICT in a knowledge environment to be innovative and creative as well as to improve performance and transform society (Ferrari, Punie and Redecker 2012; Adegbenro and Gumbo 2014; Álvarez-Flores, Núñez-Gómez and Crespo 2017).

1.1.1 ICT innovation and adoption

If local and global economies are rapidly evolving with ICT, then the South African population should be upskilled at a rate that is proportionate to ensure that a skilled workforce is available to meet workplace demands. The Network Readiness Index (NRI) measures and classifies a country's ability to benefit from the opportunities provided by ICT. Statistics available from the NRI (Acs, de Groot and Nijkamp 2013) show South Africa's capabilities in various ICT sectors. South Africa ranks 65th out of 139 countries on the NRI with only 25% of the workforce employed in knowledge intensive positions (Baller, Dutta and Lanvin 2016). Evidence suggests that this may be caused by a deficiency in our economy of knowledge workers with adequate skills to fill knowledge intensive posts and make use of the technology (Nzimande 2014).

Despite over twenty years of democracy in South Africa, there still exists a portion of the population that continue to suffer the effects created by the inequalities of the past. These people fall into low-socio-economic status groups that struggle to improve their status and

depend on government support (DHET 2014). Evidence from recent studies indicate that even undergraduates at university level may still have deficiencies in their ability to harness the capabilities of ICT in order to play an active role in the knowledge economy (Mabila, Gelderblom and Ssemugabi 2014; Ukwoma *et al.* 2016a; Álvarez-Flores, Núñez-Gómez and Crespo 2017). The inability to use ICT effectively further influences the type of employment that these graduates are likely to be placed into (Álvarez-Flores, Núñez-Gómez and Crespo 2017).

For the economy to grow, the deficiency of knowledge workers in South Africa should be addressed in line with the social inclusion policy of the Department of Higher Education and Training (DHET 2014). The policy strives to support and develop people who have been previously disadvantaged. Research around student success in South Africa have addressed the issue of access to technology (Czerniewicz and Brown 2010a, 2013a; Naidoo and Saib 2013; Pancham 2017), which is a huge step towards developing communities, however; access alone cannot guarantee that a community will develop their E-skills enough to be able to use technology to be creative and innovative. Even university students who have access to ICT may not be sufficiently equipped (Ukwoma *et al.* 2016a). The digital divide that was originally caused when certain groups or societies were unable to gain access, is no longer exclusive to just access to ICT. As more attempts are being made to make ICT more accessible to the public, the digital divide now includes their E-skills (Blignaut and McDonald 2014). Previous attempts to develop E-skills have taken on various approaches, including training and developing the E-skills of teachers to encourage them to integrate ICT into their school curriculum. This type of training is very useful to communities, however, continuous training and consistent support for these teachers is costly, and therefore training is usually provided in short sessions. In addition, this type of integration will take a long time for all the teachers to be trained and then subsequently, the students in these respective schools can be trained by these teachers (Adegbenro, Mwakapenda and Olugbara 2012; Adegbenro and Gumbo 2014).

1.1.2 E-Learning

Like other industries, the education sector has also subscribed to innovations in ICT to improve teaching and learning. E-learning is the use of ICT to create learning experiences (Horton 2012), and the use of Learning Management Systems(LMSs) further facilitate the integration of ICT into teaching and learning. ICT has been empirically tested to advance education and E-learning through the use of various LMSs thereby gaining huge support in Universities across the world (Jadric *et al.* 2010; Koranteng 2012; Min, Yamin and Ishak 2012; Lahti, Hätönen and Välimäki 2014; Parliamentary-Monitoring-Group 2016). As stated in section 1.1.1, ICT provides continuously advancing capabilities and opportunity for innovation, but its users need the right skills to capitalise on those capabilities. In universities, those users include faculty members as well as students. Universities invest in training faculty members on the effective use of LMSs so that e-classrooms are well designed. The discussion in section 1.1.1 leads to an important question: Are the first year university students in a typical South African university sufficiently skilled to use E-learning tools effectively?

Most students may have had access to cell phones and smart devices, but there are still students at university level who find difficulty in using E-learning and other technologies for the purpose of learning and creating (Li and Ranieri 2010; Álvarez-Flores, Núñez-Gómez and Crespo 2017). The capabilities of smartphones have expanded significantly, but the size of the screen and its suitability for usage over long periods limit its users, consequently only basic E-skills may be developed using small devices, whilst the use of computers are suitable for developing advanced E-skills (Bornman 2016). Using ICT for knowledge development is a vital part of E-skills and the integration of ICT into any curriculum should be done with caution to prevent unfair challenges to any group of students who may lack in technological skills (Bharuthram and Kies 2013).

Whilst the integration of E-learning may pose challenges to under prepared students, it may be a decisive resource towards developing E-skills, if an instructor has the information needed to use E-learning to improve E-skills. Literature suggests that continuous usage of technology contributes to the development of E-skills on different levels (Youssef, Dahmani and Omrani 2015; Ukwoma *et al.* 2016a). Continued usage of learning technologies should positively influence E-skills development, however literature is fairly silent in providing empirical evidence to connect these two significant components of the modern information society in a useful way.

1.2 Problem statement

First year students at universities come from diverse socio economic backgrounds where some have grown up using technology and a few may never have even seen a smart phone (Littlejohn, Beetham and McGill 2012). E-learning adoption is ubiquitous at South African Universities and first year students are required to adjust to using ICT as a platform for learning in addition to the many other demands of higher education. This creates additional stress, particularly to previously disadvantaged students who have not been prepared for this environment. Universities need to address the issue of diverse E-skills and ensure that those students who are not yet equipped to handle technology in higher education receive support (Littlejohn, Beetham and McGill 2012; Yilmaz 2017).

Despite entering university with diverse E-skills, all graduates will eventually have to function in a work environment where ICT adoption and developments in the capabilities of ICT, particularly mobile devices, has effected a culture of connectivism (Siemens 2014). In the modern society, people rely heavily on the internet, email and social networks to communicate and share information in various forms for professional and social reasons. Now that LMSs have become popular in Universities across South Africa, students are required to visit E-learning classrooms and websites regularly to access courseware and complete online learning activities.

Several studies have contributed to informing the design of Learning Management Systems(LMS), as well as the design of learning experiences (Yueh and Hsu 2008; Min, Yamin and Ishak 2012; Kowalczyk and Copley 2013; Wang, Myers and Sundaram 2013). To benefit from the E-learning tools, students should have the necessary skills to be able to use them effectively. Studies that focus on E-learning adoption and success have shown evidence of the fact that an individual's ability to use technology is critical to E-learning success (Al-Adwan and Smedley 2013; Mac Callum and Jeffrey 2013).

Universities strive to develop graduates capable of meeting the demands of each distinct industry by utilising the latest technology to enhance teaching and learning methods. Currently, literature has not yet provided input that suggests how educators may address the diversity of E-skills of students in the classroom so that all students benefit from the use of E-learning sufficiently. There remains a further gap in literature on how E-learning can be used to develop E-skills and advance learners in a way that equips them with skills to build their own knowledge and function effectively in a networked environment. Associating the use of E-learning for the specific purpose of developing E-skills is a novel concept, therefore literature that suggests elements to connect these two is scarce and needs a detailed approach to discover these elements from the students themselves.

1.2.1 Aims and Objectives

The aim of this research is to create a design framework for E-learning that will promote the development of E-skills in order to address the variance in E-skills that new higher education students have.

The following research objectives will be addressed to meet this aim:

a) To determine the preparedness of students for higher education in terms of E-skills.
b) To break down E-skills into achievable levels and identify the most effective ways in which each level of E-skills may be developed.
c) To identify the elements of E-learning which contribute to the development of E-skills of students that have different E-skills levels prior to their enrolment in an E-learning course.
d) To assemble a framework for E-learning incorporating elements that can contribute to E-skills development.

1.2.2 Research Questions

RQ1 What are the diversities in first year Information Technology students' E-skills?

RQ2 What elements of E-learning are likely to contribute to developing the E-skills of students?

RQ3 What learning activities do students at different E-skills levels find useful for their E-skills development?

RQ4 How can E-skills development be advanced through E-learning?

1.3 Research Methodology

Literature provides information relating to the importance of E-skills for successful E-learning (Mabila, Gelderblom and Ssemugabi 2014; Ukwoma *et al.* 2016a; Yilmaz 2017) however is silent on the use of E-learning as an instrument to develop E-skills. Qualitative research allows for discovery of theories and constructs that are not well documented in order to develop a deeper understanding of a subject(Creswell 2014), as is the case with the relationship between E-learning and the development of E-skills.

The selected research design combined the benefits of the case study method to observe and collect data (Punch 2013), together with Straussian grounded theory methods to analyse

qualitative data effectively (Halaweh, Fidler and McRobb 2008; Feeler 2012). Participants in this study were first year students enrolled in a four year undergraduate ICT programme at a University of Technology, selected according to their E-skill level at the start of the course and grouped into a novice or experienced focus group according to their E-skills level at the time. Participants were interviewed together with others in the same respective focus group using semi-structured interviewing techniques to encourage participation and facilitate data collection.

Straussian-Grounded Theory methods of analysis complemented the case study (Halaweh, Fidler and McRobb 2008; Feeler 2012) to provide the structure needed to assess, evaluate and analyse the data through coding of themes, trends and relationships to arrive at emerging themes and categories grounded in the data that contribute towards the research questions.

1.4 Significance of this research study

This research will contribute to the body of knowledge that strives to understand the backgrounds of first year university students in order to support their journey in tertiary educational institutions and finally become valuable players in the economy. This research concentrates on the discovery of diversities in the E-skills of specifically first year students and ways in which to advance students' ability to capitalise on the benefits of using ICT to learn. Data gathered will inform the establishment of a framework for E-learning design that will contribute to the success of the key stakeholders in education. The research findings provide educators with an enlightened understanding of the ICT capabilities of their students that can be used to inform teaching methods. Educators need adequate support from the university to be able to support their students therefore this research provides evidence needed by University governance to verify the need for improved ICT infrastructure and resources to meet the needs of their student population.

A wide range of research has been conducted focussing on educators and LMSs, but there is still not enough knowledge available from the student perspective. This research uses the student perspective to construct the framework. The output framework is intended to

improve the support students need to develop their E-skills without feeling intimidated by their more affluent peers. Ultimately, when students learn how to harness the capabilities of ICT and improve their E-skills, they will be able to use the vast amount of information available through the use of ICT effectively and become life-long learners. The immense contribution a life-long learner has on the economy is invaluable. A life-long learner is able to learn independently and adapt to innovations which means that employers need to provide minimal training to this graduate in order to receive maximum gains for the economy.

1.5 Limitations

This research study is a longitudinal study of a focus group of first year Information Technology students at DUT. Whilst providing insight on how a typical student is affected by E-skills and E-learning, results may not be generalised to all first year students. The methods of data collection and data analysis contribute to improving the generalisability of the findings. Further, this investigation examined E-skills upon entry to university and the development thereof through their learning experiences at DUT. The results did not consider cultural backgrounds of individuals.

1.6 Structure of the dissertation

The dissertation is arranged into six chapters. Chapter one provides a holistic view of the background to the research and those issues that gave rise to the objectives that this research aims to meet. Chapter two then critically analyses previous contributions by various authors in the field of E-learning, student success and adoption. E-learning being the focal point of this study is discussed in length in terms of the requirements to be E-skilled and how these skills may be developed. Chapter three discusses the research design and the rationale behind selected research methods to gather data relating to student E-skills. Chapter three further discusses the grounded theory approach and its suitability as a method of data analysis within the present context to achieve the aim of this research. Chapter three also provides intensive

discussion of the theoretical underpinning for this research, the UTAUT framework, with the objective of laying the foundation for the theoretical lens this study uses to gather data and interpret results.

Chapter four will then present the evidence gathered using the methods described in chapter three, thereafter, in chapter five, an analysis of this data will be conducted in relation to the UTAUT theoretical framework and finally a discussion of the findings uncovered from the data. Chapter six will connect the evidence uncovered in chapter four together with the theoretical framework suggested in chapter two and three to suggest a working framework that may be adopted by educators in a University of Technology (UOT) to develop E-skills through the use of E-learning. Chapter six will also call attention to shortcomings in this research study together with recommendations for future research.

1.7 Chapter summary

Technology is constantly evolving and creates a need for skilled users to harness the full extent of its capabilities. The industries that make up the economy adopts these technologies and expects the workforce to adapt accordingly. University students who graduate and become part of this workforce need to be equipped to handle the demands but for some, the degree of development required between enrolment into first year and graduation is far greater than others.

Technology is prevalent in all sectors of university life starting from the university application phase, then registration, course completion and finally graduation. Further, technology adoption and usage in teaching and learning is constantly growing and evolving to maximise the learning experience making sure that students are always connected to the lecturer, courseware and the university itself. Whilst universities and educators strive to improve their teaching methods, it is as important to ensure that these new teaching methods do not hinder the progress of any group of students. First year students at university come from diverse technological backgrounds where some students spend most of their lives interacting with

and through technology whilst others may not have even used a smartphone. This dynamic exists within a single classroom and arises from the disadvantages of the past leaving some students stressed and very afraid to touch the computer and benefit from its uses.

Technology's purpose is to improve processes therefore technology can improve the learning experience and perpetuate knowledge gain for all students if the learning experience is carefully designed. This chapter has introduced the need to address the diverse E-skills that exist within a typical University of Technology classroom. The chapters that follow will articulate the theoretical grounding to develop such a framework using existing literature, present data from interactions with a focus group of students then discuss the findings from this focus group. These findings will form the basis for construction of a proposed framework for E-learning design that will provide guidelines to educators when creating learning experiences that require the use of technology. The same framework will consider the technological skills of all students within the group in a way that advances technological skills of students particularly those that have been previously disadvantaged. Such a framework has not yet been discovered in literature.

CHAPTER 2 - Literature Review

2.1 Introduction

ICT is ubiquitous, even pervasive (Bibri 2018; Goulden *et al.* 2018), in all aspects of modern life, including education, healthcare, social interactions, civil and of course business. The developments in ICT allow for creativity and innovation in these sectors, paving the way for increased productivity. To achieve increased productively and competitiveness, the workforce requires that employees be E-skilled; in fact, the more complex and elevated the job description, the greater the level of E-skills required (Álvarez-Flores, Núñez-Gómez and Crespo 2017; Chetty *et al.* 2017). To that end, graduates of universities need to be equipped to handle the demands of their intended profession using technology creatively and innovatively to solve problems. Shortfalls of graduates in terms of E-skills will reflect negatively on their ability to find employment and progress (Chetty *et al.* 2017; Fasasi and Heukelman 2017).

With all the technology available and increasing capabilities of the smart phone, we can be forgiven to assume that all students are digitally native. The reality is that there are great diversities that exist especially between first year students from different socio economic backgrounds (Youssef, Dahmani and Omrani 2015; Ng'ambi *et al.* 2016; Levy and Ramim 2017; Yilmaz 2017) . Some students have enjoyed the exposure to technology throughout their lives, whilst others have never used ICT at all, not even smart phones.

The challenge that exists in tertiary education is two-fold. Firstly, E-learning has been widely adopted and recognised to positively influence student success, but educators are overwhelmed by the array of tools available to them on an LMS and have to undergo additional training to properly integrate the technology into their curricula (Youssef, Dahmani and Omrani 2015). Secondly, the adoption of E-learning into a classroom of students with significantly diverse ICT capabilities, particularly first years, could possibly disadvantage groups of students who are not ready for it (Yilmaz 2017). Despite this initial diversity, tertiary institutions must, within 4 years, release graduates into the workforce that are employable and have an acceptable level of E-skills to gain employment and then function effectively

(Mata 2015; Chetty *et al.* 2017). The question of how academics must support the E-skills development of diverse students, whilst concurrently adopting E-learning for teaching and learning remains under researched in literature.

2.1.1 Terminology

A study of the literature reveal numerous terms to refer to the ICT related skills needed in society, global and local economies, educational institutions and the workplace. These terms will be analysed and the significance of E-skills discussed in terms of what it means to be E-skilled, the constituents of E-skills and their classification into skill levels to inform teaching and learning strategies directed at E-skills development in section 2.2. To provide an understanding of the impact that E-skills has in various sectors, the chapter critically analyses the role that ICT plays in modern society and the impact of ICT on local and global economies, followed by a look at the current state of ICT integration into society. The chapter will proceed to evaluate efforts made to integrate ICT into schools and the result of those efforts on the ability of the youth to use ICT prior to their arrival at university.

2.1.2 E-learning

There is already a significant body of knowledge available in the field of E-learning. E-learning and its definition has evolved over time and this chapter discusses this evolution in relation to the advancement of technology. Due to its obvious benefits to learning, the critical success factors of E-learning are evaluated against the elements of effective E-learning design. The chapter then converges the fields of E-learning and E-skills development to highlight the relationship between these two fields and the success of graduate students.

2.1.3 E-learning as a vehicle for developing E-skills

The idea that sparked the use of E-learning to develop E-skills, originated from implied relationships represented on the UTAUT - Unified Theory of Acceptance and Usage of Technology (Venkatesh, Thong and Xu 2016). The UTAUT forms the theoretical underpinning for this research and is introduced in this chapter and discussed in detail to highlight factors that may be significant to the development of E-skills through E-learning in Chapter 3. The chapter will then conclude by presenting key findings in literature to support the aims and objectives of this study.

2.2 A definition of E-skills

ICT literacy, digital competence, digital literacy, digital skills, e-skills, digital fluency and 21st century digital skills are all terms used in literature to describe an individual's proficiency in their use of ICT. Various authors have used these different terms with similar definitions. Ala-Mutka, cited by Guzmán-Simón, García-Jiménez and López-Cobo (2017) describe digital literacy as the technical ability to use the computer and internet. Considering the extent to which technology is integrated into all sectors of society, this definition seems incomplete. Literature that relates directly to ICT related skills, tend to favour a more holistic and updated definition for digital literacy and include an individual's ability to use digital tools to enrich their educational experience and capacitate them for society and life-long learning (Gorman 2015; Brabazon 2016; Ukwoma *et al.* 2016b). In some instances, the term "skills" indicate more technical abilities, whilst the term "competencies" refer to a deeper understanding of ICT (Ukwoma *et al.* 2016a). Aesert (2014), on the other hand, argues that the definition of ICT Skills has evolved concurrently with the evolution of technology: from being able to master how a computer works and what to click in the 1980s, to using computer applications as tools in the 1990s and thereafter moving towards generic or meta-skills in the 21st century (Goodhue and Thompson 1995).

The evolution of technology and its presence in all fields requires that people work, learn and interact using technology to access information in a way that is different from the past, implying that individuals need an updated set of skills to be able to thrive in this technology infused society. These skills have been grouped together as 21st century skills and include collaboration, communication, digital literacy, digital citizenship, problem solving, critical thinking, creativity and productivity (van Laar et al. 2017). Digital Fluency also encompasses the ability to acquire and reformulate knowledge in a way that is creative and innovative in order to generate information rather than just understand it (Wang, Myers and Sundaram 2013).

The term Digital Competence also represents "a set of knowledge, skills, attitudes, abilities, strategies, and awareness that are required when using ICT and digital media to perform tasks; solve problems; communicate; manage information; collaborate; create and share content; and build knowledge effectively, appropriately, critically, creatively, autonomously, flexibly, ethically, reflectively for work, leisure, participation, learning, socialising, consuming and empowerment " (Ferrari 2012). Digital competence, like other similar terms, refers not only to the ability to use ICT and application software, but elevates the ability of an individual to use ICT as a tool to be creative, innovative and connect with others for the purpose of creating and sharing knowledge and information (van Laar *et al.* 2017). Many attributes relating to ICT competencies are common to both 21st century skills as well as Digital Competence.

The term E-skills bears similarities to both Digital Competence and 21st century skills and is a concept used more commonly in South Africa and Europe. E-skills may be used to describe one's ability to use ICT within the context of a knowledge environment in order to participate creatively and innovatively in a world where ICT is an essential requirement for advancement in activities of government, civil society and business (Koranteng 2012; Adegbenro and Gumbo 2014; van Laar *et al.* 2017). Both Digital Competency and E-skills may be viewed as a collection of multi-levelled skills illustrated on Table 2-1.

Table 2-1. Levels of E-skills

Source	FIRST LEVEL SKILLS Technology operation	SECOND LEVEL SKILLS Fundamental Usage	THIRD LEVEL SKILLS Information Processing and knowledge sharing	FOURTH LEVEL SKILLS Strategic skills
Indicators of Digital Competence *(Ferrari, Punie and Redecker 2012)*	Technical competence	Effective use for work, study and life	Evaluate digital technologies critically	Motivation to participate in digital culture
Dimensions of Digital Literacy (Ng 2012)	Technical Dimension	Reproductive literacy	Social Emotional Dimension	Cognitive Dimension
	Technical and operational skills to use ICT for everyday activities	Navigate, find, synthesise data and construct knowledge	Use internet responsibly and safely to communicate, socialise, learn	Think critically in the search evaluation and creation of information.
E-skills classification van Dijk(2005) cited by Youssef, Dahmani and Omrani (2015)	Operational Skills	Formal Skills	Informational Skills	Strategic Skills
	Skills to operate digital media	Skills to handle structures of digital media	Skills to locate information in digital media	Skills to employ information obtained from digital media for personal and professional development
Proficiency levels of E-skills *(Binsfeld, Whalley and Pugalis 2016)*	Digital Literacy		ICT Practitioner Skills	E-business/E-leadership Skills-
	Effective use of application for work, leisure, learning and communication		For research, design, development	Skills for strategy and innovation (not ICT specific), and ability to use ICT to improve business and organizational processes
E-skills classification Scheerder, van Deursen and van Dijk (2017)	Operational Skills	Information Navigation Skills	Social Skills	Creative Skill
	Basic skills needed to use a computer or internet	Ability to find, select, evaluate resources of information	Ability to use online communication and interactions to understand and exchange ideas	Create different types of quality content to publish or share with others on the internet.

This research seeks to understand South African students' experiences with technology in order to support the development of the ICT skills they need to use ICT effectively and contribute to the economy. The development of E-skills enables the development of life-long learning which is a basic requirement to compete in the workforce (Francisco and Torrent-Sellens 2014; Chetty *et al.* 2017). South Africa has made huge investments in the way of resources, infrastructure, policies and research in the name of E-skills (DHET 2014). Since E-

skills bears similarities to other terms related to the effective usage of ICT mentioned in this section, like digital competence (Ferrari, Punie and Redecker 2012); digital fluency (Wang, Myers and Sundaram 2013); digital literacy (Aesaert *et al.* 2014; Gorman 2015; Brabazon 2016; Ukwoma *et al.* 2016a) and 21st century skills (van Laar *et al.* 2017), the term E-skills will be used henceforth in this research to refer to an individual's competence in the effective use of ICT for the purpose of work, innovation, learning and leisure.

2.2.1 Significance E-skills for E-inclusion

Due to the nature of ICT, namely its flexibility and benefits, most recent and current innovations are based on digital technologies resulting in greater success for those countries and societies that are able to embrace the power of ICT (Baller, Dutta and Lanvin 2016). As more countries and communities join this digital society, they are propelled forward leaving those who cannot access or utilise digital technologies effectively further and further behind. These diversities in the capability of individuals, societies and countries to benefit from ICT creates divisions in the digital world. When individuals are prevented from developing their E-skills or benefitting from ICT due to circumstances beyond their control, a digital divide exists. More especially the digital divide refers to the distance between those who are able to benefit from ICT and those who are prevented from doing so for various reasons (Ramos, Mahou-Lago and Bouzas-Lorenzo 2017).

E-inclusion and digital divide are contrasting phenomena. E-Inclusion refers to the effective participation of individuals and communities in all dimensions of the knowledge society and the economy with ICT (Yu *et al.* 2016) and understanding and preventing digital divides moves communities towards achieving E-inclusion. The nature of the digital divide has evolved over the years and first resulted from the arrival of computers decades ago. The total immersion of ICT into all factions of social and economic societies that followed just perpetuated the digital divides. Digital divide originally referred to diversity in access to technology between societies, countries or socio-economic groups (Brown and Czerniewicz 2010; Czerniewicz and

Brown 2010b, 2013b). As more and more efforts are being made to minimise the problem of access to ICT, the modern day digital divide is more than just access and includes diversities in skills such as E-skills or the capability of individuals to make effective use of technology (Bach, Shaffer and Wolfson 2013; Blignaut and McDonald 2014; Bornman 2016; Tsetsi and Rains 2017).

Despite interventions towards providing access to ICT, especially in rural sectors of South Africa, the digital divide persists and unfair diversities widen the gap between E-inclusion and digital divide (Council on Higher Education 2014; Nzimande B 2014; Parliamentary-Monitoring-Group 2016; Yu *et al.* 2016). ICT integration is a slow process with some communities still needing to acquire supporting infrastructure like electricity and security before technology access (Parliamentary-Monitoring-Group 2016). For this reason there is a small but consistent number of students who arrive at universities each year having no access or previous experience with ICT or insufficient skill to use ICT (Ng'ambi *et al.* 2016). To have access to technology means that you have possession of technology (Yu *et al.* 2016) but does not necessarily guarantee E-inclusion. Even if rural societies have access to technology through schools and libraries that were provided through government initiatives, they still may not be able to use it effectively (Tarus, Gichoya and Muumbo 2015). Universities may not be able to solve the problem of access and integration of ICT to the general public however they can address the E-skills deficit of their students.

2.2.2 Level classification of E-skills

E-skills refers to an array of technology related knowledge and skills ranging in complexity and both knowledge and skill development are cumulative in nature such that higher-level skills are built upon lower level skills (Glaser and Strauss 1967). The era of connectivism that comes with ICT requires individuals to be able to communicate using different media (Ukwoma *et al.* 2016a), collaborate effectively across cultural and institutional borders (Singh 2012), combine

sources and information to argue a point (Brabazon 2016) and contribute to online environments and knowledge societies through creative expression and self-presentation (Gorman 2015; Ukwoma *et al.* 2016a).

Although Binsfeld, Whalley and Pugalis (2016) focussed on IT skills for specialist IT staff, like programmers, that are required in the workforce, they make a valuable connection between the digital competence and E-skills that general users need in the workforce. Ferrari, Punie and Redecker (2012), as mentioned in section 2.2, presents the Digital Competence Framework to guide the development of ICT skills. These skills may be categorised into four proficiency levels.

Table 2-1 summarises attempts made by different authors to classify E-skills into specific levels. The subsequent comparison between Digital competence and E-skills shows that Digital competence is notably similar to E-skills, with nearly all levels of Digital competence corresponding to respective levels of E-skills. Binsfeld, Whalley and Pugalis (2016) propose three levels of E-skills proficiency, whilst Ng (2012), Youssef, Dahmani and Omrani (2015) and Scheerder, van Deursen and van Dijk (2017) use four levels to classify E-skills. . Although the names of each E-skills level differs amongst authors, the indicators of competency at each level is similar. E-skills relate to knowledge and skill development therefore all the authors present their competency levels as incremental development from very technical skills to cognitive skills. Sections 2.2.2.1 through to 2.2.2.4 summarise the competencies required by an individual to be E-skilled as presented in literature into distinct levels that are suitably named for the purpose of referencing each level and its associated competencies in the remaining sections of this document.

2.2.2.1 LEVEL 1: Technology Operation Skills

Technology Operation Skills includes an individual's ability to operate the hardware and software related to the technology.

This first level of E-skills covers an individual's basic ability to operate ICT. Youssef, Dahmani and Omrani (2015) and Scheerder, van Deursen and van Dijk (2017) classify this level as operational skills, which users need to operate a device. To achieve competence in this level, an individual should have an understanding of how to operate the hardware (device) and the software related to the task to be completed. Ferrari, Punie and Redecker (2012) and Ng (2012) describe these skills as Technical Competence and the Technical Dimension respectively, however their description of competences related to this level also covers an individual's technical ability to operate a computer. Binsfeld, Whalley and Pugalis (2016) describe the first level skills as Digital literacy and includes competency to use technology for work, leisure, learning and communication in addition to operational skills. Digital Literacy shares competencies included in the first and second level of E-skills and also shares similarities to the level of Digital competence in the DigEULit, Digital European Literacy framework, described by Mata (2015).

2.2.2.2 LEVEL 2: Fundamental E-skills

Fundamental E-skills includes the individual's ability to use ICT to search for, evaluate and use information to effectively complete tasks related to work, study and everyday life.

The second level of E-skills covers competencies needed to use ICT for a specific purpose, for example finding information needed to complete a task, which the DigEULit calls *Digital Usage* (Mata 2015). Scheerder, van Deursen and van Dijk (2017), Ferrari, Punie and Redecker (2012) and Ng (2012) position competencies related to navigating digital media for information, evaluating the information and using it to construct knowledge to this level. Youssef, Dahmani and Omrani (2015) on the other hand describe this level as Formal skills needed to handle structures of digital media including only fundamental usage skills at this level, leaving information navigation, evaluation and knowledge construction to the third level of E-skills. The first two levels of E-skills are coherent with the requirements to achieve digital literacy. Youssef, Dahmani and Omrani (2015) description of E-skills levels is derived from the works of van Dyk (2005), therefore the competencies he pegs at level two is consistent with earlier definitions of digital literacy. Earlier definitions were limited to the operation of computers and the ability to use productivity software, because that was all that

was needed to complete day-to-day tasks at the workplace. The transformation of the economy inspired by the internet and digital technologies demand more from employees in terms of Digital literacy (Ferrari, Punie and Redecker 2012). Being able to access, navigate, and use information available on the internet have become fundamental skills for knowledge workers. For this reason, finding information, evaluating it and using it to construct knowledge should be included in the second level.

2.2.2.3 LEVEL 3: Information Analysis and knowledge Sharing Skills

Information Analysis and knowledge Sharing Skills, include the individual's ability to use technology to critically analyse information resources available for its authenticity and relevance; collaborate with others through digital media with the goal of building and sharing knowledge, and use knowledge to improve processes.

This third level of E-skills leans towards collaboration. Ng (2012); Scheerder, van Deursen and van Dijk (2017) require that individuals at this level be competent with interacting with others on a digital platform using their social skills to exchange ideas and solve problems through safe and responsible collaboration. This level of E-skills includes the individuals processing of information but leans more towards cognitive abilities than Level 2 E-skills, which are more operational abilities. Level 2 skills searched and evaluated the information for its suitability to the task whilst Level 3 requires that the user critically analyse the information, debate and discuss the information in order to create meaningful knowledge and use the information creatively. Binsfeld, Whalley and Pugalis (2016) aptly presents these as skills needed to research, design and develop solutions.

2.2.2.4 LEVEL 4: Strategic E-skills

Strategic E-skills, refers to the individual's ability to use knowledge and technology to make strategic decisions and innovative contributions that may affect his self-development, or that of his community or business.

The fourth level of Digital Competence relates to an individuals' motivation to participate in Digital culture (Ferrari, Punie and Redecker 2012) which resembles Binsfeld, Whalley and Pugalis (2016) strategic skills at the fourth level of E-skills where individuals use digital culture for innovation and improvement of business processes. The DigEULit framework aptly calls this the level of Digital Transformation because of the creative and innovative ways professionals at this level use technology(Mata 2015). This final level of strategic E-skills is reached when an individual is able to construct new knowledge from different sources, debate and discuss this new knowledge with others and present this knowledge creatively and innovatively using technology. This level of skill requires strategic use of ICT placing the individual in a position that enables him to think critically and innovatively as he creates quality content, new approaches to solve problems that may be shared with others in his organisational, social or knowledge community (Ng 2012; Youssef, Dahmani and Omrani 2015; Scheerder, van Deursen and van Dijk 2017). Both Level 3 and 4 requires more cognitive application of digital technologies that shift the individual away from just functioning in their position towards participating and contributing towards knowledge development. Moreover, individuals having higher levels of E-skills are no longer dependent on assistance from others for operation and usage of technology. They are able to use the technology independently but collaborate with others on cognitive matters moving towards innovation and entrepreneurial skills needed in knowledge intensive jobs (Bilbao-Osorio, Dutta and Lanvin 2013; Baller, Dutta and Lanvin 2016).

2.2.3 Developing E-skills

Arguably, students who spend so much time on their mobile phones, social media and the internet should have already developed some E-skills, but the classification levels of E-skills (Table 2-1) illustrates that E-skills are so much more than just surfing the internet and being able to use ICT for social and entertainment purposes. Most people today can search for information and reword it, but E-skills is about finding, evaluating, applying and combining sources of information to find solutions to problems through debate and discussions and to contribute actively to a Knowledge Society (Littlejohn, Beetham and McGill 2012; Gorman 2015; Brabazon 2016; Ukwoma *et al.* 2016a). A Knowledge Society describes a modern

society in which the creation, utilisation and dissemination of information and knowledge has become an extremely important factor of production. Mobile phones, despite their popularity even among low socio-economic groups, have only a limited impact on E-skills development due to their screen size, processing power and flexibility to handle high end applications (Bornman 2016; Bartikowski *et al.* 2018). Since the diversity of first students is unmistakable, tertiary institutions must find a way to bridge the E-skills gap for their students whilst balancing the diversity in skills to promote life-long independent learning in all students.

The different levels of E-skills to be developed require different approaches to develop each. Considering the limited amount of time that is allocated in most curriculums to a single module like Computer Skills, academics struggle to develop the basic computer operational skills, specifically in those students with limited or no previous digitally related skills (Scheerder, van Deursen and van Dijk 2017). Computer Skills and similar training initiatives are effective in developing first and second level E-skills (Youssef, Dahmani and Omrani 2015). Students must still develop E-skills to a level where they are able to successfully navigate information, collaborate effectively and use ICT to be creative and innovative with others on digital platforms (Várallyai and Herdon 2013). These advanced E-skills may be acquired through continued development in different contexts, allowing students the opportunity to appreciate the usefulness and relevance of ICT in all their courses, as opposed to a once off module like Computer Skills (Littlejohn, Beetham and McGill 2012).

An effective learning design can place the more skilled student in support and mentoring roles for their peers. Wang, Myers and Sundaram (2013) posits that having more skilled classmates can promote interest in other students, whilst Smyth *et al.* (2012) suggest that students may even prefer collaborating with their peers rather than their instructor. Sykes (2015) suggests the use of higher skilled users as “power users” to capitalise on their expertise. Teachers need to facilitate the learning process so that a healthy productive learning environment exists, to provide the best opportunities for knowledge sharing between “power users” and their peers. The flexibility that E-learning provides, allows for different paths to achieve a course outcome.

Feeler (2012) maintains that although students may be diverse in their skill and knowledge, the instructor's presence is equally important to all students. The role of the instructor however, varies according to students' skill. His study of experienced online students in Texas that were enrolled for a full online course, found that less experienced students need more face-to-face contact whilst more experienced students simply needed assurance that the instructor was available to provide assistance but, were content with even an online presence of the instructor.

Strategic E-skills are developed through experience, support and collaboration. Youssef, Dahmani and Omrani (2015) maintain that learning by using technology affects the development of cognitive, social and strategic E-skills. These findings are in agreement with the conceptual model of digital fluency (Figure 2-1) proposed by Wang, Myers and Sundaram (2013), which suggests that the use of technology influences the development of digital fluency and that the development of digital fluency subsequently encourages the use of technology. Digital fluency, as discussed in section 2.2, refers to a similar set of ICT related skills as E-skills. Continuous usage of technology and involvement with technology affects the development of all levels of E-skills (Youssef, Dahmani and Omrani 2015; Ukwoma *et al.* 2016a). A closer look at the attributes of technology that influence continued usage can provide clarity on how the outcome of E-skills development can be promoted through continued use of E-learning.

Understanding what contributes to continued usage, together with outcomes of specific types of usage, gives an informed view of how continued use of E-learning may be utilized to improve the specific E-skills of users, so that appropriate measures can be adopted into E-learning design. The conceptual model of digital fluency, Figure-1, is an extension of the Unified Theory of Acceptance and Usage of Technology (UTAUT). This model forms the theoretical framework for understanding adoption of technology, usage and the outcomes of adoption and usage (Venkatesh *et al.* 2003; Venkatesh, Thong and Xu 2012, 2016).

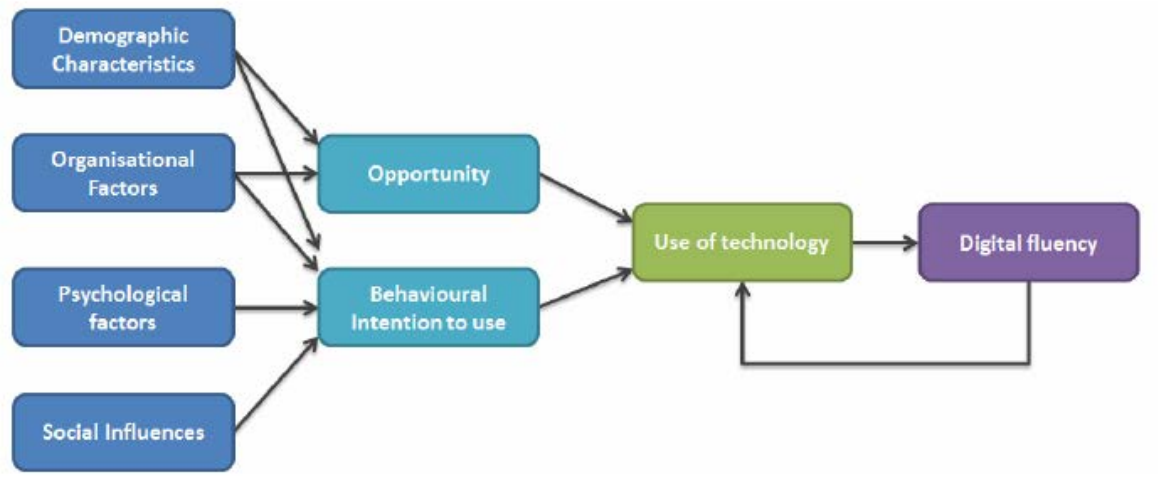

Figure 2-1. Conceptual model of digital fluency(Wang, Myers and Sundaram 2013)

2.3 ICT integration into the Economy

South Africa has invested tremendous resources into the development of infrastructure and access to technology in addition to training of communities (KZN Department of Education 2016; Parliamentary-Monitoring-Group 2016; Fasasi and Heukelman 2017). These investments have significantly helped improve international standings, as shown on Table 2-2, which depicts South Africa's standings on the Network Readiness Index (NRI) in 2012 compared to 2016. The NRI measures a country's ability to benefit from the opportunities provided by ICT. South Africa's status on the NRI in 2016 showed an improvement by 7 places over the past 4 to 5 years (Acs, de Groot and Nijkamp 2013; Bilbao-Osorio, Dutta and Lanvin 2013; Baller, Dutta and Lanvin 2016). More people now own computers and even more own mobile phones. As shown in Table 2.2, more businesses are connected across South Africa and to the world, automating their business processes and capitalising on the benefits of being able to market their business and services globally using ICT.

What is most significant to this study is that, as shown in Table 2.2, although the business sector has improved and the number of individuals using the internet has increased by 36.7% over the past 5 years, the number of people employed in knowledge intensive jobs has only increased by 1.1%. The Knowledge Economy is continually changing and evolving and digital technology is the fastest way to develop knowledge to keep up with knowledge development

worldwide (van Laar *et al.* 2017). E-skills, therefore are critical to establish an organisation or country's competitive and innovative capability towards achieving international competitiveness (Bilbao-Osorio, Dutta and Lanvin 2013; Cheah *et al.* 2014; Baller, Dutta and Lanvin 2016; Chetty *et al.* 2017).

Knowledge intensive jobs are positions such as professional, technical and related workers, administrative, managerial, clerical workers, legislators, senior officials, professionals, technicians and associate professionals, whose job function is dependent on searching for and using information effectively (Bilbao-Osorio, Dutta and Lanvin 2013). ICT creates ideal conditions within these professions to improve productivity, communication, access to information for self-development and more importantly provides opportunities for entrepreneurial discovery, the pursuit of opportunity and innovation (Acs, de Groot and Nijkamp 2013).

The type of employment in the knowledge sector is proportionate to the E-skills level required of an individual (Mutula and Van Brakel 2007; Mata 2015; Chetty *et al.* 2017). Entry-level jobs include mainly routine tasks that require digital literacy skills and basic knowledge of hardware, software and information processing whist intermediate jobs include non-routine tasks where employees evaluate and negotiate meaningful information and determine what is applicable or necessary for a task. Top-level employment is predominantly non-routine and requires creative use of technology to produce innovative solutions (Chetty *et al.* 2017). Of course, remuneration is also proportionate to level of employment therefore E-skills development is critical to both initial employment as well as the professional development of knowledge workers (Pouliakas 2016). This also means that without skill development individuals are bound to their current socio-economic status.

The South African Government's National E-skills Plan of Action drives the process of integrating ICT into key sectors of South Africa's economy (Republic of South Africa: Department of Communication 2012), but SA still has a long way to go. Greater efforts are needed to develop individuals into knowledge workers with adequate E-skills.

Mata (2015) suggests that the E-skills shortage may be addressed by developing the youth using the stepwise progression of the E-skills ladder. The E-skills ladder maps E-skills

development into levels of competency from basic literacy to innovative use of technology, as discussed in section 2.2.1, as required in knowledge intensive posts. Improving E-skills across the levels improves the individual's chance of finding work by enabling him to find employment on a digital platform, work effectively using technology, use technology for self-development and improve his level of employment.

Table 2-2 Comparing South Arica's development on the Network Readiness Index

Network Readiness Index Indicator	**2012 (Bilbao-Osorio, Dutta and Lanvin 2013)**		**2016 (Baller, Dutta and Lanvin 2016)**		**Differences + (climb) -(drop)**	
	ranking/142 countries	**Score**	**ranking/139 countries**	**Score**	**Ranking**	**Score**
Overall NRI Ranking	72	3,87	65	4,2	+7	+0.33
Usage						
Business Usage Score	34	4,01	32	4,2	+2	+0.19
Individual Usage Score	96	2,57	77	3,9	+19	1.33
Government usage score	89	3,55	105	3,3	-16	-0.25
% workforce employed in knowledge intensive activities	58	23,70%	57	24,80%	+1	+0.011
Internet usage in schools for learning	100	3,4	119	3,2	-19	-0.2
Percentage users using the internet	108	12,3	79	49	+29	+36,7
Readiness						
Infrastructure	82	3,6	44	4,9	+38	+1,3
Affordability	94	4,6	74	5,2	+20	+0,6
Skills	101	4,3	95	4,4	+6	+0,1
Quality of education system	133	2,3	137	2,2	-4	-0,1
Quality Maths and Science Education	138	2,1	139	2	-1	-0,1
Percentage households with personal computer	88	18	90	28,1	-2	+10,1

2.4 ICT integration into schools

Although the South African government had intended to integrate ICT into rural communities and schools to improve the quality of education, evidence shows that when compared globally, education in SA has actually deteriorated from 2012 to 2016, to the extent that SA is now ranked last on the Network Readiness Index (NRI) for Mathematics and Science Education (Bilbao-Osorio, Dutta and Lanvin 2013; Baller, Dutta and Lanvin 2016). The lack of ICT needed to make a positive impact in these sectors may be attributed to the fact that most Mathematics and Science resources are available in English, whereas the students in rural communities, especially, are second language speakers (Council on Higher Education 2014). It may also be that ICT integration into their schools has not been successful, due to a lack of security, funding or infrastructure (Parliamentary-Monitoring-Group 2016). Padayachee (2017) posits that the highest ranked barriers to E-learning in South African schools is still the lack of infrastructure and cost of both equipment and data.

Recent findings from Krauss, Simuja and Conger (2015) show that teachers' workloads were a huge barrier to teaching with technology in the classroom. Padayachee (2017) found that although teachers were able to use ICT for their own needs, they were not sufficiently skilled to integrate ICT into their classrooms and furthermore had insufficient time to learn how to and prepare technology enhanced lessons. Koranteng (2012) established that teachers were not skilled to integrate ICT into their classrooms, because training courses for teachers were mainly directed at developing the teachers Technology Operation and Fundamental E-skills levels, whilst teaching with technology is far more complex, requiring that teachers effectively align technology integration with pedagogical approaches to optimise learning. To achieve this, teachers need to develop their TPACK-Technological Pedagogical and Content Knowledge (Adegbenro and Gumbo 2014).

The diversity that exists in a typical university first year classroom clearly stems from the various levels of ICT integration achieved at schools. Depending on the school the student came from, their E-skills level will vary from student to student. Clearly, South African government still has much work to do towards completing ICT integration into previously

disadvantaged schools throughout the country and achieving E-Inclusion. Until that is resolved, the diversities in E-skills of new first year university students will continue to exist.

2.5 ICT in Higher education

Since the transformation in the school sector will take time, universities needs to mitigate the skill diversity by providing support particularly to students who arrive at university each year with no E-skills or low level E-skills as a result of the digital divide (Ng'ambi *et al.* 2016). From a university perspective, any student despite their E-skills level upon entry into first year, will graduate into the same work environment as their peers, a work environment that is digitally dependant and constantly evolving due to innovation (Fasasi and Heukelman 2017). All students need to develop their skills towards self-mediated learning and developing the necessary skill to harness the capability of ICT in order to constantly improve their knowledge and fill the gaps that exist in knowledge intensive positions.

First year students are challenged with a brand new lifestyle at university, which is typically urbanised and fully integrated with technology. Technology aside, students are already having to adapt to being away from their homes, diverse cultures, language barriers and self-directed learning(Collins and van Breda 2014). These challenges can leave first years feeling inadequate, unprepared, lost and frightened. The countrywide adoption of E-learning in universities causes further anxiety among those students who have not used a computer previously and even those who don't really know how to use a computer for the purpose of learning (Koranteng 2012).

2.6 E-learning

To begin with, it must be established that E-learning does not exclusively mean distance education (Gros and García-Peñalvo 2016). Learning that is optimized through the use of the internet, Learning Management Systems (LMSs) and related digital technologies, is called E-learning and has become increasingly popular, especially over the last decade due to innovations in technology and the benefits that technology can bring to teaching and learning (Bhuasiri et al. 2012). Technology and the internet provide educators as well as students with

flexibility, richness of materials, resource sharing, access to large amounts of content and opportunities for interactive learning beyond the classroom (Habeeb Omer 2014; Mohammadyari and Singh 2015; Zamfir 2015). E-learning has been adopted to enhance teaching and learning from primary school through to matric and thereafter in tertiary institutions. Tertiary institutions across the globe have embraced E-learning for their benefits for both the teaching and the learning process and has been topic of interest to researchers for many decades. The concept of E-learning together with the way E-learning activities and e-classrooms are designed has evolved concurrently with advancements made in ICT.

2.6.1 Defining E-learning through its Evolution

E-learning has been around for many decades. In the early 1990s, E-learning meant learning that was delivered online with no face-to-face interaction with the instructor. Earlier attempts of technology-enhanced learning simply focussed on providing course material in electronic format (Gros and García-Peñalvo 2016). Since the evolution of the internet and the accessibility of the internet through various hardware and software technologies, E-learning has advanced with it. The focus of E-learning has moved from wrote learning course materials and getting a good grade towards gaining a meaningful understanding of the subject content, the discipline and being creative and innovative so that new solutions can be created to solve problems.

LMSs have since provided instructors with the capability to place entire classrooms on the internet through technology. An LMS is an information system that provides a platform for creating and delivering instructional content, tracking student progress individually or as a group, assessing student learning and in general managing all aspects of teaching and learning (Min, Yamin and Ishak 2012; GonÇAlves, Fdez-Riverola and Rodrigues 2013). Despite the benefits of LMS for course management, their communication features are more rigid and need to be supplemented by other technologies and Debattista (2018) even suggests trends towards crossbreeding social networking sites and E-learning. The very nature of the internet is about connectivity and popular applications are centred on social networking, group

interviews and generally staying in touch. The user created groups, alerts, sharing capabilities and instant communication of social networking force E-learning software designers towards rethinking the emphasis LMS currently place on communication as well as the way they handle communication. Where an LMS lacks in capability, an instructor is able to supplement the LMS with other available technologies. It is clear that an LMS alone does not define E-learning and E-learning is not an LMS.

The availability and capability of ICT has also seen a change in the users of ICT and E-learning. Many decades ago E-learning was used by self-motivated, self-directed educated adults whereas modern trends use E-learning to educate learners from a very young age (Gros and García-Peñalvo 2016). The design of the online classroom and courseware therefore needs to be appropriate for its learners.

Clark and Mayer (2011) defines E-learning as "*instruction delivered on a digital device such as a computer or mobile device that is intended to support learning"*. The significance of connectivity in E-learning is evident in the definition afforded by Navimipour and Zareie (2015) who describes E-learning as the use of the Internet and multimedia technologies to advance the quality of learning. E-learning does not exclusively refer to full online courses, however some research that is focused directly on full online courses may choose to define E-learning as such within the context of their research (Gros and García-Peñalvo 2016). Since this study speaks to E-learning in general with a focus on designing effective E-learning to develop E-skills of students in tertiary institutions, this study will adopt the definition provided by Clark and Mayer (2011).

2.6.2 E-learning adoption

Adoption of technology to advance learning, or e-learning is not simply about using technology as a tool to transmit knowledge using the old teacher centred learning approach (Duisterwinkel, van der Aalst and den Brok 2014) therefore using an LMS to simply make content accessible in and out of the classroom severely underutilises the capabilities of technologies such as an LMS. Some of the most commonly used LMSs like Blackboard and Moodle typically broadens the focus of teaching and learning extending communication

between educators and students beyond the constraints of the classroom and designated lesson times through the use of the internet (Mohammadyari and Singh 2015; Navimipour and Zareie 2015). The LMS does not replace the teacher, in fact the teacher becomes more valuable for his expertise in designing effective online classrooms to achieve deeper learning (Ruhl 2016).

Given the advancement in technology and the requirements of individuals to function in a digital society, teaching and learning pedagogies have moved away from content and teacher centred to learner centred designs (Gros and García-Peñalvo 2016). The type of skills that students need to develop in a knowledge society now focus on life-long learning, independent learning, collaborative learning and E-skills more than content. It is the teacher's task to design e-classrooms and learning activities and pedagogy that match the correct technology with course outcome and student capability to improve teaching and learning. For this to be successful, careful consideration must be given to the student's capabilities, culture and access to technology; the teacher's role and expertise (Adegbenro and Gumbo 2014), the technology available and the best design to bring these building blocks of E-learning together into a successful e-classroom. Learning outcomes, pedagogy, technology and student are critical to E-learning design and have been summarised into Figure 2-2.

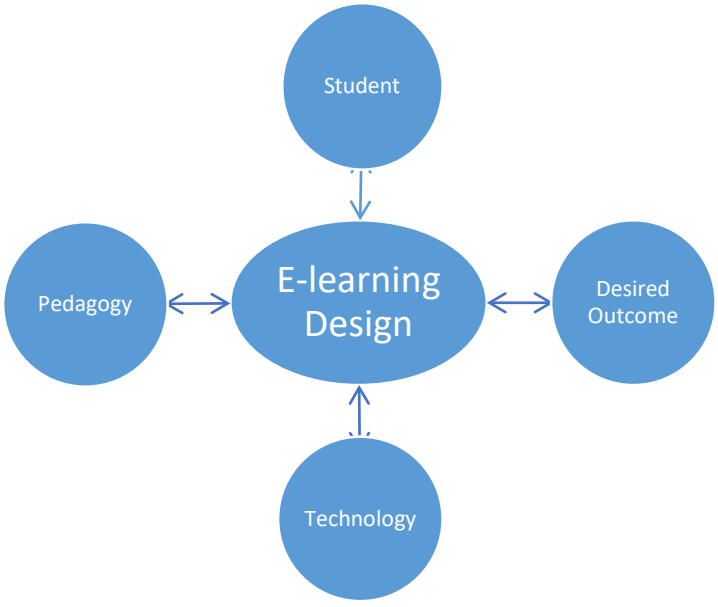

Figure 2-2 Building blocks of E-learning Design (author's own work)

2.6.3 Aligning the E-learning approach with the building blocks of E-learning design

Multiple approaches exist for technology enhanced classroom design. The exclusively online learning approach consists of students enrolled in an e-classroom, where the only means of contact between his peers and the teacher is through the e-classroom or through digital media such as email (Feeler 2012). The level of independent technology-driven learning for this approach is furthermore, best suited to a student that has already developed sufficient skills to work independently, has developed his E-skills to a level at which he is able to learn new technologies easily without much intervention from his teacher and has access to internet as well as the computing equipment(Yilmaz 2017). On the other hand, first year students, with diverse skills and socio-economic backgrounds, require more assistance, training and contact time with a teacher, therefore a completely online approach is not ideal for first year students (Thai, De Wever and Valcke 2017).

The flipped classroom approach combines contact time with technology enhanced learning activities. This approach requires that students go through the online lecture and course materials prior to the contact lecture to allow for greater discussion in the classroom. For this approach to be successful, students must be able to access the technology at home and at school (Youssef, Dahmani and Omrani 2015). Furthermore, the student must have developed a level of E-skills to be able to access the material online without the teachers help before attending or he will be lost during the actual discussion (Wastiau *et al.* 2013). If the students are not skilled and the technology is not available to some, this approach is likely to fail. Success in E-learning requires careful consideration of critical factors

Blended learning is yet another pedagogical approach to learning in the digital age (Bidarra and Rusman 2017). Like Flipped classrooms, the approach combines face to face teaching and learning activities with technology enhanced teaching and learning activities, however, this approach does not force students be able to use technology on their own prior to class discussions (Duisterwinkel, van der Aalst and den Brok 2014; Thai, De Wever and Valcke 2017). Blended learning provides more support to students than Flipped classrooms and

exclusively online classrooms, providing greater flexibility and student-centeredness to address diversities in the student population (Becker *et al.* 2017). Face-to-face activities and online activities in this approach support each other where this approach affords the students the chance to become familiar with the coursework and technology in the classroom and supplement their learning with additional technology enhanced activities directed towards improving their learning and overcoming their challenges (Duisterwinkel, van der Aalst and den Brok 2014; Mirriahi, Alonzo and Fox 2015; Bidarra and Rusman 2017).

2.6.4 E-learning Success

Successful E-learning is dependent on the selection of pedagogies that will be effective in achieving the course outcome, the selection of technology that is available and suitable for the enrolled students and the selection of technology that will be effective in implementing the selected pedagogy (Debattista 2018). Pedagogical approaches may be further broken down into specific learning or instructional strategies like Blended learning and Flipped classrooms which were described in 2.6.3, distributed E-learning or knowledge building communities (Gros and García-Peñalvo 2016). A useful technological tool to enable the selected instructional strategy must consider the capabilities of the students to learn independently as well as their access to the required technology (Aparicio, Bacao and Oliveira 2016).

The findings of a study conducted by Yilmaz (2017) in a survey of undergraduate students in Turkey indicate that student readiness for E-learning has a significant impact on their motivation to use E-learning and their satisfaction from the use of ICT, which in turn impacts on their performance. These findings are consistent with the results of a quantitative study of first year Information technology students in Croatia, by Jadric *et al.* (2010) who found that student computer and internet self-efficacy had a statistically significant impact on student performance. Other factors from the student's perspective, that Jadric *et al.* (2010) found to influence student success in technology enhanced learning environments was the student's time management skills, academic skills and learning skills. Students were also found to be

successful when the courseware was clear, structured and easy to navigate by the student (Ter and Herrington 2014; Tiyar and Khoshsima 2015).

Nonetheless, even perfectly designed courseware would be rendered useless if it is not accessible. The results of a survey conducted with head teachers, teacher and students from 27 countries in Europe by Wastiau *et al.* (2013) also indicate that students and teachers were more confident and motivated to use ICT when they had access both in school and at home. Access to technology is a factor that requires significant consideration from instructors in developing countries like South Africa where ICT availability in schools and homes especially is relatively low (Koranteng 2012).

Creating the perfect balance between these aspects of each E-learning activity requires a trained and competent instructor (Adegbenro, Mwakapenda and Olugbara 2012; Adegbenro and Gumbo 2014). Wastiau *et al.* (2013), found that teachers who are confident in their own ability to use ICT and confident in the impact ICT has on teaching and learning incorporate ICT into learning activities more often. These teachers were additionally able to provide support to students to enable students to complete course related activities (Adamu 2017). Feeler (2012) study of community college students in Texas proved that instructor presence and support even in a completely online class is considered by students to be critical for their success.

Literature provides many views on factors contributing to E-learning success. More recent studies like that of Al-Fraihat, Joy and Sinclair (2017) posit the following E-learning success factors:

- Planning
- E-readiness of staff, student and environment
- Management and organisational factors
- Support in the form of online support, supportive resources, pedagogical and technological support, responsive support to learners
- Pedagogical factors that bring together learner, instructor, content and course goals
- Technological factors such as reliability, availability and appropriateness of selected technology

Factors such as planning and E-readiness emphasise the need to train staff so that they are empowered to make informed decision regarding pedagogy and technology to promote learning. The contributions of Adegbenro and Gumbo (2014), Chai *et al.* (2014); Koh, Chai and Tsai (2014); Rosenberg and Koehler (2015); Cheung *et al.* (2016) also confirm the importance of building teacher competence to teach using technology. Part of these competencies require that teachers be able to consider the students ICT competencies needed to complete the activities successfully.

From a student's perspective, critical success factors for E-learning have been consistently evidenced in literature to include the student's own perception of technical competence, which bears similarities to E-skills; student's prior experience with technology, and perceived ease of use of the technology (Jadric *et al.* 2010; Littlejohn, Beetham and McGill 2012; Becker, Newton and Sawang 2013; McKeown and Anderson 2016; Yilmaz 2017). Students ICT competencies directly affect their perception of the degree of complexity of technology. Task complexity consequently reduces satisfaction with E-learning and may affect continued use (Fleming, Becker and Newton 2017). Navimipour and Zareie (2015) further found that when employees of a Telecommunication company in east Azerbaijan, were reluctant to use the technology because of their inability to do so, they also experience increased anxiety that negatively influences satisfaction and E-learning success. Al-Samarraie *et al.* (2017b) confirms the significance of usage satisfaction with E-learning success, but provides a different perspective by including instructor satisfaction. Both instructors and students are satisfied when the E-learning experience offers high quality information that is relevant and structured; where the selected technology fits the task; the technology is available and dependable; the lesson is useful and will contribute to the student's performance in the course; has a high utility value meaning that it is helpful or necessary to achieve the course outcomes. A consistent and structured organisation of information in the E-learning classroom improves the readability and memorability of the course that subsequently influences student satisfaction (Gros and García-Peñalvo 2016; Al-Samarraie *et al.* 2017a).

2.6.4.1 Factors that influence student satisfaction

Achieving student satisfaction can be a complex task when students are diverse in their access to technology as well as their ability to use it. There are those who may have had access to technology but may not necessarily be able to use it for learning (Fasasi and Heukelman 2017) and there are those who experienced digital division and were not able to develop their skills. Many e-classrooms have failed because students where not ready for it (Yilmaz 2017). In fact, multiple authors have stressed the importance of students' abilities to E-learning success. According to confirmation expectation theory (Tiyar and Khoshsima 2015), continued usage of a technology is generally affected by satisfaction derived from usage. The success of an E-learning classroom therefore is determined by the skill, knowledge and confidence of the students (Ukwoma *et al.* 2016a), their prior experience with technology (Duisterwinkel, van der Aalst and den Brok 2014) and their skill of using technology for learning (Littlejohn, Beetham and McGill 2012; Council on Higher Education 2014). Adoption of E-learning has also been affected by students self-efficacy (Duisterwinkel, van der Aalst and den Brok 2014), anxiety, fear and attitude towards technology (Becker *et al.* 2012). In contrast, Cidral *et al.* (2017) find that computer anxiety has no significant effect on learning success but it must be noted that the sample group used in his study were already in possession of at least a degree and were already comfortable with using technology.

Literature provides extensive evidence for the benefits of E-learning to improve the learning process but a student can only benefit if he makes use of E-learning. Mabila, Gelderblom and Ssemugabi (2014) posits that E-skills level affected the efficiency and effective use of LMS among first year Open Distance learners in University of South Africa. People tend to adopt use easier technologies more readily (Cruz-Jesus *et al.* 2016) because these technologies require reduced effort to use and cause less anxiety among users (Singh 2012). Chen and Yao (2016) also provide empirical evidence that Perceived ease of Use (PEU) of technology affects initial adoption of technology. If the technology is too difficult, students may not use at all. Although these finding may spell disaster to the student affected by the digital divide with limited E-skills, the findings of Tiyar and Khoshsima (2015) and Mohammadyari and Singh (2015) provide a light at the end of the tunnel positing that although initial adoption may be affected by PEU, PEU has a low.er significance than Perceived Usefulness. This means that

despite E-skills at the start of adoption, a student will begin to use a technology if he is motivated and encouraged by his teacher (Council on Higher Education 2014) and understands the usefulness of the technology to his learning and performance in the course (Mohammadyari and Singh 2015; Tiyar and Khoshsima 2015; Yilmaz 2017). Teachers may motivate students by creating interest in the technology as well as the content to achieve learning goals (Gorman 2015). Providing students with the necessary training in the initial stages of adoption to effectively use the technologies within the pedagogical approach adopted for the class manages students initial anxiety, improves their ability to use the technology and may even create interest in developing E-skills to improve usage and performance (Tiyar and Khoshsima 2015). Providing the students with additional support during actual usage of the technology further minimises the effects of student anxiety towards technology and learning (Adamu 2017) and ultimately the success of the E-learning initiative.

The role of the teacher has a tremendous effect on student learning in E-learning classrooms (Ruhl 2016). Aside from providing support and motivation in the initial stages, keeping the student interested is a more challenging task. Students respond positively to course materials that are well organised and structured (Duisterwinkel, van der Aalst and den Brok 2014; Al-Samarraie *et al.* 2017a). E-learning has a capability of providing access to vast amounts of information therefore, the teacher must ensure that information available within the classroom is necessary and directly affect the outcomes of the course. An overload of information and activities that a student is required to process will not only confuse the student, but also demand large amounts of the students time outside the classroom (Triantafyllou and Timcenko 2015; Thai, De Wever and Valcke 2017). A frustrated unsatisfied user will not continue using the technology (Tiyar and Khoshsima 2015) and continued usage is critical to the students' achievement of both the course outcomes and their advanced E-skills.

Many researchers have contributed to understanding the role of the teacher and teacher training (UNESCO 2011; Bladergroen *et al.* 2013; Adegbenro and Gumbo 2014; Koh, Chai and Tsai 2014; Adu and Galloway 2015; Demir *et al.* 2015; Cheung *et al.* 2016). The discussion of literature in this section has also discussion contributions in literature that identify student

competence in using ICT as a factor of E-learning success. E-skills are important for E-learning success but also important for a graduate's survival in the world of work in the knowledge society. The pedagogical approach selected for technology-enhanced learning must suit the E-skills of the student's at the start of the course and this study proposes that consideration may also be given to the level of E-skills development the course aims to achieve on completion. The aim of this research is to capitalise on the students' use of E-learning in a way that will help them improve their E-skills and enable their success. To achieve E-skills development as an ancillary goal of an E-learning course, an instructor needs a thorough understanding of E-learning design and how it can be structured to achieve the primary goal of E-learning success.

Successful E-learning means student success and student satisfaction, which leads to continued use of E-learning technologies (Tiyar and Khoshsima 2015). Continued use of technology is critical to achieving higher level E-skills (Youssef, Dahmani and Omrani 2015).

2.7 E-learning design

If the participation in E-learning is meant to contribute towards developing and improving the E-skills levels of students, the design of e-learning classrooms must be considered carefully.

2.7.1 Perspectives of E-learning Design

The field of E-learning design has been approached from various perspectives. Literature focuses mainly on the roles and needs of educators to inform the design of LMSs, and the flexibility of Learning managements systems to accommodate diverse and effective teaching practices (Kowalczyk and Copley 2013; Wang et al. 2013) . Literature also provides evidence of what is necessary for designing LMS (Yueh and Hsu 2008; Wang, Myers and Sundaram 2013), directions for E-learning design (Charalambos, Michalinos and Chamberlain 2004; Kowalczyk and Copley 2013; Keengwe, Onchwari and Agamba 2014), effective use of ICT for learning(Horton 2012) as well as the relationship of design to usage(Min, Yamin and Ishak

2012). Recent studies have acknowledged the importance of investigating the relationship between E-skills and E-learning (Youssef, Dahmani and Omrani 2015; Rana 2017; Yilmaz 2017). In the present study the term E-learning design will refer to the design of e-classrooms and E-learning activities to support learning.

2.7.2 Effective E-learning Design

E-learning requires that the instructor successfully integrate technology to enhance the teaching and learning of instructional content to achieve student success. The instructor, the content, the student and the technology are the fundamental components of any E-learning initiative. Table 2-3 summarises the contributions in literature to understanding what is required for E-learning success comparatively with what is needed for effective E-learning design. Both avenues of research in the field of E-learning have significant overlap.

E-learning Design specifications that relate to the instructor focus on the instructors' availability to provide support relating to the content as well as the technology (Ter and Herrington 2014), provide constructive feedback to build knowledge , align course outcomes with appropriate pedagogy to enable the selection of effective instructional strategies and technological tools to achieve the outcomes. Debattista (2018) suggests that the teacher communicate the usefulness of the course with respect to its alignment to course outcomes and its' importance for student success. Debattista (2018) and (Mirriahi, Alonzo and Fox 2015) agree that an active teacher that provides regular motivation, stimulation and support is an integral part of Effective E-learning design. The teacher must also incorporate various tools for assessment to enable students to demonstrate what they have learnt (Mirriahi, Alonzo and Fox 2015). Activities, assessments and content that the teacher provides must stimulate critical thinking and encourage collaboration and innovation in students (Ter and Herrington 2014; Debattista 2018).

Table 2-3. Requirements for successful E-learning and E-learning Design

Fundamental Components of E-learning	Requirements for E-learning success	E-learning design considerations
Teacher	TPACK for effective design and implementation of E-learning (Wastiau *et al.* 2013; Adegbenro and Gumbo 2014; Al-Fraihat, Joy and Sinclair 2017; Debattista 2018)	Communicate usefulness and alignment of technology to course outcomes (Debattista 2018) Provide different tools for assessment (Mirriahi, Alonzo and Fox 2015)
	Provide timely constructive feedback (Brown and Voltz 2005; Wastiau *et al.* 2013; Council on Higher Education 2014; Al-Fraihat, Joy and Sinclair 2017; Debattista 2018)	Provide timely, constructive feedback instead of just correction Must be reachable (Ter and Herrington 2014) Must be active communicator (Mirriahi, Alonzo and Fox 2015; Debattista 2018)
	Provide support and motivation (Council on Higher Education 2014; Mohammadyari and Singh 2015; Tiyar and Khoshsima 2015; Youssef, Dahmani and Omrani 2015; Yilmaz 2017)	Set regular activities to enable progress tracking (Debattista 2018) Encourage critical thinking and self-directed learning (Ter and Herrington 2014)
Student	Have an interest in the content as well as the technology (Becker *et al.* 2012; Gorman 2015)	Take ownership of learning goals (Debattista 2018)
	Peer support (Aparicio, Bacao and Oliveira 2016)	Encourage group work and knowledge sharing (Debattista 2018)
	Prior experience with technology (Duisterwinkel, van der Aalst and den Brok 2014; Binyamin, Rutter and Smith 2017)	
	Sufficient E-skills (Littlejohn, Beetham and McGill 2012; Council on Higher Education 2014; Yilmaz 2017)	Consider E-skills competence needed to complete task and reach outcomes (Debattista 2018)
	Access to technology at home and school(Wastiau *et al.* 2013)	Gather feedback needed to understand student and for course improvement (Debattista 2018)

(Continued on Page 52)

Technology	Suit the technological capabilities of target audience (Council on Higher Education 2014) Make attempts to train users to use technology efficiently (Tiyar and Khoshsima 2015)	Scaffolded complexity to appeal to students at different levels of competence User friendly (Ter and Herrington 2014)
	Must be accessible (Wastiau *et al.* 2013) Must be dependable (Al-Samarraie *et al.* 2017b)	Select technologies that are accessible to students (Mirriahi, Alonzo and Fox 2015)
	Must be useful for improved performance and outcomes achievement (Al-Samarraie *et al.* 2017b)	Support Pedagogy (Aparicio, Bacao and Oliveira 2016)
	Support collaboration and social participation (Cidral *et al.* 2017)	Selected technology should be relevant and useful (Ter and Herrington 2014) Include technology that supports collaboration and communication (Gros and García-Peñalvo 2016; Debattista 2018)
Classroom content and learning activities	Clear, structured and easy to navigate (Duisterwinkel, van der Aalst and den Brok 2014; Ter and Herrington 2014; Abubakar and Adetimirin 2015; Triantafyllou and Timcenko 2015)	Pedagogically aligned to meet course outcomes (Aparicio, Bacao and Oliveira 2016) Well designed, interactive content aligned to achieve the outcome within context (Mirriahi, Alonzo and Fox 2015; Gros and García-Peñalvo 2016)
	Effective course structure and materials to improve student satisfaction (Tiyar and Khoshsima 2015) High quality content (Al-Samarraie *et al.* 2017b; Cidral *et al.* 2017)	Problem based learning to stimulate critical thinking, collaboration and self-directed learning (Triantafyllou and Timcenko 2015; Gros and García-Peñalvo 2016)
	Different types of activities and approaches to improve understanding (Mirriahi, Alonzo and Fox 2015; Triantafyllou and Timcenko 2015)	Instructional strategies to operationalise pedagogical goals (Aparicio, Bacao and Oliveira 2016)
	Different learning pathways for achieving the outcome for diverse learners (Council on Higher Education 2014; Abubakar and Adetimirin 2015; Triantafyllou and Timcenko 2015; Becker *et al.* 2017)	Time and workload considerations to prevent overwhelming student unnecessarily (Triantafyllou and Timcenko 2015) Optional activities must be clearly defined (Debattista 2018)

Earlier contributions to E-learning design focussed very little on students aside from the support they needed from their. Debattista (2018) recently suggested that student E-skills and previous experience with technology are importance aspects to consider for E-learning design. Students E-skills dictate the types of instructional strategies and technologies that will be best suited to achieve success (Yilmaz 2017) Accommodating student E-skills, and providing the initial training needed, helps reduce the anxiety students felt when they encounter new technology so that learning may continue. Debattista (2018) also suggests that learners should create their own learning goals at the start of the course to force them into taking ownership of their own learning and performance. Students also seek assistance from their peers when they experience difficulty in the course or with the technology, therefore the design should provide tools for collaboration and knowledge sharing (Ng 2012; Cidral *et al.* 2017; Scheerder, van Deursen and van Dijk 2017). In some instances these tools may not be part of the adopted LMS, in which case the instructor may include supplementary tools available on the internet (Gros and García-Peñalvo 2016).

The choice of technology for an activity brings together the instructional strategy and the pedagogical goals related to specific course outcomes (Aparicio, Bacao and Oliveira 2016; Gros and García-Peñalvo 2016). Being the learning tool of an E-learning course, the technology selected should be available to students or they would not be able to use it (Wastiau *et al.* 2013; Mirriahi, Alonzo and Fox 2015), relevant to the course and useful for improving student performance (Ter and Herrington 2014; Al-Samarraie *et al.* 2017a). The selected technology and tools incorporated in the design should not be more complex than the student is able to manage or adapt to within the time available (Ter and Herrington 2014).

The content or learning activities is the focal point of E-learning. The instructor structures the content and learning activities based on pedagogy which subsequently executed through technology (Aparicio, Bacao and Oliveira 2016; Gros and García-Peñalvo 2016). The content available on a E-classroom should be well-structured, flexible and easy to navigate to enable students to find information quickly and learn how to use the technology with minimal anxiety (Mirriahi, Alonzo and Fox 2015; Gros and García-Peñalvo 2016). Problem based learning activities help stimulate critical thinking, collaboration and self-directed learning

(Triantafyllou and Timcenko 2015; Gros and García-Peñalvo 2016). Learners who are unable to cope with either the content or the technology may be provided with additional material however, effective design also means including only what is necessary for achieving the outcomes so that the student is not overwhelmed and does not waste time on completing activities that were not meant for him (Triantafyllou and Timcenko 2015). Optional learning activities should therefore be clearly marked and their usefulness and alignment to specific outcomes should be communicated to students so that the student can choose if it is necessary for that student to attempt the activity or not (Debattista 2018).

2.7.3 Connecting E-learning Design with E-skills

According to Aparicio, Bacao and Oliveira (2016), effective E-learning *design* requires three fundamental components. Firstly, a pedagogical model defining how the learning will be organised to best suit the subject area, for example through open or distributed classrooms, learning communities or communities of practice, full online, blended learning or flipped classrooms. Secondly, an instructional strategy that includes plans and techniques that will engage the student and finally, carefully selected technologies to support the selected pedagogy for e-leaning to be successful (Aparicio, Bacao and Oliveira 2016; Gros and García-Peñalvo 2016).

The learning process itself is made up of three elements namely orienting or preparing to learn, processing or undertaking learning activities that promote learning and lastly regulating which includes planning, monitoring and adjusting the learning process to ensure that learning takes place (Duisterwinkel, van der Aalst and den Brok 2014). The orientation phase of learning is critical to the initial stages of instructional design where the teacher gathers data relating to the prior knowledge of the class and their readiness for the module as well readiness for technology enhanced learning (Yilmaz 2017). This information is vital to the design of supporting activities to train and familiarise students with lower levels of skills and encourage adoption and usage of the E-learning technologies (Youssef, Dahmani and Omrani 2015). The orientation phase may also be used to motivate students to use the courseware and create interest by communicating its importance and usefulness to students (Gorman

2015; Mohammadyari and Singh 2015; Tiyar and Khoshsima 2015). Communicating the usefulness, as previously mentioned plays a vital role in moderating the effects of anxiety and complexity in users that are new to technology.

The learning process that results from participating in learning activities will be slightly different for each student since they are diverse in E-skills, personality and learning style. For student groups with diverse cultures, the effective use of language plays a vital role in E-learning success (Mutula and Van Brakel 2007; Parliamentary-Monitoring-Group 2016; Yilmaz 2017). Universities in South Africa use English for teaching and learning, which can cause anxiety among first year students from rural schools therefore, the language used to present information and provide instruction should be simple, clear and appropriate to the students (Parliamentary-Monitoring-Group 2016).

The learning activities themselves need to utilise technologies that are appropriate for achieving the outcome but once again, the student must be able to use it. If some of the students are unable to use the technology due to low or no E-skills, the teacher may consider group activities to encourage students to learn from their peers, or provide links to useful videos and tutorials covering the basics (Mirriahi, Alonzo and Fox 2015). Providing different means and approaches to learning helps to improve the students understanding particularly for students who are not ready for E-learning (Triantafyllou and Timcenko 2015). It also affords the teacher a means to provide extra support to those that need it in a class of students with diverse E-skills.

Regulating the learning process is important for both students and educators and will be continuous throughout the learning process. Educators must plan flexible E-learning classrooms that provide choices to diverse students. Many pathways may exist to achieve an outcome and these must be well organised, structured, concise and relevant to the student to facilitate learning so that students can achieve the learning outcomes (Abubakar and Adetimirin 2015; Becker *et al.* 2017). Students can then plan their learning by selecting a pathway towards outcomes achievement that best suit their E-skills, content knowledge and learning (Council on Higher Education ; Becker *et al.* 2017). Regulating the learning process

also involves monitoring and adjustment of learning. Students must be able to monitor their own progress through formative assessments that provide them with feedback on their progress. Learning analytics available in LMS can provide educators the data required to track student activity to ensure that students reach the correct milestones and achieve the outcomes (Becker *et al.* 2017). Students should be encouraged to set their own course goals, reflect on their achievement and adjust their learning accordingly so that they develop the skill of self-directed learning.

The online learning approach that an instructor selects is critical to the success of diverse students. Although Flipped classrooms proved superior in achieving learning outcomes over Blended learning, traditional learning and full online learning, the amount of independent learning required may not be suitable to first year students (Thai, De Wever and Valcke 2017). Students may actually fail if they are not ready for this method of learning (Yilmaz 2017). Furthermore, the amount of online activity required outside the classroom would greatly disadvantage the student who does not have access outside the classroom(Youssef, Dahmani and Omrani 2015). Still the benefits that this learning approach offers to students is paramount. Flipped classrooms allow for higher quality learning and focuses on increasing the individual's ability to learn independently (Triantafyllou and Timcenko 2015; Thai, De Wever and Valcke 2017). It provides an opportunity for students to learn how to adapt to new technologies by doing, collaborating and using the technology (Youssef, Dahmani and Omrani 2015). Although not suited to first year diverse groups. Flipped classroom approaches can be valuable to developing senior students who have achieved the first two levels of E-skills.

Blended learning on the other hand incorporates greater hands-on support for technology use than other learning approaches and address diversities in the student population (Becker *et al.* 2017). Face-to-face and online activities are designed to support each other (Mirriahi, Alonzo and Fox 2015). A blended learning design includes resources that are well structured, activities that are appropriate to the outcome. Since these activities take place both on and off line they allow for diverse learning, confidence building. Support provided by the teacher

face-to-face and online develops the students ability to use the technology and experiment without fear (Mirriahi, Alonzo and Fox 2015; Youssef, Dahmani and Omrani 2015).

Traditional learning focussed on learning by studying content for exams whereas learning through technology means active learning, participation, learning from others and with others, collaborating and reflecting on the learning process, evaluating, and critically analysing information for deeper understanding (Youssef, Dahmani and Omrani 2015). A deeper understanding of a subject allows for creative strategic thinking at which stage individuals would look to technology to formally express and share that creativity and new knowledge in a knowledge society (Thai, De Wever and Valcke 2017). Effective E-learning design includes elements such as collaboration with peers and instructor, continued technology usage, instructor support and regular feedback, communicated usefulness of the technology to the pedagogy and well- structured flexible design to support diverse students. Similar elements were encountered earlier in this chapter that relate to E-skills development. The chapters that follow will be instrumental in providing empirical evidence for including or discarding elements into an E-learning design that is directed towards advancing E-skills.

2.8 The UTAUT for E-learning Adoption and usage

The UTAUT was created by Venkatesh *et al.* (2003) to incorporate the key attributes of significant models for technology adoption and usage like Technology Adoption Model (TAM), Theory of Planned Behaviour(TPB), Innovation Diffusion Theory (IDF) and the Theory of Reasoned Action(TRA). The unified model proposed by Venkatesh *et al.* (2003) was able to account for a higher level of variance in intention to use technology and actual use of technology than its predecessors. Although intended for an organisational context to examine acceptance and use of information systems among employees, the model has been adopted to underpin studies in other contexts (Venkatesh, Thong and Xu 2012, 2016). The original model has since been revised by Venkatesh, Thong and Xu (2016) to incorporate extensions and contributions from these empirical studies in various contexts over the past decade. The revised UTAUT depicted in Figure 3-4 consists of three levels. The individual level and higher contextual level includes moderating factors related to the individual and the environment in

which the technology is being used. These moderating factors may influence adoption and usage of technology. The baseline level includes only the main effects of UTAUT and will form the theoretical underpinning to interpret the development of E-skills of students through E-learning.

E-learning has been selected as the technology or group of technologies to advance E-skills because its purpose is to use technology to promote learning. E-learning has already been adopted in universities across the world and it brings together technology and learning in a way that has the potential to develop self-directed life-long learning skills in students to enable them to keep up with evolving technologies in their prospective workplaces and societies.

The baseline model of the revised UTAUT depicts the relationship between facilitating conditions, individual beliefs and habit on an individual's Behavioural Intention(BI) to use technology. BI, facilitating conditions and habit, directly influences acceptance and usage of technology. Individual beliefs include the Performance expectancy (PE) and Effort expectance (EE)(Venkatesh, Thong and Xu 2016). PE is derived from the individuals perceived Usefulness of the technology to their training and computer experience whilst EE represents the Perceived ease of use of a technology as a result of the individual's computer self-efficacy, computer anxiety and the quality of the technology design itself (Olumide 2016). The acceptance and usage of technology prompts new outcomes, one of them being an increase in individual performance that improves as they use the various features of that technology more and gain experience. As they develop confidence in using the technology, they tend to apply more features of the technology and find new ways of using these features (Wang, Myers and Sundaram 2013; Venkatesh, Thong and Xu 2016). This addition to the original model solidifies the notion proposed by Wang, Myers and Sundaram (2013) that regular progressive usage of technology influences the development of E-skills of the individual. An investigation into the advancement of E-skills using E-learning will provide valuable information needed by educators to design e-classrooms and E-learning activities that will build these critical competencies in their graduates. The UTAUT-2 model will be discussed in detail in Chapter 3 to enable the researcher to shape the way the empirical data in this research will be examined.

As discussed earlier simple usage does not contribute to the development of advanced skills, neither do training courses. For E-learning to make an impact on high level E-skills development, this study will closely examine students of diverse initial E-skills and its development throughout an E-learning course in order to develop a framework for E-learning design that can advance E-skills. The E-learning design must bring together the student, the content and the technology seamlessly to produce a primary goal of competency in course outcomes and a secondary goal of advanced E-skills development. A framework for E-learning design will contribute to the development of E-skills of all students despite their current digital competencies (Hatlevik, Guðmundsdóttir and Loi 2015).

2.9 Chapter summary

E-skills are critical for the modern, connected and ICT enhanced world. E-skills describe one's ability to use ICT within the context of a knowledge environment in order to participate creatively and innovatively in a world where ICT is an essential requirement for advancement in activities of government, civil society and business (Koranteng 2012; Adegbenro and Gumbo 2014; van Laar *et al.* 2017). University students are diverse in their E-skills and require proper support in order to improve. A dissection of E-skills into specific traits and characteristics allow one to view E-skills as a collection of multi-levelled skills that require lower level skills to be developed prior to attempting the next set of skills. A multi-levelled classification of E-skills also allow instructors to identify student's level of E-skills and provide the necessary interventions and support to develop underprepared students.

The first level of E-skills, *Technology Operation Skills,* cover an individual's basic ability to operate ICT (Youssef, Dahmani and Omrani 2015; Scheerder, van Deursen and van Dijk 2017). Second level E-skills, or *Fundamental E-skills,* include the ability to use ICT to search for, evaluate and use information to effectively complete tasks related to work, study and everyday life (Ferrari, Punie and Redecker 2012; Ng 2012; Mata 2015; Youssef, Dahmani and Omrani 2015; Scheerder, van Deursen and van Dijk 2017). First and second level E-skills may be developed through computer literacy training courses and continuous usage.

Level 3, *Information Analysis and knowledge Sharing Skills***,** requires that the user critically analyse the information, debate and discuss the information in order to create meaningful knowledge and present the information creatively (Ng 2012; Binsfeld, Whalley and Pugalis 2016; Scheerder, van Deursen and van Dijk 2017). At level 4, *Strategic E-skills* requires strategic use of ICT focussing on critical thinking, innovation and creativity and the use of ICT to facilitate the creation of knowledge and the presentation thereof in a knowledge society (Ng 2012; Youssef, Dahmani and Omrani 2015; Scheerder, van Deursen and van Dijk 2017). *Information Analysis and knowledge Sharing Skills* and *Strategic E-skills* may be acquired through continued development in different contexts (Littlejohn, Beetham and McGill 2012), group work and knowledge sharing amongst peers (Smyth *et al.* 2012; Krauss, Simuja and Conger 2015; Sykes 2015). Strategic E-skills in particular are developed through experience, support and collaboration (Wang, Myers and Sundaram 2013; Youssef, Dahmani and Omrani 2015) whilst continuous usage supports the development of all levels of E-skills.

Studying the ICT related background of students provide an informed view of the extent of diversities among students prior to taking the task of preparing graduates with ICT competencies and life-long learning skills needed to compete in the digitally enhanced workforce (Francisco and Torrent-Sellens 2014). The economy has invested significant resources into ICT adoption due to the extensive benefits it brings to organisations (Republic of South Africa: Department of Communication 2012; Mata 2015). Increased adoption amongst organisations as well as general users have helped improve South Africa's standings on the NRI however, there still is a huge deficit of people able to fill knowledge intensive posts and make use of the technology (Nzimande 2014). Improving E-skills across the levels improves the individual's chance of finding work by enabling him to find employment on a digital platform, work effectively using technology, use technology for self-development and improve his level of employment.

The diversity in student E-skills at university is largely attributed to the extent of E-inclusion experienced by the student prior to university. As one moves away from urban areas towards rural areas, e-inclusion declines such that these communities remain disconnected from the

digital world of information (Fasasi and Heukelman 2017). Whilst many efforts have been made to improve access to technology, Padayachee (2017) posits that the highest ranked barriers to E-learning in South African schools is still the lack of infrastructure and cost of both equipment and data. Even if the equipment has been provided, it does not automatically mean effective usage and E-skills development is taking place. E-Inclusion is also challenged by other problems such as poor security, unreliable internet, too few computers or unskilled teachers.

Teachers are additionally tasked with maintaining large classes and completing the syllabus leaving little time in their workload to learn and implement new technologies. The more distinguished schools are fully equipped to learn with technology having trained staff and sufficient resources to actively involve its learners in the information age (Koranteng 2012). The task of bringing rural school towards E-inclusion to benefit from its capabilities the way more affluent schools do is a huge task which will take a long time to come. Until that is resolved, the diversities in E-skills of new first year university students will continue to exist.

Many institutions have adopted Learning management systems to provide a platform for E-learning that may be supplemented with additional technology if needed. The focus of E-learning has evolved concurrently with technology beginning as a tool to deliver content and progressing towards instruction delivered on a digital device that is intended to support learning and the development of knowledge (Clark and Mayer 2011). If used correctly, both students and teachers may benefit but for this to happen many elements need attention.

It is the teacher's task to consider students prior knowledge with technology as well as the content. Successful E-learning is dependent on the selection of pedagogies that will be effective in achieving the course outcome, the selection of technology that is available and suitable for the enrolled students and that will be effective in implementing the selected pedagogy and achieving course outcomes. From a student's perspective, critical success factors for E-learning has been consistently evidenced in literature to include the student's own perception of technical competence, which bears similarities to E-skills; student's prior experience with technology, and perceived ease of use of the technology (McKeown and

Anderson 2016). The student is definitely at the centre of an E-learning classroom therefore considering the students ability to use E-learning technologies in order to provide the student with the necessary support will not only contribute to E-learning success but also improve student satisfaction, which ultimately leads to continued usage. Continued usage with constructive support helps develop E-skills. The UTATUT model makes provisions for outcomes of technology usage and is introduced at the close of this chapter because it plays an important role in bringing together continued E-learning technology usage with E-skills development as an outcome of that continued usage.

The remaining chapters of this research will focus on evaluating available research methods and a discussion of the reasoning behind the selected research design adopted to extract the necessary information relating to the specific aspects of E-learning that helps students improve their E-skills. The UTAUT model is also discussed as it provides the lens through which the results may be studied. The information gathered from the students who experienced E-learning will then be presented and compared to results of related studies in order to derive conclusions and theories from the results that provide resolutions to the research questions. The results of this study will be used to create a framework for E-learning design that will inform instructors committed to developing all levels of E-skills of their students.

CHAPTER 3 – Research Design

3.1 Introduction

This study posed multiple questions relating to the E-skills requirements of students and the steps needed to develop E-skills. The review of literature relating to the economy and workforce provides a comprehensive account of the ICT related skills required by individuals in the digital economy. Literature further provides evidence of the diversities in E-skills of children in school environments as well as higher education and conditions leading to their exclusion from developing E-skills thereby providing an understanding towards seeking a response to RQ1. If E-skills development is to be a by-product of E-learning, E-learning needs to be successful first, therefore any E-learning design must take cognisance of the requirements from each of the elements of E-learning that could contribute to student success through E-learning. These requirements have been summarised in Table 2-3. Literature provides anecdotal evidence of the relationship between E-skills development and E-learning. This study is therefore compelled to investigate this relationship further because of its potential to benefit previously disadvantaged students and prepare individuals for the employment in the digital economy. The study aims to discover answers to the following research questions:

RQ1 Are there diversities in first year Information Technology students' E-skills?

RQ2 What elements of E-learning are likely to contribute to developing the E-skills of students?

RQ3 What learning activities do students at different E-skills levels find useful for their E-skills development?

RQ4 How can E-skills development be advanced through E-learning?

This chapter discusses in depth the philosophical views that provide a lens through which the problem is approached. In light of the research questions that have been triggered through the examination of relevant literature, the suitability of the selected research approach to address the research questions is justified. The research design is discussed in detail focussing

on the research strategy for collecting and analysing data, methods of collecting appropriate quality data, and a description of the methods most suited to analyse rich qualitative data in a way that establishes confidence in the systematic analysis and academic rigour, in order to achieve trustworthy results. The chapter then explores the UTAUT model and its robustness in predicting technology adoption and usage, which is relevant in the context of student adoption of E-learning. The UTAUT model is also the only model that makes provisions for consequences of usage where other popular models, such as the Technology Acceptance Model(TAM) (Davis, Bagozzi and Warshaw 1989) and the Theory of Reasoned Behaviour(TRB) (Venkatesh *et al.* 2003), do not explore beyond usage. The UTAUT conceptual model provides a framework for the analysis of the rich qualitative data to discover concepts and theories that contribute to the understanding of E-skills development and its relationship with continued usage of E-learning and ICT.

3.2 Research paradigm

The research paradigm is the philosophical view that shapes the way in which a research problem is defined, approached and interpreted.

3.2.1 Social constructivists and constructivist/interpretive

Creswell (2014) posits that social constructivists believe that individuals develop subjective meanings about a subject and that these meanings vary between individuals. They strive to gain an understanding of these views and their complexities by collecting data from the individual's experience to develop meaning and derive theories. Halaweh, Fidler and McRobb (2008) concurs that interpretative studies' aim is to understand and make sense of the research problem by considering the meanings that the individuals involved have assigned to the phenomena being addressed in the research questions.

The constructivist/interpretive paradigm matches the focus area of E-skills development. The problem of not knowing how E-skills of students can be developed through E-learning lies in

understanding student's experiences with E-learning. These experiences are likely to be constructed on the foundations of knowledge that the students have already acquired from their own personal background, prior knowledge and abilities therefore; a set of activities that improve E-skills in one group of students may have a different effect on another group.

Contributions in literature (Ferrari 2012; Ng 2012; Youssef, Dahmani and Omrani 2015 ; Scheerder, van Deursen and van Dijk 2017) have also revealed multiple levels of E-skills that need development for effective participation of individuals in a knowledge society. Studying the way technology is used by first year students allows for the observation of the transition of skills from one E-skills level to the next. How students use E-learning, what keeps them using technology to learn and the relationship between E-learning technology usage and their E-skills requires careful observation and documentation.

3.3 Research Approach

The research paradigm frames the selection of suitable research methods for research design and analysis to address the research problem and a qualitative approach is concerned with obtaining a quality picture of the phenomenon(Corbin and Strauss 2008).

Feeler (2012) posits that although online learning has received much interest in the research field, most research relating to student success is quantitative. Quantitative research is applicable to testing theories and hypothesis, implying that most research focused on students' perceived success in online learning are dependent on categories that have been previously defined in dated literature (Feeler 2012; Creswell 2014) . The role of technology and the internet has resulted in tremendous developments in education, technology and e-inclusion, which calls for a rejuvenated look at what students, who actually use online learning, consider important for their success. This research responds to Feeler (2012) call for qualitative research directed towards discovering new categories affecting students at multiple levels of skill. The discussion of existing literature relating to E-learning and e-inclusion motivates this research to concentrate specifically on those categories that influence the E-skills of students involved in E-learning because of its benefits to the digital economy.

The *qualitative approach* is inductive in nature and suited to inferring theoretical concepts from observed data (Punch 2005; Creswell 2014, 2018). The aspects of E-learning that can be associated with E-skills development are yet unknown therefore a qualitative approach and more specifically a case study, facilitates discovery of elements that are unknown, which is the case for students using E-learning and developing E-skills due to that usage. Furthermore, the qualitative approach is flexible enough to respond to student's responses, however contemporary they may be, to gain deeper understanding of this new phenomenon.

3.4 Research Design

The research design is the overall plan for a piece of research and includes the strategy, conceptual framework, sampling, methods of data collection as well as methods of analysing the empirical data (Punch 2013). Within each aspect, specific methods are selected for their suitability to the research problem and their alignment with the philosophical assumptions (paradigm) and personal experiences of the researcher (Halaweh, Fidler and McRobb 2008). The consolidated research design then maps the specific direction for procedures in the research (Creswell 2014). The rationale behind the selection of specific methods in each aspect of the research design is discussed in the sections that follow.

3.4.1 Qualitative Research Strategies

The research strategies associated with qualitative research include Ethnography, Narrative, Case Study, Grounded Theory (GT) and Phenomenological strategies. Halaweh, Fidler and McRobb (2008) posits that of the five, Grounded theory, case studies and ethnographies are suited and commonly used with interpretive studies, because they enable the researcher to study the phenomenon within its natural context. Although these methods collect data in a similar way, they differ in execution and use. Ethnographies is a naturalistic way of conducting research where the researcher immerses himself into the environment being studied almost like a participant in order to observe the culture of the people being studied and understand

the world from their perspective(Punch 2013). The present study is concerned with development of E-skills rather than culture, furthermore, the researcher is also an instructor to the students who will be studied therefore an ethnographic strategy would not be possible.

Both GT and case studies have characteristics that are useful for the current research questions therefore they will first be introduced individually before they are compared and placed into this particular research design.

3.4.1.1 Case studies

The idea behind the case study is to study one or a small number of cases in detail using appropriate methods to develop as full an understanding of that case as possible (Punch 2013). The boundary and scope of the research case and the unit of analysis bind interpretive case studies. Lawrence and Tar (2013) comment that case studies provide research with a contextual boundary for examination and affords the researcher a detailed examination of one or more case to explore the phenomenon whilst examining all the dynamics that exist, processes that occur and people that affect the phenomenon being studied within the context of the case. Case studies afford the researcher with the flexibility of observing the case and collecting data from different sources and in different formats for the creation of a rich, unbiased picture of the case to facilitate the discovery of crucial and novel concepts. The case study methods provide the benefits of a structured design and data collection guided by research questions derived from the critical analysis of relevant literature. The researcher is able to move into data collection with an informed view of the contextual boundaries of the case and the phenomenon.

Case study methods on their own, however, are not sufficiently rigorous when it comes to data analysis. Halaweh, Fidler and McRobb (2008) describes ways in which qualitative research outputs may be evaluated. He emphasises on a systematic process of data analysis that clearly shows how theories have been conceptualised from the raw data itself and not from the preconceptions of the researcher. The findings must be well documented and most importantly traceable to the empirical data. The methods of analysis used in Grounded Theory Research on the other hand, is sufficiently rigorous and traceable to strengthen the analysis process of qualitative research.

3.4.1.2 Grounded theory

Grounded Theory (GT) was originally developed by Glaser and Strauss (1967) and its research methods focus on discovery which grounds a theory in reality (Corbin and Strauss 2008). Data analysis and collection is interchangeable and continues until theoretical saturation – a point at which no new data or concepts are emerging that can be used to formulate more theories. The ultimate goal of GT is to generate theory that fit the data and is generated directly from the data because of the research process and not from preconceived ideas developed prior to the data (Feeler 2012). Corbin and Strauss (2008) suggest that a preliminary review of literature is necessary to gain an understanding of the phenomenon being studied and that research questions are merely a guide for the research process. Halaweh, Fidler and McRobb (2008) and Feeler (2012) also agree that an initial set of questions provide the research with a starting point and a focus and that these questions are intended to merely guide the researcher to make sense of the data gathered in fieldwork in the beginning without being prescriptive of any category or concept implied in literature. Feeler (2012), maintains however, that these pre-existing ideas have no relevance to the theories generated in the research unless they prove themselves to exist consistently in the data itself.

Corbin and Strauss (2008) propose a systematic approach to coding using three types of coding; open, axial and selective coding. Open coding provides conceptual labels for the data together with properties for the conceptual labels, subsequently axial coding is then achieved by comparing and relating categories to each other which will eventually form the basis of theories. The model allows the researcher to look into relationships between categories in a more structured way classifying them into cause, condition, context or consequence shown in detail in (Table 3-1). The structure that systematic and well-defined coding provides, is critical for achieving reliability in a study that aims to achieve some degree of applicability (Halaweh, Fidler and McRobb 2008). Table 3-1 lists the classification aspects of Straussian codes and guiding questions have been constructed from explanations provided by Halaweh, Fidler and McRobb (2008) and Corbin and Strauss (2008) to assist in defining categories within the data.

Table 3-1 : Classification of Straussian codes (Halaweh, Fidler and McRobb 2008)

Aspect of coding	***Key questions to analyse data and relationships between data***
Causal conditions	What led to the occurrence of the phenomenon?
Phenomenon	What is the central idea behind the event or action? To what extent are the actions or interactions related?
Context	In what context is the category embedded? What specific properties relate to the category? What set of conditions are required to take action?
Intervening	What facilitates or constrains the action/reaction within the specific context?
Action or interaction	What specific actions or interactions are directed towards managing, handling or responding to a specific phenomenon under a set of conditions?
Consequences	What are the outcomes of the action or interaction?

3.4.1.3 Combining Grounded Theory with Case Study

Case studies and grounded theory are adept to developing theories and explanation behind events. They allow data to be collected from multiple sources and may use different data collection techniques however the primary method of data collection for both strategies is the interview (Halaweh, Fidler and McRobb 2008; Punch 2013). The interview allows the researcher to capture natural spontaneous responses about the participants experience together with their feelings, emotions and reactions. In order to define the context within which the phenomenon is to be studied, Case studies require a *specification of the boundaries* and scope of the case as well as the *unit of analysis*. These characteristics are in agreement with grounded theory, which uses *theoretical sampling* techniques to select *relevant* cases to extract in-depth information that will contribute to the discovery and development of theories and concepts (Halaweh, Fidler and McRobb 2008).

According to Corbin and Strauss (2008), theoretical sampling is more concerned with sampling incidents than individuals. Charmaz (2014) explains that after initial data is collected and initial codes and categories have emerged, theoretical sampling means that researchers will now seek data that is directly related to those emerging theories in order to elaborate and

refine those categories. Theoretical sampling, collection and analysis proceeds thereafter until theoretical saturation. For this particular study, theoretical sampling was executed with caution. The reason for this is that continued usage of technology was a significant part of the context of this study because of its relationship with developing knowledge and skills over a period of time. Glaser and Strauss (1967) also agree that knowledge is cumulative over time and through experience. The objective of the study is to determine the forces that influence the development during the period of development. The analysis of data collected from students early in the study, may not necessarily reveal all concepts relating to E-skills development through E-learning usage. For this reason, the researcher used the analysis to gain theoretical sensitivity to the emerging concepts but remained open to new concepts that emerge over time. Theorising is about rethinking and connecting data in an abstract way to explain a phenomenon whilst gaining theoretical sensitivity is about the identification of a concept in the data and the awareness of the concept in other forms and instances of the data in order to find the patterns and connection(Charmaz 2014). Theoretical sampling, according to Feeler (2012) allows the data to point to the next step of either deeper analysis or further data collection to address gaps in the data that have been identified through initial coding.

Case studies are characterised by their ability to derive a rich picture of a particular case. Although it allows the researcher to collect data over a longer period of time from specific individuals within the case, the results are not generalizable (Halaweh, Fidler and McRobb 2008; Creswell 2009; Punch 2013) and the findings are unique to the case being studied. The purpose of this study is to provide a framework that guides E-learning design, which requires a degree of applicability to similar situations so that other instructors may be informed, by the framework or test the framework in their own environments. Punch (2013) suggests that conceptualizing and developing propositions may increase the generalisability of a case study. Conceptualizing means that a more disciplined study of the case is required using methods of analysis that focus on conceptualising rather than describing. Analysis methods applied in Grounded theory research allow for such conceptualisation through rigorous analysis of data. Another way to extend the results of the study beyond the specific case under study is to develop propositions that are based on the case. The propositions link concepts or factors

within the case to resemble hypotheses, which may subsequently be assessed for their applicability and transferability to other cases.

A research design may adopt a combination of strategies to account for the weaknesses and capitalise on the strengths of each strategy. Halaweh, Fidler and McRobb (2008) and Punch (2013) agree that grounded theory methods of analysis can be used effectively to complement other strategies. Halaweh, Fidler and McRobb (2008) maintains that integrating two or more strategies/methods is effective if they share the same philosophical assumptions in order to maintain a strong position to conduct the data analysis. The interpretive nature of a case study and of grounded theory research provide the necessary similarities critical for integrating both into a single research design.

This research design will adopt the case study strategy studying the case of first year students enrolled in a four year undergraduate course. Straussian GT analysis methods will be used to complement the case study design in order to add the rigour and structure needed for reliability and to create a framework that is applicable to other instances where E-learning is used by students. The sections that follow will discuss specific methods that form part of the design in further detail.

Diversity of E-skills within a classroom particularly in the first year of higher education is a variable that educators in universities of technology must cater for in their teaching. Since all participants are enrolled for the same course at the same university, they will be examined as a single case, however their prior E-skills will be considered when interpreting the experiences of E-learning from the perspective of learners new to technology and from those who have had previous experience with technology.

3.4.2 Sampling

The priority of qualitative research is to collect data that is of high quality. This is achieved through the use of effective data collection methods from participants that have experienced or are likely to experience the phenomenon under investigation (Charmaz 2014). Furthermore, sample sizes in qualitative research is less prescriptive of the number of participants and more concerned with the richness of the case study; the constraints that one

may be operating under and a commitment to a detailed interpretive account of the case. Smith (2015) posits that the depth at which the case needs to be studied to achieve such detail and richness in data can realistically, only be achieved with a small sample.

The number of participants in a case study may range from a single individual to a group of individuals (Halaweh, Fidler and McRobb 2008). Participants selected for the case study were organised into two distinct groups for the purpose of data collection: novice users and experienced users and were selected from a single group of actively enrolled students at the Durban University of Technology. Since the participants were active students, consideration had to be given to the availability of their time for data collection and the logistics behind the collection of data for both cases.

The sampling method adopted for optimal data collection in this research was a purposeful sampling technique. Samples are purposive if the selected participants are capable of generating useful data (Charmaz 2014). Grounded theory uniquely affords the researcher the benefit of theoretical sampling to enable researchers to direct subsequent data collection and analysis on extracting a deeper understanding of categories and theories that have emerged from earlier data.

Samples were drawn from first years studying a four year undergraduate degree at the Durban University of technology. First year students were appropriate because they are representative of students with diverse E-skills having recently joined the university. The selected participants under observation were enrolled in courses using blended E-learning environments in the first year, offered by instructors who have successfully completed a certification course to improve their TPACK and make innovative use of technology for teaching and learning. Thus, the students of the selected diploma were guaranteed to have experienced E-learning and were capable of providing useful data. Responses from participants were used for analysis if the following criteria were met:

a) Participants were in their first year of study
b) Participation or contribution in interviews was completely voluntary

c) Participants provided informed consent, documented using a consent form.
d) Participants either met the criteria of an individual with no prior experience with ICT and formed part of the novice user case or individuals had experience with technology prior to entering university and formed part of the experienced user case.

The sample was convenient and feasible, because the researcher is a first year instructor and had regular access to the student, their course results and their E-learning activities.

Sixteen students, 3 females and 13 males participated. Five participants were interviewed as the experienced user focus group and the other 11 were interviewed as the novice user focus group.

3.4.3 The E-Learning design of the case

In keeping with effective E-learning design principles suggested in literature, the modules taught were designed according to the three fundamental principles of E-learning design suggested by Aparicio, Bacao and Oliveira (2016):

1) Select a pedagogical model that will suit the subject area and its audience
2) Design instructional strategies that include specific plans and techniques to engage the learner
3) Select technologies that support the instructional strategy within the pedagogical approach

The pedagogical approach selected for the courses directly used a blended approach. The rationale behind this approach was to use technology to support learning without compromising contact with the lecturer, which first year students need. Since the context of the case included first year students, completely online and flipped pedagogies were rejected because they required that the student be sufficiently skilled to use the technology independently to learn and the diversity of their skills was established through the creation of novice and experienced focus groups. In addition, one of the modules the students had to

take covered basic computer literacy in the first semester. The second module, Algorithm Design, was offered in the second semester of their first year. The second module also adopted a blended pedagogical approach to enable a comparison of the students' initial reaction to technology with their experience and reaction to the use of technology for learning after having experienced it over time.

Technologies adopted in learning activities were selected for their ability to support the learning objectives of the lesson. As an example, one of the lessons' objective was to introduce students to writing clear instructions to help students understand the basic principle of algorithm design. Technology enabled the researcher to facilitate the entire class to play snakes and ladders online eliminating the need for the lecturer to acquire physical game boards and tokens. The students were required to each go to specific link provided by the instructor on the internet where they could play the online game *snakes and ladders* and after playing the game a few times, the student had to write down his own set of rules for playing the game. The technology played the role of a supportive tool to the instructional strategy.

3.4.4 Data Collection

The type of data required to answer the posed research questions, needed to be collected from students directly over time to monitor their experiences with E-learning and their ability to use technology effectively in and beyond the classroom (E-skills). This data related to understanding each student's encounter with E-learning and identifying aspects of these encounters that affect E-skills.

To facilitate data collection, focus group interviews were conducted. Patton (2002) suggests a focus group size of 6 to 10 participants as manageable for sustaining a discussion. These groups provided a comfortable environment for especially novice users to share their experience without feeling intimidated by more experienced users.

Prior to data collection, students were placed in focus groups for discussion. Two focus groups were created, one for novice users and one for experienced users. Interviews

conducted with students were always conducted as a group discussion with all students in the same focus group present at the discussion to encourage sharing of experiences with others experiencing the same challenges and learning experiences. The group of students who were new to technology were interviewed at a different sitting from those who were experienced to prevent students from feeling shy or intimidated by their experienced peers.

3.4.5 Methods of Data Collection

Case studies allow researchers the flexibility of using multiple sources as evidence for data. This flexibility adds to the credibility of the data and derived findings (Halaweh, Fidler and McRobb 2008). Collecting data in this way allows for a well-rounded view of the case being studied. As discussed earlier, the design adopted in this study brings together case study research with grounded theory. This type of cohesion is possible because of the many similarities between the two methods. Case study Research (CSR) and Grounded theory research (GTR) both allow for multiple data sources to enable credibility and depth. They rely on interviews as the primary source of data and most importantly share interpretive philosophical views so there is not conflict in methods used for specific purposes in the research design (Halaweh, Fidler and McRobb 2008; Feeler 2012; Charmaz 2014). Although each are research methodologies in their own right, they also have distinct strengths and weaknesses.

3.4.5.1 Focus Groups

Focus group interviews were the primary source of data collection in the study and were supported by other forms of data collected, relating to the case study, including students' test results and observation of participation in online activities. E-learning course activity reports from the LMS verified that the participants had been actively involved with e-learning. Test scores of an ICT training module verified that E-skills development had taken place, at least to the operational and functional levels.

Since focus groups were constructed according to previous experience with ICT, this helped to facilitate participation in the focus group interviews. Moreover, the semi structured

technique adopted for each focus group provided participants the opportunity to draw on each other's experiences and be motivated to add, agree or disagree so that the discussion yielded a rich picture of their experiences as a group as well as an individuals (Creswell 2014). Separating students into a novice group and experienced group depending on their initial E-skills then then interviewing participants that belonged to the same group as group discussions, optimised the usage of the researcher and participants' time in addition to providing a supportive environment for discussion. The novice and experienced groups were interviewed separately to prevent especially novice participants from feeling inadequate or shy.

The researcher collected the data pertaining to this research personally in order to reflect on preliminary data and analysis to track development in later interviews. The researcher also earned the trust of the respondents through collaboration and the respondents shared their thoughts more willingly. The focus group interviews were scheduled at a time when the students and researcher were free, to ensure that no teaching and learning time at the university was compromised. All focus group interviews were conducted on university premises to eliminate any travelling requirements from the participants. Focus group interviews were noted and recorded by the researcher with the permission of the participants.

3.4.5.2 Semi-structured Interviews

Interviewing is a useful method of gathering data. In depth conversations with a person or group of individuals is directed towards a topic of interest that the participant has experienced (Charmaz 2014). Interviews are accurate ways of capturing peoples' perceptions and their construction of reality in a given situation. Oral interviews also allow the researcher the opportunity to capture the unspoken words of the participant for example their tone, body language and facial expressions. Structured interviews deliberately limit the discussion where participants may only talk about items that the interviewer has previously decided on (Smith 2015). Structured interviews was deemed unsuitable as it could inhibit the collection

of novel data relating to the participant's experience with e-learning. Each participant's experience at university is new and learning will differ between students.

Smith (2015) comments that a semi-structured interview, consists of a set of questions that are assembled prior to the interview, but are merely used as a guide for the researcher and do not dictate the discussion. A semi-structured interview best suits the type of data required to answer the research questions. It provided the researcher the flexibility of digging deeper into new concepts surfacing during the interview and gave the participants the freedom to contribute any related experience. The semi-structured method was favoured over unstructured, because it allowed for in-depth interviews whilst maintaining focus especially within each group (Creswell 2014).

3.4.5.3 Active Interviewing

The semi-structured interview technique was strengthened with the use of active interviewing mentioned by (Feeler 2012). Active interviewing allows both the researcher and the respondents to become active participants in the interview such that the interview itself becomes more of a conversation. Through collaboration, respondents are seen more as constructors of knowledge rather than containers of knowledge. Within the focus groups itself, participants were able to share and relate their experiences with each other in order to understand and discuss those issues that are important to them. It is the function of the interviewer to orient him/herself with the process of collaboration rather than mechanically questioning and collecting answers. Respondents will recall their experiences in the form of narrative, but it is the active interviewer's role to activate their respondents to organise their experiences; reflect on their meanings and significance to the respondents themselves, and provoke reflective thought about the experience and the conditions surrounding it. This type of interviewing allowed both the researcher and respondents the opportunity to develop a greater understanding of the students and their actions/reactions to E-learning in terms of what they needed and how they have developed.

3.4.5.4 Implementation

Each participant signed a consent form to allow the researcher to use their contributions in publications. To protect the participants' identities, pseudonyms replaced the participants' actual names and the respondents' actual identities were known only to the researcher. The type of data collected related to the students' personal experience with E-learning and their E-skills levels. Although every effort was made to make respondents feel comfortable with sharing those experiences, respondents were in no way forced to attend or contribute to the interview. For this reason, respondents who may have been present in one interview may not necessarily have been present in others.

Table 3-2 : Index of all data collection events

Data Collection Event	Participants	Date
Interview 1	Novice focus group	24/03/2017 Month 2
Interview 2	Novice focus group	11/05/2017 Month 4
ICT literacy course results	Novice and Experienced	20/05/2017 Month 4
Interview 3	Experienced focus group	22/09/2017 Month 8
Interview 4	Novice focus group	20/10/2017 Month 9
LMS Activity Report	Novice and Experienced	End of course

3.4.6 Methods of Data Analysis

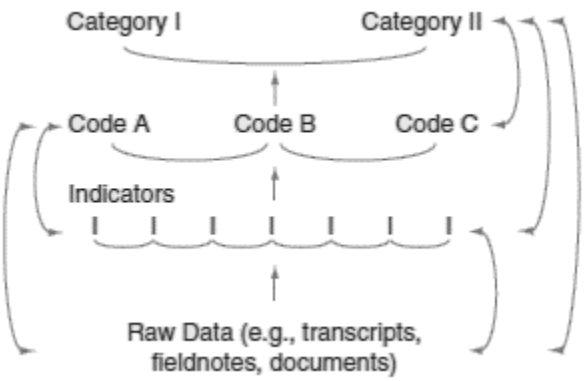

Figure 3-1 Constant comparison procedures for open coding (Creswell 2014)

Creswell (2014) maintains that the findings of any qualitative research must be induced from methods of analysis that are systematic, disciplined and that can be seen and described. Transparent and detailed methods of analysis that are presented systematically can be easily scrutinized to determine confidence in the findings of the research. Grounded theory is a general style of doing analysis that is independent of any specific disciplinary perspective (Lawrence and Tar 2013). The grounded theory methods of analysis may also be adopted without using the complete grounded theory design (Punch 2005). Straussian GT in particular allows for rigorous; structured and traceable data analysis to complement case studies that want to achieve a greater level of generalisability and applicability than standard qualitative methods (Halaweh, Fidler and McRobb 2008).

The idea of grounded theory is that the generation of theory at various levels is invaluable for a deep understanding of a social science phenomenon. A theory is grounded when it emerges directly from the experiences and relationships of the people and processes that the research is trying to understand. The process itself involves multiple stages of data analysis to discover emerging themes and concepts in a systematic way. Although labour intensive, the strategy provides structure and rigour to the analysis process of large amounts of qualitative data in order to recognise indicators of a concept and refine these concepts by studying their interrelationships to then group them into categories at higher levels of abstraction in order to formulate a theory (Charmaz 2014; Creswell 2014). The basic idea behind the development of theory using grounded theory is depicted in Figure 3-1.

3.4.6.1 Labelling

The first level of coding, *Open Coding*, involves opening the data for conceptualisation by labelling actions and events that may or may not eventually be instrumental in forming theories. Punch (2013) describes these labels as indicators of a specific concept. Corbin and Strauss (2008) add that the concepts are the basic units of analysis. All concepts are provisional at the beginning, especially those that the researcher may have discovered from literature. Actions and events are compared and similar incidents are given the same

conceptual label. Conceptually similar events, actions or interactions may be grouped together to form categories and subcategories. Each concept earns its way into the theory if its presence or absence is consistent in the data collected (Corbin and Strauss 2008).

3.4.6.2 Memos

Memos allow the researcher to document hunches, ideas and thoughts about the data throughout the research process (Creswell 2014). The use of memos is extremely valuable to the researcher during open coding, because it allows the researcher to note his/her thoughts that arise from the analysis process, which may be the beginnings of more abstract categories and theories (Feeler 2012). Memo creation distances the researcher from the data to reflect on the emerging concepts and may help direct the researcher in identifying gaps in the data that need to be explored in further data collection phases. In addition, memos allow the researcher the opportunity to reflect on the interviews and realise perspectives that have not been covered in the interview for whatever reason but have relevance to the research questions.

3.4.6.3 Comparisons

The process of constant comparison, coding and memo creation is repeated several times to ensure rigorous coding and prevent oversight of concepts. The inductive process of grouping concepts into categories moves the analysis towards a greater level of abstraction and requires going through the data to test the fit of the category to related concepts and their indicators. In this way, all categories, no matter the level of abstraction, may be traced directly to data collected from the participant responses in the case.

To protect the final output of the research from being biased, Straussian GT requires that a concept's relevance to the emerging theory be demonstrated as either a cause, condition or consequence(Corbin and Strauss 2008; Halaweh, Fidler and McRobb 2008). If the concept has not been proven relevant, it must be discarded, even if the researcher feels that it is important.

3.4.6.4 Coding

Axial coding aims at achieving a greater level of abstraction. This coding process is directed towards examining the relationships that exist between different categories as well as their subcategories (Feeler 2012; Creswell 2014). These relationships are systematically tested against the data, using the S*traussian* GT coding paradigm. The use of a coding paradigm deviates from the original ideas of coding by Glaser and Strauss (1967). Glaser argues that this type of predefined algorithm limits coding creativity and forces codes and theories into existence. Researchers may focus more on applying the paradigm than allowing theories to emerge organically (Seidel and Urquhart 2013). Halaweh, Fidler and McRobb (2008) maintain that the paradigm does not supress emerging theories but merely allows the researcher to compare the relationships in a more systematic way. Furthermore, the structure provided by Straussian coding, using the paradigm, makes the theory easily traceable back to the empirical data and therefore more reliable. Although Seidel and Urquhart (2013) caution on the forcing of theories, they recognise the benefits of the technique and suggest a set of guidelines for the use of axial coding in practice to enhance theoretical sensitivity and complement the emergence of new theories.

The axial coding process strengthens the analysis, using constant *comparative analysis* of the data with other data and relationships. Data is analysed to the extent of breaking it down into individual units or concepts in open coding. The comparative aspect is evident as each unit of analysis is compared with others that have been labelled and then again compared with new data that is collected in follow up phases of data collection and analysis. This process of continuous data collection and comparative analysis is what makes this process constant. Feeler (2012) posits that the constant comparison and analysis of data and concepts crucial to GT involves progressively building up from the facts. The nature of comparative analysis also allows for comparison of all data that the researcher collects that relates to the case.

Open coding provided conceptual labels for the data. Axial coding grouped these conceptual labels into categories through constant comparison and systematically relating the data to each other. The open codes from the previous coding phase were examined, using constant

comparisons as described in Figure 3-1, to document the various aspects of the relationships between concepts.

Finally, *Selective Coding* is the highest level of abstraction, where the categories that emerged were unified into one core category. The selected core category had the strongest link to the other categories (Feeler 2012) and is meant to tie together the central ideas that emerged from the data into one coherent story that sums up the research and relates to the research objectives. Once a core category had been selected, the coding process became focussed on this core category and how the other categories related to it in terms of the coding paradigm. Creswell (2014) quotes the guiding principles for selecting a core category as suggested by Corbin and Strauss:

1. *It must be central. All other major categories must relate directly to it.*
2. *It must appear frequently in the data. The concept may be identified in most indicators.*
3. *The explanation that evolves by relating the categories is logical and consistent. There is no forcing of data.*
4. *It must have a suitably abstract name.*
5. *As the concept is refined, the theory grows in depth and explanatory power.*
6. *The explanation must hold true even if conditions vary although the phenomenon may be expressed differently to suit the condition.*

The relationships between the categories that were tied together by the core category resulted in the initial hypothesis (Corbin and Strauss 2008).

3.4.7 Use of specialised software for Data Analysis

CAQDAS represents Computer Assisted Qualitative Data Analysis Software. The software provides the researcher with assistance in analysing large amounts of data that is typical in qualitative studies. The purpose is to provide support in managing and organising the data to facilitate accuracy in data analysis. The software also provides useful tools to generate

reports needed for analysis as well as presentation of the results. It is important to note that the intention of the tools is to provide support, but it cannot conduct the analysis for the researcher (Punch 2013). NVIVO 11, which is available to students and staff at the university was selected.

The primary source of data in this study were the interviews that were first recorded and then transcribed for analysis. Open Codes or indicators detected in the interviews were cross referenced with memos, made during class observation and observation of online activity. Open codes were summarised under specific concept names by comparing indicators for similarities and differences. Concepts induced during open coding were input into the axial coding phase to explore connections between concepts through comparisons to derive categories on a higher level of abstraction that consolidate originating concepts and their indicators. The categories that resulted from axial coding were tested by feeding them through their root indicators and concepts to test the fit of the category for selection. Best fit categories that arose from selective coding were adopted as the emerging theory. Figure 3-2 illustrates the processes to be following through the grounded theory analysis of the interpretive data collected for this case study.

Figure 3-2: The processes followed through the Grounded Theory analysis (Halaweh, Fidler and McRobb 2008)

3.5 Issues of research soundness

Internal consistency is crucial to grounded theory research. Theories resulting from the research must be relatable to the data collected and applicable to the situation being studied. Glaser and Strauss (1967) maintains that the theories must be generated inductively from the data and remain uncontaminated by preconceived theories that may have emerged from literature. Detailed records of all data used in analysis were maintained so that propositions

and theories may be traced back to interview transcripts, memos, online activity/ participation and assessment results.

Reliability issues were addressed by ensuring that three of the four interviews were recorded and then transcribed to maintain accuracy. Technical difficulties experienced with the recording equipment in the first interview and the limited time available from the participants, resulted in a live transcription of the discussion for the first interview. The accuracy and reliability of the participants' responses were triangulated with their activity on the online classroom as well as assessments directly related to using technology effectively.

3.6. The UTAUT model

The Unified Theory of Acceptance and Usage of Technology (UTAUT) was derived from the synthesis of earlier models that predict the adoption and usage of technology like Technology Acceptance Model (TAM), Theory of Planned Behaviour (TPB), Innovation Diffusion Theory (IDT), Social Cognitive theory (SCT), Theory of Reasoned action (TRA) and the motivation model (MM) (Kocaleva, Stojanovic and Zdravev 2015; Venkatesh, Thong and Xu 2016). The model consists of four main constructs affecting Behavioural Intention to use technology and the Actual Use of technology and four moderating factors that influence the impact of the main constructs.

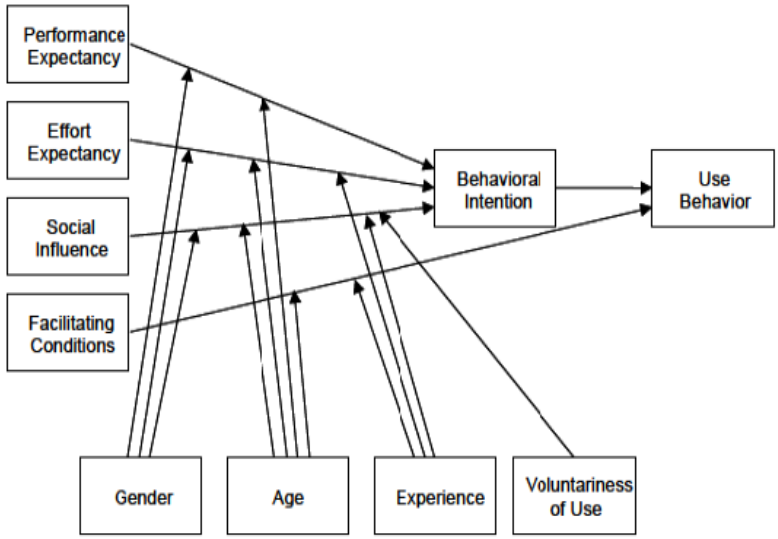

Figure 3-3. UTAUT model (Venkatesh et al. 2003)

Venkatesh *et al.* (2003) suggested Performance Expectancy (PE), Effort Expectancy (EE) and Social Influence (SI) to be determinants of Behavioural Intention (BI) to use technology. Behavioural Intention and Facilitating Conditions (FC) are represented on the model (Figure 3-3) as determinants of technology usage. PE is the degree to which the user believes that the technology will improve the way he does his job (Kocaleva, Stojanovic and Zdravev 2015). EE refers to the degree of simplicity of use to the user and SI is the degree to which the user perceives that others think he should use the technology. FC is the individual's belief that the organisation and the technicians will support his usage of technology. The moderating factors may or may not have significant effects depending on the context in which the model is applied. Gender regulates the impact of PE, EE and SI whilst Experience influences EE, SI and FC. Voluntariness of use regulates the impact of Facilitating conditions and Age on all four constructs (Venkatesh *et al.* 2003). This model focuses on factors affecting the adoption but fails to address the results of usage of technology that is essential to developing E-skills through E-learning as well as for effective use of E-learning.

3.6.1 Revisions of UTAUT model

Since it emerged in 2003, the UTAUT model has been the foundation of multiple studies prompting the revision of the original model to create the UTAUT2 (Venkatesh, Thong and Xu 2012), which retains the main constructs of UTAUT and contains additional constructs to make the model more applicable to the consumer context. Despite these modifications to improve the original model, literature still favoured the original UTAUT model over UTAUT2 (Venkatesh, Thong and Xu 2016). The commercialised nature of UTAUT2 also does not fit the educational context for E-learning adoption from the student perspective. The new UTAUT multi-level framework depicted in Figure 3-4, is a product of integrating valid extensions posited by empirical research using previous UTAUT models. The new framework provides a foundation for future work in the face of the dynamic world of ICT innovation and adoption (Venkatesh, Thong and Xu 2016).

The relevance of the UTAUT framework in the context of University students and their adoption of E-learning technologies is critical to the success of university students. As

mentioned earlier, E-learning has been widely adopted internationally for its benefits to teaching and learning. Technology itself has revolutionised teaching and learning creating more student-centred approaches to education to develop 21st century skills. The adoption and overwhelming effect that technology can have on first year students and their learning environment, can have a negative impact on student motivation and anxiety especially if they have been disadvantaged and not had sufficient experience with technology prior to university. The UTAUT has been tested for validity and robustness in different cultures and different contexts finding similar results in different contexts but a significant variance in the effect of the moderating factors in different cultures (Simeonova, Bogolyubov and Blagov 2014). The UTAUT has successfully been used in previous research conducted within the South African culture (Murire and Cilliers 2017).

3.6.2 UTAUT Framework in University E-learning context

The new UTAUT framework consists of three levels of factors contributing to technology adoption. Higher-level contextual factors allow for analysis of effects of factors relating to the organisation or environment in which the user and the technology exist, whilst the individual level contextual factors represent those factors that directly influence the individual user of the system. The baseline model incorporates the most significant effects on adoption and initial usage making this middle segment of the model valid for use on its own without the other two levels (Venkatesh, Thong and Xu 2016). The baseline model, which makes up the middle part of the framework combines EE, PE, SI and hedonic factors into the *individual beliefs* factor on the framework.

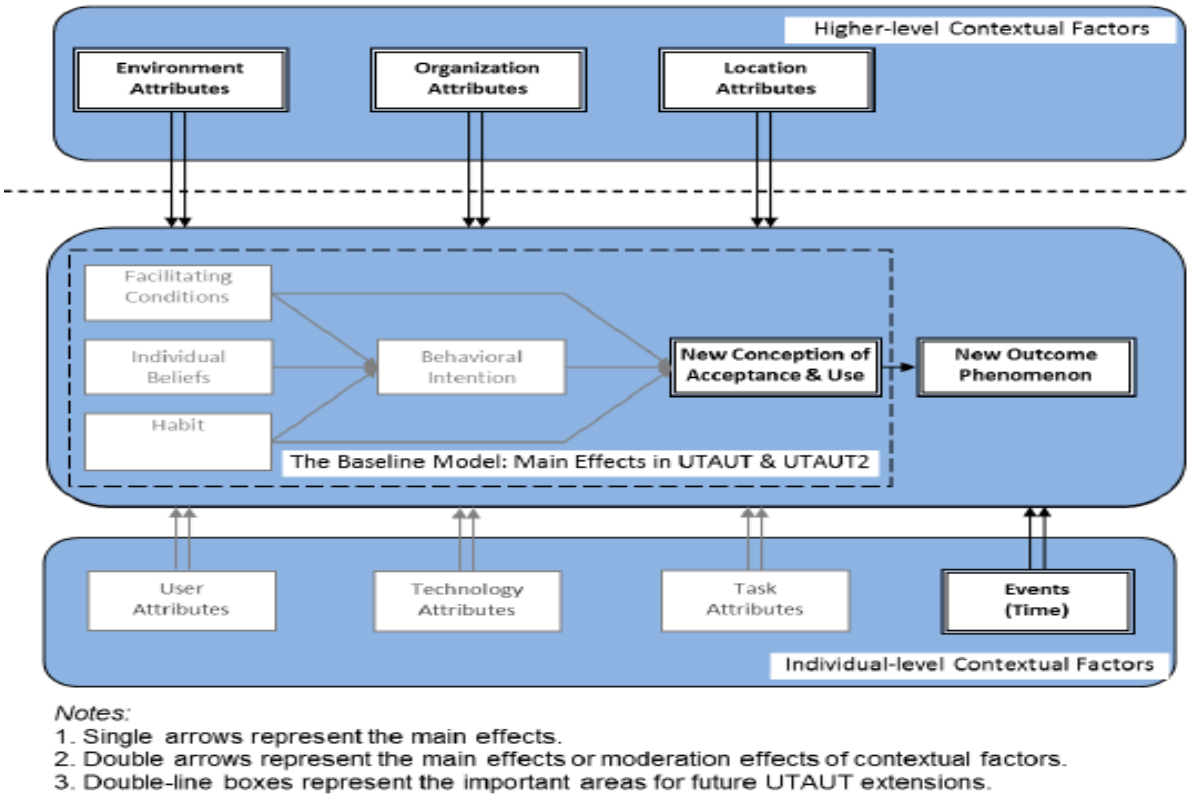

Figure 3-4: A multilevel UTAUT framework (Venkatesh, Thong and Xu 2016)

The effect of EE on adoption may exist only in the initial stages of adoption however, its effect diminishes if the user expects the technology to improve his learning (PE) and he has sufficient technical support and support from his teacher (*FC*). Considering high dropout rates at universities due to financial difficulties and underprepared students, the effect of EE should not be excluded. In the context of E-learning, EE and the student's attributes may be used to inform instructional designs to accommodate diversities in student capabilities and experience with technology. *Habit* refers to the tendency of an individual to repeat learned behaviour. This factor may be valid for university students who may revert to old habits of learning and completing assessments if they are unfamiliar with technology, possibly leading to them not participating in E-learning activities (Simeonova, Bogolyubov and Blagov 2014; Yilmaz 2017).

To cultivate new habits directed towards technology usage for learning purposes, adoption, usage and repetition of tasks are required. Habit and Facilitating conditions directly affect Acceptance and Actual Usage of technology, which subsequently results in the outcome phenomenon introduced in this new UTAUT framework. The outcome factor suggests that usage of E-learning technology will result in increased performance in achieving learning objectives (Bere 2014), which in turn will result in users making use of the E-learning technology more often, using more features of the technology and finding new ways of using the technology for learning(Wang, Myers and Sundaram 2013; Venkatesh, Thong and Xu 2016).

Higher level contextual factors that affect initial adoption and usage, like organisational attributes, also moderate the effect of the main factors. Universities may provide a culture of support and active engagement to promote E-learning adoption amongst students. Given the socio-economic backgrounds of students, the availability of equipped computer laboratories for student access creates an environment for adoption and the access to open-labs create a culture of support for those students who may otherwise be prevented from accessing, adopting and using E-learning technologies. The environment and culture of learning through technology increases SI and PE so that the effects of EE are minimised for underprepared students (Thomas, Singh and Gaffar 2013). Location attributes of the UTAUT refers to differences in national industrial cultures and insufficient evidence is available in literature to examine its effects on local culture between rural and urban societies where diversities in e-inclusion exists for developing countries like South Africa. Since the primary location for this student is at the university, location will be excluded from the focus of this study.

Literature most often focuses on adoption and initial usage however, limited research exists on post-adoptive usage and the effect of feature level usage of technology (Venkatesh, Thong and Xu 2016). The multilevel UTAUT framework makes provisions for outcomes from usage such as increased performance, user satisfaction and E-skills development.

3.7 Applying the UTAUT Framework to the research design

Despite the fact that access to technology has improved over the last five years, the digital divide still exists. The digital divide now focuses heavily on usage of technology and outcomes of technology usage due to insufficient knowledge workers and decline in education especially in maths and science (Baller, Dutta and Lanvin 2016; Yu *et al.* 2016). E-skills is synonymous with life-long learning skills that are required to educate and sustain knowledge workers in a competitive knowledge economy. A model to advance E-skills of students, particularly those who may have experienced digital division will be invaluable for building the economy. The decision to integrate technology into a classroom is a decision made by the educator(Cheung *et al.* 2016). Even if the educational institution deems it mandatory, the extent of integration and adoption remains dependant on the educator.

Kocaleva, Stojanovic and Zdravev (2015) successfully applied the UTAUT model to the E-learning context examining the adoption of E-learning by university staff. E-learning was not mandatory and owing to the time investment required to learn how to use E-learning, the adoption and usage of E-learning by staff was most significantly affected by EE and FC. The availability of support staff plays a critical part in boosting their self-efficacy for using E-learning. In a separate study, FC, specifically the availability of technical support and teacher support, played a significant role in adoption of E-learning by students (Attuquayefio and Addo 2014). Thomas, Singh and Gaffar (2013) posits that the predictive effect of FC on BI becomes significant when resources become limited and that FC has no effect on the BI of students in the mobile learning context when PE and EE are included. Studies relating to E-learning present EE to be significant in the early stages of student adoption but its effect diminished with continued usage. Continued usage of E-learning reduced the effort required from the student to use the technology implying that some skill development has taken place in a 'practice makes perfect' effect. Refining this effect is the focus of this study.

Students will use the technology if they believe that the use of technology will be beneficial for their learning (Thomas, Singh and Gaffar 2013). Furthermore, when provided with ample support from technical and teaching staff, students will adopt and use the system despite

their technological competence and the degree of difficulty in using the system (Attuquayefio and Addo 2014; Mohammadyari and Singh 2015; Adamu 2017). The educator facilitates teaching and learning in a classroom and is the starting point for any module. For students to believe that E-learning is beneficial and that support is available, the educator will need to instil these beliefs in their students for adoption to take place. Once E-learning is underway, its success, as depicted in Table 2-3, is dependent on :

- ✓ the learner's skill, confidence and knowledge to use technology for learning purposes (Littlejohn, Beetham and McGill 2012; Council on Higher Education 2014; Yilmaz 2017),
- ✓ an interest in the content as well as the technology (Becker *et al.* 2012; Gorman 2015),
- ✓ prior experience with technology (Duisterwinkel, van der Aalst and den Brok 2014),
- ✓ technology use for learning activities support the pedagogy (Aparicio, Bacao and Oliveira 2016),
- ✓ effective use of language in the online classroom (Mutula 2005; Parliamentary-Monitoring-Group 2016; Yilmaz 2017),
- ✓ provision for multiple pathways for achieving outcomes for diverse learners (Triantafyllou and Timcenko 2015; Murire and Cilliers 2017),
- ✓ organised and structured course material (Duisterwinkel, van der Aalst and den Brok 2014; Ter and Herrington 2014; Triantafyllou and Timcenko 2015),
- ✓ different approaches and types of activities to address diversities in learners abilities and learning styles (Mirriahi, Alonzo and Fox 2015; Triantafyllou and Timcenko 2015),
- ✓ timely constructive feedback from educator (Adegbenro, Mwakapenda and Olugbara 2012; Wastiau *et al.* 2013).

This research design framed the way students' learning experiences with technology were observed, as well as their performance in their coursework and their E-skills development over the duration of a course that utilises technology for teaching and learning were monitored. The UTAUT model incorporates constructs that affect adoption of E-learning by students, continued usage and the possible outcomes that may arise from continued usage of E-learning technologies. The observation and interpretation of student experiences with technology and their ability to use technology (E-skills) provided theories that can connect E-learning usage with E-skills development.

3.8 Chapter summary

This chapter described the constructivist philosophical view underpinning this study and the subsequent selection of a qualitative approach to discover answers to the research questions that have been posed in Chapter 1. Qualitative research allows for discovery of theories and constructs that are not well documented, which is the case with the relationship between E-learning and the development of E-skills. Motivations for the selection of case study research and its potential to discover the rich data for this work, as well as its ability to allow the researcher to discover concepts and theories within the context of the case were presented. A number of methods exist for selecting and constructing cases therefore this chapter explored these methods of sampling and provided insight into the relevance of the selected case, its construction and how it will contribute to this research. The chapter then identified and motivated the selection of suitable tools and methods for data gathering. To achieve trustworthiness in the collected data, further data collection activities, including students' LMS activities and their progress in class, were described. A strategy for data analysis using grounded theory analysis was described and substantiated. Straussian GT has been selected to guide the analysis process of data. The processes applied to the collected data such as open coding to fracture data, constant comparative analysis and the subsequent grouping into categories were examined and their relevance was discussed with respect to the research questions and the sample. Finally, the process to select a core category was discussed together with its ability to unify the central idea emerging from the data and tie up the categories into a unified explanation or theory relating to the relationship between E-skills and E-learning.

The next chapter will explicitly present the results that has been collected using methods that were appraised and selected in this chapter. The chapters that follow will go on to discuss and analyse the findings of the analysis. The hypothesis, categories and general theory emerging from the data derived from students experiencing E-learning in an undergraduate course in DUT will then be used to develop an E-learning design framework that is capable of advancing the E-skills of its users.

CHAPTER 4 - Results

4.1 Introduction

The Research Design described in Chapter 3 was utilised to coordinate the collection and analysis of data from first year students enrolled in an undergraduate course at DUT. The chapter aims to examine the participants in the sample to establish the existence of diversity of E-skills in first year Information Technology students (RQ1), determine the elements of E-learning that could influence E-skills development (RQ2) through interviews, observations and test scores. Data collection focussed on the students' experiences with technology and their reflections on how they have may have developed their E-skills.

This chapter describes the roles of the researcher and the participants in the project and then moves on to provide an overview of the results of the interviews that were conducted, the broad observations made about the participants, their E-skills as well as the data during the initial coding phase.

4.2 A review of the research questions

Chapter two provided an extensive review of literature that contributed to the discovery and understanding of the factors critical to successful E-learning. The chapter also found that these factors can be compared to literature that focussed on considerations for E-learning design. A review of relevant current literature contributed to the discussion of the categorisation of E-skills into specific levels as required by an individual for successful participation in learning and the economy. To discover what is needed to develop E-skills, RQ1 seeks to assess students' readiness for E-learning by establishing the existence of diversity in their E-skills,

RQ1 Are there diversities in first year Information Technology students' E-skills?

The selection of focus group candidates was dependent on their levels of prior experience with technology. Chapter 3 identified the characteristics of each focus group within the case

and this chapter presents empirical evidence relating to the E-skills of participants within each focus group and reports on the diversities detected among first years students enrolled in the same course.

This chapter presents a critical discussion of the data analysis directed towards resolving the remaining research questions:

RQ2 *What elements of E-learning are likely to contribute to developing the E-skills of students?*

RQ3 *What learning activities do students at different E-skills levels, find useful for their E-skills development?*

RQ4 *How can E-skills development be advanced through E-learning?*

4.3 The researcher's role

The researcher facilitated group discussions with students of similar E-skill levels to observe student accounts of their experience with technology and discover details of the experience that affected their E-skill development positively or negatively. The researcher recorded and transcribed the discussions for preliminary analysis to prepare questions for the follow up discussion with students as per Grounded Theory and case study methodology (Corbin and Strauss 2008; Halaweh, Fidler and McRobb 2008; Lawrence and Tar 2013; Seidel and Urquhart 2013)

4.4 The participants and their roles

This research examines a group of first year undergraduate students as a single case over time observing firstly their development in E-skills during that time and secondly the reaction from both students brand new to technology (novice) and those who have used it previously (experienced). The participants were part of the 2017 cohort of students in their first year of study who volunteered to contribute to the research. The demographic data relating to the participants is represented on Table 4-1 showing details such as age, gender, and their

classification in terms of prior experience with technology (novice or experienced). Of the entire group of 60 first year students, fifteen novice and fifteen experienced students were invited to participate; of which sixteen students responded in total. Since these participants met the sampling criteria for the case, and this being a qualitative study, the number was sufficient for the study. All sixteen participants provided a signed consent form authorising the researcher to use their responses for the purpose of research excluding their actual names. The names appearing on the table are pseudonyms. Of the sixteen, 3 were female and 13 were male. Five participants were interviewed as the experienced user focus group and the other 11 were interviewed as the novice user focus group. These numbers are in no way proportionate of the demographics of the classroom, they were selected using theoretical sampling methods combined with willingness and their availability.

Table 4-1 : Participant Details

Participant	Age	Gender	Focus Group	Hours of activity on LMS	Number of online discussions active	Formal test E-skills Level 1 and 2 (%)	Paired Assignment (%)	Self-Assessment (%)	Group Project (%)
Randy	24	M	Experienced	5,22	2	64	96	39	62
Sli	21	M	Experienced	5,78	3	84	95	85	61
Sphe	22	M	Experienced	14,08	4	69	100	30	75
Timmy	20	M	Experienced	12,23	3	66	95	30	68
V	20	M	Experienced	11,33	4	71	87	53	62
Ali	21	M	Novice	8,79	4	55	71	68	80
Dubs	21	M	Novice	2,7	1	61	60	33	75
Hugo	23	F	Novice	11,74	3	66	73	40	70
Kanye	21	M	Novice	14,15	3	50	71	57	61
Mba	23	M	Novice	11,74	4	50	73	35	81
Mbu	20	F	Novice	13	4	57	50	12	61
Mini	18	M	Novice	12,9	4	42	70	42	75
Mtho	19	M	Novice	6,79	3	51	70	44	70
Q	23	M	Novice	12,09	5	60	100	35	81
Sandy	18	M	Novice	19,69	5	67	98	28	61
Za	23	F	Novice	9,46	3	54	73	39	70
Miss N	45	F	Instructor						

4.5 Addressing Verification and Generalisability

The initial theoretical sampling for this research required that participants be first year students actively engaged in E-learning. Although E-learning activities are not limited to activity on a LMS, the number of hours of activity and the number of discussion groups the participant contributed to was sourced from activity reports generated from the Blackboard classroom to verify their engagement with E-learning. All students regardless of their background with ICT were taught using the same e-classroom in Blackboard and attended lectures as a single group. This project was not experimental and simply explored the E-skills phenomenon through group interviews with students in the natural setting of the module. This context allowed the case to share in similarities to other typical first year E-learning

classrooms that would consist of students with diverse E-skills. This context was directed towards improving the applicability of the results of this research to other similar cases.

Each focus groups' reaction and experience with E-learning technology relative to their E-skills was observed separately so that their reactions and experiences could be compared. In doing so, the framework can also address E-skills development at multiple E-skills levels.

4.6 Technology related tools and activities

E-learning tools are not specific to or limited by the adopted LMS. E-learning is about technology enhanced learning not limited to the LMS. Over the period of observation and data collection, students were required to make use of multiple technologies in their learning activities and learn new skills that were important for their learning, like connecting to the university Wi-Fi as an example.

4.7 Initiating data collection and analysis

The initial stage of data collection was conducted early in the year to get an understanding of their experience with technology from the perspective of students who still have not developed their E-skills. Although many students who were new to technology attended the initial group interview, some did not attend subsequent interviews or did not complete the consent form therefore their responses were excluded.

Following each data collection event, the Straussian GT methods of data analysis described in section 3.4.6 were applied to the collected data to identify indicators of concepts. As subsequent data collection events were conducted, new indicators of concepts were identified, more instances of indicators identified in preliminary analysis was also detected. Concepts and indicators are presented in a table format within this chapter to improve readability and presentation of indicators, concepts and emerging theories whilst maintaining the structure of Straussian GT analysis and presenting levels of abstraction as suggested by Punch (2005); Corbin and Strauss (2008); Halaweh, Fidler and McRobb (2008); Calisir *et al.* (2014); Charmaz (2014). The identification of initial codes, their relationship with each other

to form concepts and their connection to emerging theories is captured by (Punch 2005) in Figure 4-1. Categories may subsequently be compared and contrasted to identify relationships that may be presented as an emerging theory (Corbin and Strauss 2008; Halaweh, Fidler and McRobb 2008; Feeler 2012).

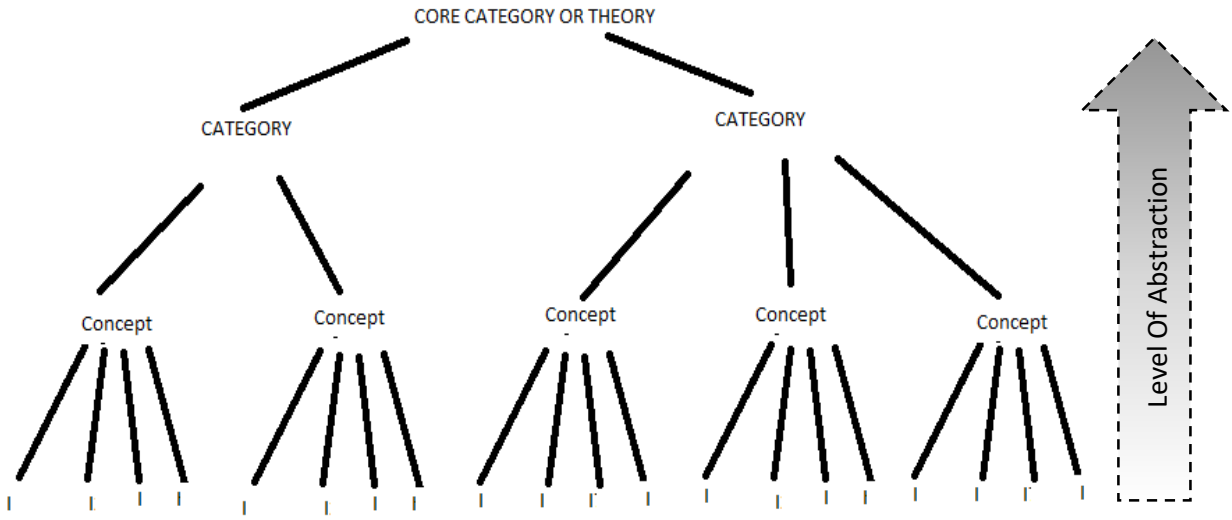

Figure 4-1 Concept Indicator Diagram showing levels of abstraction - Adapted (Punch 2005)

4.7.1 Interview 1 – Novice Group

The first data collection event was Interview 1 with the novice focus group of students who had no or very little experience with technology prior to university. The initial questions that were prepared to guide the interview were based on the research questions and the study of related literature (Corbin and Strauss 2008; Seidel and Urquhart 2013). These questions were directed towards gathering data about their experience with technology in a learning environment and how they were adapting to the use of technology in their first year.

The questions selected to initiate the discussion included:

a) Can you tell me about your experience with ICT at DUT?
b) What has helped you with learning how to use ICT at DUT?
c) What difficulties have you experienced?
d) What do you think will help you get better at using technology?

The overall tone of the responses indicated much anxiety and fear about being required to use something they know nothing about. The responses were focussed more on their feelings than their ability to use of the technology itself. The anxiety and fear reportedly stemmed from their lack of relevant skills to use the technology properly. These displays of anxiety correlate with the findings of Navimipour and Zareie (2015), who associated students internet use skills, experience, self-confidence to anxiety when using computers for E-learning and the negative influence this anxiety had on user satisfaction. Fleming, Becker and Newton (2017) also found that the complexity experienced, when using an innovation, affects user satisfaction and subsequently future use and the overall success of E-learning. Simeonova, Bogolyubov and Blagov (2014) further contribute that extrinsically motivated individuals are negatively affected by anxiety, causing them to avoid use of a system if they are not motivated by someone else.

It is important to note that the first interview of the present study took place earlier in the year when participants were still engaged in the Computer literacy course directed towards providing the basic training and support. The importance of Computer literacy courses for building operational level E-skills and information navigation skills is supported in literature (Ng 2012; Youssef, Dahmani and Omrani 2015).

Figure 4-2. Word cloud of first interview transcript

After transcribing the first interview, the NVIVO 11 Word Frequency tool was used to identify broad concepts for coding by looking at commonly used words that have similar meaning in order to conceptualise data. The word cloud, shown in Figure 4-2 was created from the transcribed first interview and the initial analysis showed many instances relating to communication, for example references to "communicate, communicating, discussion, chatting, help, emails, discussions, announcements". They also imply significant dependence on people with references to "others, group, people". In addition, their discussion about their experience with technology in the learning environment showed evidence of difficulty and anxiety, as there was frequent mention of words such as "pressure, challenging, afraid, Challenge, difficult, complex, different". The terms "like" and "mam" were excluded from the initial analysis as closer inspection showed these to be general parts of their speech. In addition, the discussion of this particular interview was focused on their "use" of technology therefore, "use" was also excluded.

These early observations were captured in Memos that were documented in an Excel document. The specific Memos relating to these observations provided direction for theoretical sampling and are depicted in Figure 4-3. The Excel document provided greater flexibility, because it was more accessible than NVIVO from multiple locations where interaction with participants or data were taking place.

Theoretical sampling guided the subsequent interview to gather more detail and description of these early concepts (Creswell 2014). The subsequent interviews however, were not restricted to these early concepts and were flexible to allow for new concepts arising from their prolonged experience to emerge.

Memo3	*Interview 1*	*Level of dependence in this stage leads them to seek help and communicate with others. Next interview needs to examine how they have communicated with others, why, results of that communication*
Memo5	*Interview 1*	*Seeking help from different sources like peers, instructor, online tutorials which requires them to communicate often. Further look is required on how they are communicating, what mechanisms. How they are sourcing knowledge from the internet.*

Figure 4-3 : Initial coding memos

The initial list contained 64 codes. From this list, 25 auto-codes, which were created at the initial stages by the software, were removed from the codes related to concept development, because the auto-codes were actually created using the participant names as codes. Although the participant name codes could not represent a concept, and were not used for directly inducing a concept or theme, the participant names as code became useful later for tracking and observing individual participant responses and their development over the course. In this way evidence of E-skills development in each individual participant could be tracked from one interview to the next.

4.7.2 Interview 2 – Novice Group

The questions that would initiate the second interview with the novice group were determined by the preliminary analysis of the first interview.

All sources were re-examined and analysed, using the 41 codes that remained. These codes were compared to others to identify relationships and similarities to achieve a higher level of abstraction by classifying related or similar codes into concepts. Related concepts were then arranged into emerging categories before conducting subsequent interviews.

The dependence that novice participants exhibited on others was a result of the anxiety brought on by unfamiliar technologies and an unfamiliar learning environment. Communication emerged as a key concept that was required for their 'survival' in E-learning, therefore this concept was explored further in the second interview to identify how the students communicated with instructors and peers, if there was any changes in the methods, or technologies they used to communicate with others and to establish why they felt communicating with others was necessary. Questions included:

1) How has your communication abilities changed now that you have been using technology more frequently.? How are you using technology to communicate?
2) Has there been any change to the way in which technology is being used from before?
3) What type of tools and technologies are being used?

4) What will help improve the way you work with information and communicate using the computer?
5) How do you find information and learn about things now. Is it the same?
6) Have you learnt how to do anything new and exciting with technology?
7) What led to you learning about these things?
8) What has helped you the most in learning to use technology for learning purposes.

4.7.2.1 Theoretical sampling and theoretical sensitivity

As described in section 3.4 theoretical sampling refers to data collection events in a sample intended to explore indicators, relationships and comparisons within a case that may either provide support to emerging theories or neutralise them. Theoretical sensitivity, on the other hand, is a way in which data is analysed, that one may detect indicators of concepts, relationships between indicators and concepts, comparisons between concepts and categories in order to derive new theories or support preliminary theories that emerged in the earlier analysis of data (Charmaz 2014).

The tone of the second interview was significantly different from the initial interview with this novice group. Students were less anxious, had moved away from 'complaining', and were now willing to share their experience. The group's attitude toward technology was now more positive and focused on the technology and its usefulness more than their feelings. Pange and Pange (2011); Duisterwinkel, van der Aalst and den Brok (2014); Ukwoma *et al.* (2016a) agree that communicating and emphasising the usefulness of technology motivates the student to overcome anxiety, become comfortable and engage in a technology enhanced activity. In a separate study, Attuquayefio and Addo (2014) further provide quantitative evidence that although Effort Expectancy (EE) was significant in the initial stages of adoption by students in Ghana, EE diminished through continued use over time as it has in the present study.

Interview 2 was conducted in the final month of the first semester after 4 months of the Computer Literacy course. Responses from participants show evidence of operational skills and functional skills, for example Za comments that she finds the computer easier to use now because it has more options than her phone. She further comments that she was able to

identify free Wi-Fi networks available at the public train station and successfully connect her device. In the first interview the same student commented with much irritation at being 'forced' to use technology:

> **Za:** We don't know how to use internet but now we have to look at internet all day. We have to get used to this way of things and communicating on the internet.

Initial coding and comparative analysis of the interview data revealed a gap in the data that was important to the development of E-skills. The first two interviews addressed issues surrounding the experience of using technology and identifying evidence of development. Further data was still needed to understand how they came to develop their abilities and what was important for their development. These issues were addressed in interview 3 of the experienced group as well as interview 4 of the novice group.

4.7.3 Interview 3 – Experienced Group

The more experienced students entered university having prior experience with technology and appeared to show competence in at least the operational, information levels of E-skills with some having achieved competence in social and creative E-skills levels. This group of students were able to provide data from the perspective of individuals that have already developed their skills, providing insight into key contributors to their development and the conditions that facilitated the development. This further promoted understanding of their experience of using technology for learning purposes within a university environment. Their ability to debate issues with others in the group was more significant than their less experienced peers, who merely reported their own experience. For example in the extract below, Timmy in this group challenges another student who suggests You Tube as a valuable source to learn new skills. Timmy maintains that You-Tube is useless if you don't have internet at home, however, others in the group were able to identify solutions to this problem, suggesting that one can download and then watch the videos at home:

Timmy: *if you want to access you tube what you gonna do, you don't have internet. Internet should go in hand with that devices.*

Sli : *Download, you can download videos from youtube*

Sphe: *Yea, you can download on campus and take it home*

These participants seem to be more willing to adapt to new technologies and learn how to use them for their own curiosity. They are able to find solutions to technology related problems more easily and do not show signs of anxiety and fear. Using diverse methods to learn and a greater involvement in the use of technology seemingly improved their confidence and ability to adapt to new technologies. Sli comments that originally he would not touch a computer and was afraid that he would 'kill' it but now he likes to experiment and 'try everything'. Youssef, Dahmani and Omrani (2015) also suggests that more mechanisms used for learning new technology and increased involvement improves the technological absorptive capacity of a student, which is a valuable skill in the workplace.

Theoretical sensitivity and coding of this interview showed similar concepts identified in previous interviews with the less experienced groups. The interview with this group was instrumental in identifying additional indicators such as curiosity, reassurance and diverse reaction to new technology. These indicators triggered theoretical sampling of earlier data in earlier interview transcriptions and subsequent interviews for theoretical sensitivity to the concept of motivation. This course of analysis lead to the discovery of multiple indicators of motivation in earlier interviews conducted with the less experienced group.

4.7.4 Interview 4 – Novice Group

The questions prepared to guide the fourth interview (third interview of novice students) were created to address gaps from the initial analysis of previous data as mentioned earlier; however, the interview was flexible to allow for participants to raise issues that have emerged since the last interview. The semi-structured interview questions included:

1) How did you learn how to do new things and use technology in new ways?
2) So why did you learn it. What motivated you to learn how to use this technology in this way?
3) How do you feel about the internet after your experience with technology over the past few months?
4) Now that you have used an example of technology a few times, is there any change to how you are able to use the same technology afterwards? (if yes)What kind of changes?
5) What else can you tell me about how you learnt to improve your skills or what helped you?

This interview was conducted with the novice group approximately seven months after the first interview, which means, that they had experienced eight months of interaction with technology. The discussion itself was more fluid and energetic, suggesting that the participants in this group had developed their confidence with technology as well as to speak out within the group. They were also in a position to reflect on their abilities when they arrived at University and compare those abilities to their current level of skills. What is interesting to note is that they were now reflecting on tasks that they had originally 'complained' about and commenting on how it helped them. For example an extract from interview one shows learners complaining about having to register on free online courses and complete work frequently:

> ***Mbu:*** *Miss N tells us we must finish this free online course by this date and then another one by that date*
>
> ***Za:*** *But we don't even know how to register for the course. We are not sure how to do it. We don't know if we are doing it right. It is scary, we don't know if it will work and we have to do it ourselves.*

In interview 4 the same student comments on the support from her instructor to use online courses to teach themselves new skills.

> ***Mbu:*** *Even Miss N is helping us with a lot of things that we do. The way she always says to go to Khan Academy teach yourself and then you do the exercise.*

And then later in interview 4 she comments:

> ***Mbu:*** *Some things are hard to understand but you go to her and she explains it.*

They did not seem to remember that they had previously complained about this phenomenon of using online courses on their own so this observation was noted quietly during the interview, without mentioning it to them for fear of making them uncomfortable or changing the energy of the discussion.

These types of responses feature in two contrasting aspects of technology use and adoption explained by the UTAUT framework of Venkatesh, Thong and Xu (2016). On the one hand, that of the effect of individual beliefs on Behavioural Intention. If a technology requires too much effort then the user is unlikely to want to use it. On the other hand if the user receives the necessary support and motivation (Facilitating Conditions) then they will use the technology despite the EE, because they believe the technology to be useful (Venkatesh *et al.* 2003; Attuquayefio and Addo 2014; Venkatesh, Thong and Xu 2016). In addition, the experience the novice group of students in the present study had accumulated from their usage, positively affected their EE, because they were now getting used to it (Venkatesh, Thong and Xu 2012).

Interview four was instrumental in identifying the importance of support for the participants and their development of E-skills. This concept created the link between the initial anxiety and their current motivation. Repeated analysis of the data after Interview 4 raised this concept to be a significant concept/category in the emerging model.

4.7.5 Interview 5 - Instructor

This interview was not originally planned. The case study design complemented by Straussian GT methods of analysis provided the researcher with the flexibility needed to continue to collect data until no new data emerged and the concepts may be explored fully and repeatedly if needed (Halaweh, Fidler and McRobb 2008; Feeler 2012). The need for an instructor's perspective of the E-learning experiences of the case was a result of the axial coding process. Continuous mention was made of the instructor, the tasks allocated by the

instructor, and the support provided by the instructor and the instructor's presence. Although the focus of this research was to explore what students experienced to be significant in their E-skills development; the views, experience and recollection of the students' development provided a practical way to triangulate the student experience with E-learning and E-skills. Furthermore, the instructor selected for Interview 5 was not involved in this research; she was simply an instructor in a second course that all the participants had enrolled in, and that also used E-learning. The instructor was able to provide a contrasting perspective of the E-skills development of the participants in the case consistent with the multiple sources and views required to understand a case under study (Punch 2005; Halaweh, Fidler and McRobb 2008; Creswell 2014). Her input into the difficulties experienced by the students in class, her observations of their attitude to the use of technology for learning, the group dynamics and peer relationships that developed, the type of support the students requested from the instructor and how the instructor balanced the use of technology for E-learning with the diverse E-skills levels of the students in the class, was valuable data.

The questions used for the instructor interview were semi-structured, derived from earlier analysis of the data to ensure theoretical saturation (Feeler 2012). By the fourth interview with the student participants, students were reinforcing aspects of their development that they had already mentioned in earlier interviews. Evidence of this is shown in tables 4-3, 4-4, 4-5, 5-6, 4-7 where no indicators or concepts were detected in interview 4 (I4) that was exclusive to interview 4.

In Interview 5, the instructor's observations of the student's E-skills development corresponded with student accounts. The instructor was adamant that students should be made aware of the need for the technology and its alignment to the pedagogy, which concurred with the student Interview 1, where students wanted to know why they had to perform certain online activities. The works of Attuquayefio and Addo (2014); Duisterwinkel, van der Aalst and den Brok (2014); Tiyar and Khoshsima (2015); Youssef, Dahmani and Omrani (2015) equally stress the importance of communicating the usefulness of adopted technologies to the student when introducing new tools or technologies to supplement their learning.

The instructor's observation that the students shared knowledge by the end of the semester or year also coincides with student remarks that they learn from each other. The instructor did not comment on the novice student's dependence on the more experienced students in the early stages of the course. The reason may be that the peer support took place outside of the classroom when the instructor was not present.

Another difference in student and instructor data was that the instructor did not perceive the anxiety experienced by the students to be significant whilst elements of the anxiety related to technology usage were detected in all 4 student interviews. The instructor observed students to increase effort in classroom and only request help if they needed. The contributions of Feeler (2012) and Adamu (2017) may explain why the instructor did not see evidence of anxiety in the classroom. Feeler posits that Instructor presence is critical to successful E-learning and that the role of the instructor may vary but his/her presence is something the students would look for when needed but prefer to be assured that the instructor will be available when instructor support is needed. In a separate study, Adamu (2017) posited that the instructor's support and encouragement motivated students to take on E-learning despite any difficulties they might be experiencing because the instructor assures them of its usefulness hence they persevere and overcome their fears. The impact of the instructor support is discussed in detail in section 4.8.4.

Although the significance of some of the elements related to E-skills development varied between instructor and student, the list of elements relating to E-skills development and E-learning had reached saturation as no new elements were detected in this final interview.

4.8 Chapter Summary

The chapter set out to establish the existence of diversity of E-skills in first year Information Technology students (RQ1), determine the elements of E-learning that could influence E-skills development (RQ2) through interviews, observations and test scores.

Voluntary participants in the case study were organised into two focus groups, the Novice Group who had never used a computer before or the Experienced Group of students who

were able to use the computer independently. The researcher was easily able to secure voluntary participants whose E-skills ranged from none at all to higher level E-skills thereby establishing the existence of students with diverse E-skills in the first year course(RQ1).

The primary data was collected from 4 interviews with the students and one interview with an instructor. Triangulation of data with test results confirmed students' competence in using technology for learning purposes.

The sections that follow discuss the elements of E-skills development through E-learning that were detected in the blended E-learning course experienced by the selected case of first year undergraduate students. The results presented in chapter 4 of the data collected is then critically analysed and discussed in detail to substantiate the emergence of each element of E-skills development stemming from E-learning.

CHAPTER 5 - Discussion

5.1 Introduction

This chapter will identify specific types of E-learning activities that students will support the advancement of E-skills at different levels (RQ3), and explore ways in which E-skills development could be escalated through E-learning (RQ4)?

The initial open coding phase of Grounded theory analysis takes place intermittently with data collection and that was discussed in chapter 4. The axial coding phase allows for deeper analysis to detect categories at high levels of abstraction. Comparisons between concepts and categories are discussed to establish the need for each one and the reasoning behind its existence at the category level of abstraction. This chapter will also discuss and compare the results from the two focus groups.

The chapter concludes with a summary that recaps on the key findings and categories identified in the analysis that were instrumental in the development of the E-learning Framework which will be presented in the final chapter.

5.2 Emerging Categories

Grounded theory coding and levels of abstraction are shown in figure 4-1. Categories are high levels of abstraction derived from the analysis and comparison of related concepts which in turn were derived from analysis and comparisons of related indicators (Corbin and Strauss 2008; Feeler 2012; Punch 2013). In the sections that follow each category is described in detail presenting the concepts and indicators that ground the category back to the data presented in chapter 4. Concepts and indicators of each category has been portrayed in table format to facilitate the presentation of concepts together with the indicators from which the concept was derived whilst further specifying the source document from which each indicator was detected. The table assists in substantiating how each category is grounding in the raw data (source document). Interview transcriptions documents are abbreviated using the letter *I* whilst memos are abbreviated using the letter *M* on each table. The transcribed interviews

from Interview 1 to Interview 4 is appended to this document as Appendix 1 through to Appendix 4 respectively. All names appearing on the transcribed interviews are consistent with pseudonyms used to reference each participant in this chapter.

5.2.1 The category of Usage Related Anxiety

Evidence of anxiety had significant representation in the data in multiple forms however; the anxiety could be classified into two major concepts; anxiety arising from lack of competence to use the technology, and anxiety arising from being forced to use technology for learning within a limited time. The concepts relating to this category, its indicators, source documents in which these indicators were detected, together with the total references in the source document that link to these indicators are represented in Table 5-1.

Table 5-1: The category of Usage related Anxiety

Concept	Indicators	Sources	No of references detected
Competence anxiety	feeling unprepared	I1,I2,I3,I4,I5, O1,	22
	exclusion anxiety	I1,I2,I3	7
	cask Complexity	I1,I2,I5	7
	workload	I1, I2, I5	4
	preference for easy to use technology	I1	1
	fear	I1,I2,I3, M2, M16	4
	diverse reaction to new technology	I1,I3, I4	10
Mandatory tasks	workload	I1,I2,I5, M7	4
	time intensive tasks	I1, I2, I3	8
	deadlines	I1,I3,I4, M1	5

5.2.1.1 Concept of Competence Related Anxiety

Competence related anxiety was first identified as codes indicating that the student was nervous because he was f*eeling underprepared.* During axial coding, the term could be raised to a higher level of abstraction as comparisons summarised other codes like *exclusion anxiety*,

task *complexity*, *workload*, *preference for easy to use technology*, *fear and diverse reactions to new technology,* as indicators that could be conceptualised under the term *competence related anxiety*. A total of 22 references were found in the data directly indicating that students were at some stage feeling under-prepared. This excludes references to the other indicators of the *competence related anxiety* concept. This made competence anxiety one of the most frequently mentioned phenomenon in the data set.

Competence related anxiety relates to feelings of anxiety, fear and stress that a student experiences when he/she needs to use technology, but is not sufficiently skilled to do so. For example, students that are attempting to improve their knowledge and E-skills on an operational level are likely to feel anxious when presented with a task that requires live online discussion or independent learning through online courses, as we observed from Za and Mbu's responses in Interview 1 that was quoted in section 4.7.4. Za explained that when faced with something they haven't used before, like when they had to register online at Central Applications Office for University entrance, one would sweat from *fear*. Sli also indicated that he was initially afraid of computers until his teacher reassured him.

Simeonova, Bogolyubov and Blagov (2014) found that the presence of anxiety in students from the UK stimulated greater effort on the students' part to secure a positive grade for the course, whilst students from Russia made minimal use of their LMS when anxiety was present. A similar comparison can be made with American and South African students. Marchewka and Kostiwa (2007) found no evidence of anxiety amongst American students introduced to their LMS, because their participants had significant prior exposure to technology in general. South African students do not all share the same level of exposure to technology in the years preceding university; which may explain why references made to anxiety were consistent and frequent amongst the students in this case study.

On the point of diversity in South African Universities, Marchewka and Kostiwa (2007) findings have congruent representation in the experienced focus group of students of this study. The experienced students in the present case did not report anxiety at university, because they came from a background in which they owned their own devices and had used technology in the classroom at least at primary school level. They did report anxiety to be present when

they were first introduced to technology and suggest that they needed support and motivation from their instructors to move past the anxiety and develop a positive attitude.

> ***Sli:*** *For me mam, when I got into high school my parents bought me a computer so it could be easier to do my homework but I was afraid to use it because I don't want to do something wrong and kill it or something but when I got into CAT in grade 10 my teachers told me, sat me down and told me , isizela I'm afraid to do stuff, he said that there is no button to kill a computer. From there I started fooling around I even went into the computers at my school*

The *complexity of the task* and the level of E-skills that a student needs to enable him to complete that task appears to be significant for the design of E-learning activities. Za comments that when she doesn't know where or how to handle a task it causes extreme anxiety even causing her to sweat. Moreover, novice students especially completed tasks at a much slower pace and often became anxious of being left behind or not knowing how to do the tasks others can complete easily – exclusion anxiety. Yilmaz (2017) cautions that pushing students into tasks that are too complex for their current level of skill may result in failure if the anxiety is overwhelming and they give up. Reaching a balance between these two factors may promote development, and at the same time prevent excessive anxiety and feelings of exclusion.

> *Za: if you get that opportunity where they take you and say here the computer, do the application online. You will sweat [laughing] every part of you*

Students generally had *different reactions to new technology*. Some would be overcome by anxiety and others sought help from their friends. Those who were intrinsically motivated like Q in the present study, proceeded to find many resources to learn how to perform a task. His reaction was similar to the UK student's results in Simeonova, Bogolyubov and Blagov (2014) study. Students like Mba, Mini and Za, became anxious by the complexity of the task but chose to seek help from peers. Observations of class activity showed that some students, like Dubs, did not complete some activities on the online classroom at all; this may well be because he was not sure how to do the task and it did not form part of his final grade mark.

5.2.1.2 Concept of Mandatory tasks

The concept of **Mandatory tasks** relates to the anxiety that students experienced when they were 'forced' to learn a new skill or use an unfamiliar technology to complete their learning activity within a fixed period. The anxiety was caused because they first had to learn how to use the technology and then use it for the first time, with the added pressure of the task being mandatory. This process left them working at a much slower pace than their more experienced peers, making them feel left behind (*exclusion anxiety*). In addition, their inability to complete the tasks or activities quickly, coupled with the deadlines imposed for tasks that needed completion in multiple concurrent courses, meant that they were overwhelmed by their additional workload, particularly when the instructor allocated many tasks which needed to be completed within the allocated time (*deadlines*).

The findings of Kocaleva, Stojanovic and Zdravev (2015) are similar in that the use of unfamiliar technology requires a greater time investment and a greater amount of effort (EE). The time needed to complete tasks cannot be mentioned without highlighting its relationship to another critical challenge that many novice users experienced, which was access to technology. Being new to technology usage and having very low-level E-skills meant that it took longer for them to complete tasks using technology.

In interview 1, Za, of the novice user group explained that if they were unable to finish the task on campus on a particular day, they were only able to continue on campus during free periods the following day, because they had no access to the computers and internet at home. This made them anxious, constantly feeling like they are being left behind. Comments made by Randy, who was part of the experienced group, seemed to support Za's experience. In interview 3, Randy maintained that access was indeed a challenge off campus and that one needs access to the technology in order to develop E-skills through practice. Timmy from the same group added that internet must go hand-in-hand with the device for students to be able to improve themselves at home.

5.2.2 The Category of Resources to Sustain Development

The student population at DUT come from diverse socio-economic backgrounds. Their fees may be subsidised if they come from low-socio economic groups by government, family members, bursaries, student loans or even part-time work. It is for this reason that their **access to technology,** especially off-campus, is equally diverse (Bornman 2016; Ukwoma *et al.* 2016b). At the start of the first year, each student in the course selected for this research was allocated a tablet device to improve their access to technology and the LMS, both on and off campus however, they were required to purchase their own data. The availability of free Wi-Fi in South Africa is limited, some shopping malls offer it and some restaurants, however these environments are not necessarily conducive to studying. Table 5-2 presents the concepts and indicators of the concepts from which the category of **Resources to Sustain Development** was derived.

Table 5-2: The category of Resources to sustain Development

Concept	Indicators	Sources	No of references detected
Access to technology			
	availability of computers at home	I1, I2, I3, OB	3
	availability of internet at home	I1, I2	12
	device to practice	I2,I3	5
	computer lab space	I1, I3	2
Time			
	ability dependent usage speed	I1, I2, I3, I4, I5	11
	time intensive tasks	I1, I2, I3	8
	workload	I1, I2, I3, I5	5
	deadlines	I1, I3, I4	4

5.2.2.1 Concept of Access to Technology

Youssef, Dahmani and Omrani (2015) found that the presence of ICT facilities significantly influenced higher-level E-skills. Ukwoma *et al.* (2016a) further found that in a study of Nigerian students digital literacy skills, students tended to use computers more at home, if they had one, because it was convenient and there was more time for them to experiment.

When the participants in the present case were asked for comments relating to the challenges they experienced with using technology and learning to use technology effectively, access to technology was one of the more frequently mentioned challenges, reported by both groups of students. Indicators of this concept included *availability of computers at home*, *availability of internet at home*, *devices to practice* and *computer lab space*. Access to technology also appears to be very closely linked to anxiety, competence and the availability of time.

The experienced group were reported to have access to at least a computer at home, but not necessarily internet, to complete their work and experiment in their free time The experienced group, in the present case, reported technology access, particularly to desktop and laptop computers, to affect their experience with technology. Sphe, who is one of the more experienced users, stated that having access at home "gives you more chances to know it" because you are able to practice regularly in your own time. Another experienced student in the same focus group who maintains that the student had more time at home to practice than on campus echoed his thoughts.

> ***V:*** *I think to emphasise on his point I think the computers the access is big. Because as we doing this course I think each and every student needs to have a computer. We do need computers.*
>
> ***SS:*** *Do you mean at home or more at least more access to the computers here on campus.*
>
> ***V:*** *not necessarily more on campus only mam, more at home*
>
> ***V****: And the other thing is that we have more time at home than at school.*

The access to the technological devices appear to be equally important to all participants as their *access to the internet*. Timmy, from the experienced group commented that a device like the tablet that they were given was useless when they went home because they were unable to access the internet. Kanye, in the novice group, similarly likened a device without internet to a children's toy because he felt that he was unable to use the internet for learning. Q, Mbu, and Mba further stated that they were unable to view announcements and communicate with the lecturer through e-mail or Blackboard once they left campus because they had no internet access off campus. Communication with the lecturer actually plays a significant role in E-skills development as will be discussed in sections to follow. Za was able to connect to free Wi-Fi at the train station whilst waiting for the train in the afternoons but the amount of time spent in the station together with its feasibility as a learning environment, did not make this type of off-campus access acceptable for learning purposes.

Randy, who is an experienced user went on to say that access is a big problem in the rural areas and people who don't understand the importance of computers, end up burning the equipment that the state provides to schools in the rural areas and that without access the community generally has a very low computer literacy.

> ***Randy:*** *yea I can say mam from the community and I'm pretty sure we can all say that from the communities we come from, computer literacy is very low, because, access , there's no access to computers and whenever there is access people do not understand the importance of computers so they end up burning down labs or ..*

Considering the challenge that students face with access to technology, an E-learning design that includes the most well-planned and pedagogically sound E-learning activities would have little effect if sufficient consideration was not given to the students' access to technology. This actually leads onto the second concept in this category of **Resources to sustain development** : time.

5.2.2.2 Concept of Time

Time is an extremely critical resource to students, who have limited technology resources off campus and its effect is intensified if the student has not yet developed basic operational and formal E-skills.

Time as a concept was indicated by the speed at which the student is able to successfully complete a technology dependent task as a result of his E-skill and is indicated on Table 4-4 as *ability dependent usage speed.* Other indicators that suggest that time is a critical resource for development include *time intensive tasks*, their *workload*, and *deadlines* that have to be met. In fact, time was so closely related to access and ability in the empirical data that it could be used to moderate the effects of access challenges by controlling the frequency of tasks, their intensity and ensuring a manageable workload so that the student is able to meet the deadlines without undue anxiety.

Participants with low E-skills in particular took longer to complete a task, because they had the added task of familiarising themselves with the technology first. In fact, some could possibly have spent more time trying to learn how to use the technology than they spent on the activity itself, which minimises the learning experience for the intended module specific outcome.

Particularly in the initial stages of E-skills development, all students reported their typing speed to be the most significant obstacle. Both experienced and novice participants mentioned that more opportunities to practice typing helped them practice and get familiar with the keyboard. They found online or offline games directed towards improving typing speed to be extremely useful to be able to maximise the time they spend on the computer for actual learning activities. Those participants who could only access computers on campus to complete their documents found that too much unnecessary time was wasted on typing, and that they would be typing for long periods of time only to find they have typed less than a page.

> ***Za:*** *Because of time. You thinking of the time and then when you check its already 4 o clock and then you check you type only half a page and you have to type 2500 word and [shakes head]*

> ***Dubs:*** *You don't have enough time, you have limited time to be here on campus while you have to go because you don't stay in res, and time you have to go and you have to finish the document and you haven't finished the assignment.*

The findings of Ng (2012) who measured student's adaptability to new technology, are in contrast with the observations of this case. Ng (2012) found the students in their study were able to adjust to using the technology quickly and spent more time on the content of an E-learning task than learning to use the technology. On closer examination, it was found that the participants of the experiment conducted by Ng(2012) had unlimited access to laptops and the internet and furthermore were already familiar with technology before their research was conducted. Considering those, it may be hypothesised that having a level of operational and formal E-skills influences one's adaptability to new technology.

The results of the present case under study presents *time intensive tasks, workload and deadlines* to be significant factors influencing novice students in particular; therefore, these aspects should be considered in the overall design of E-learning activities. Tasks that require excessive typing need to be balanced with a manageable deadline to support students who are still learning to type. The 'excessive' typing will ultimately benefit the student, because it creates an opportunity for the student to practice typing and engage with the course objectives for a longer period. On the other hand, if the students' workload prevents them from achieving the deadline, they will resort to prioritising tasks in a manner that results in them only completing tasks that have a mark allocation and abandoning other tasks that may be valuable for achieving the course outcomes, as was confirmed by Miss N, the instructor, in interview 5. In interview 5, the instructor interview, Miss N confirmed that if a student believes that a task is not important and has no mark attached to its completion, students would not complete it. Mbu, in the first interview voiced her frustration at the fact that they are required to finish many free online courses in quick succession, whilst Za, in interview 2, described the overwhelming number of tasks that have to be completed by her over a limited time. When task are carefully chosen and designed for its benefit to the cognitive development of the student related to that particular course, the students' success in the course itself is likely to be compromised if those tasks are regularly skipped.

On a completely contrasting note, once students had become sufficiently competent in the first two levels of E-skills, they were very appreciative of the amount of time the technology actually saved them. They were able to navigate e-books and find information much quicker. They were able to get responses from their instructors even when they did not see her that day. In terms of E-learning design, the instructor has to firstly consider how time is balanced to ensure that sufficient time is allocated to the task, giving additional consideration to the diverse levels of E-skills that students in a single classroom may have. Secondly, the instructor also must ensure that the student is using technology frequently enough to improve his E-skills. Thirdly, the instructor must consider the number of tasks that the student is required to complete in all his courses, within the timeframe, so that the student is able to complete the learning activities that are critical to his development.

5.2.3 The Category of Usage Related E-skills Development

E-learning activities require that students use technology to complete a learning task. As mentioned in the section 5.2.2, students who had not at least developed the first two levels of skills competence were heavily affected by their ability to use the technology within the allocated time, however, the empirical data in this research suggests very strongly that the actual usage of the technology is instrumental in developing E-skills. This idea may be explained through the two related concepts that make up the category of usage related E-skills development. This category arose from comparisons and analysis of its two concepts. **E-skills development** tracked the students' actual development and indicators of development throughout the project whilst **opportunities for development** detected circumstances that created chances for development to take place. Initially both categories were coded and worked with separately, however the strong relationship between them and the inability to discuss one without the other, led to the abstraction of these two concepts to the category level allowing them to co-exist under the same category. Table 5-3 presents the concepts and indicators of the concepts from which the category of **Usage related E-skills Development** was derived.

Table 5-3: The Category of usage related E-skills development

Concept	Indicators	Sources	No of references detected
E-skills development			
	development from usage	I1, I2, I3, I4, I5	31
	improved efficiency	I1,I2,I4, I5	16
	independent learning	I2,I3,I4, OB	19
	technology dependence	I2,I3	7
	adaptability to new situations	I2	2
Opportunities for development			
	mandatory usage	I1,I3,I5	13
	frequent usage	I1, I2, I5	3
	hands on experience	I1, I2,	2
	repeated usage	I1, I2, I3, I5	13
	regular usage	I2, I5	2

5.2.3.1 Concept of E-skills development

The E-skills development concept was created to combine indicators that suggest that E-skills development had taken place. Students reported changes to their ability and behaviour from as early as the first interview, prompting pursuance of this development using theoretical sampling methods to determine the extent of the development. The first source of data was the interviews themselves, however self-reporting of development or skill is subjective and may sometimes be misleading or inaccurate. For this reason, the reported development was triangulated with the students' course results in their Computer Literacy related module, contribution to online discussion in the Algorithm Design module, together with evidence of activity on the Learning Management System, where tasks were completed. A summary of Participant's demographic details and course results is presented in Table 4-1. Participants' responses in the interview also indicated that E-skills development has taken place from evidence documented as indicators of *development from usage*, *improved efficiency*, *independent learning*, *technology dependence*, *adaptability to new technologies*.

An examination of the evidence relating to participants' actual activity and evidence of technology usage suggested that the more experienced students spent an average of 9.7 hours over the semester on the LMS itself, whilst the novice group spent an average of 11.1 hours on the LMS. These figures are in agreement with the students' claims discussed earlier that those who were new to the technology took longer to use it. Both groups contributed to a similar number of online discussions however, it must be stated that these discussions were made mandatory by the instructor to assist the instructor in monitoring student progress and identify students who needed support with the content and the technology. A formal assessment, conducted approximately four months into the course, tested the students' knowledge of the computer hardware and software as well as their general ability to use computers. These covered the first two levels of E-skills and the results of these assessments confirm that the participants from the Experienced Group were significantly more competent in these levels of E-skills, having an average score of 70.8 percent, whilst the participants from the Novice Group had achieved a moderate level of competence with an average score of 55,7 percent. The data confirmed that the Novice Group had experienced development in their E-skills, however there were clear differences between the two groups.

These differences are visible in other assessments as well, where the Experienced Group outperformed the Novice Group in terms of averages. Still, when individual results were examined, novice users like Ali, Mba and Q outperformed their experienced peers in the final group project. The final group project required students to identify a problem in their community, thoroughly research the problem using the internet and then show how technology can be used to solve or reduce the effects of the selected problem in a formal presentation, using presentation software. The project required a substantial amount of independent research as well as group work prior to the presentation and submission of the portfolio. Furthermore, these 3 students completed all self-assessment tasks multiple times so they were able to benefit from the learning experience of the task.

Students commented that they had learnt how to do many new things with the computer and in some cases even learnt how to use their old technologies in a new way. For example, Mbu commented that they now use Whatsapp groups to communicate with group members for learning purposes, and Za proudly reported that she has discovered that free Wi-Fi is available at the train station she commutes through every day and she is able to connect her device to it. Responses indicate that being able to personally use the technology has improved their knowledge about the technology as well as their ability to use it.

Improved efficiency resulting from E-skills development was evident in the data. Being able to use the computer and tablet meant that students were better able to use the Blackboard LMS for learning. In addition, their typing speed had improved because of continued regular usage and they were able to complete tasks quickly. Miss N, in the instructor interview, stated that having used various technological tools over a period of time meant that ultimately, even in an unfamiliar application, students were able to pick out basic things like a textbox and apply their skills so that they could use the application efficiently, thus developing their ability to adapt to new technologies.

Students made use of YouTube videos to learn new things and learn how to perform tasks that they were unsure of relating to their subject or technology. Their test results and their comments show that they had moved past operational and formal E-skills and were competently able to use the device. They now showed evidence of moving towards the development of higher levels skills that relate to the cognitive processing of information through technology. They had gained sufficient skills for *independent learning.* For example, Q commented that he now searches for information on the internet after a lecture to learn more about the topic and improve his knowledge. Mbu also agreed that if she is having trouble with a section she would look for more information, however she believes that the instructor's explanations cannot be replaced, because it is tailored to the needs of the class. This concept will be discussed further under *instructor support*. By the fourth interview Mbu

reflected on the use of free resources available on the internet like Khan Academy which is available to students to improve their knowledge.

Several students in the novice group displayed *technology dependence* in later interviews. They reported that they now found it difficult to separate from technologies like the internet, for example, because they had come to rely on it for their learning and to maintain communication with the lecturer. Upon reflection on their previous methods of finding information and learning in Grade 12, students were able to reflect on how useful technology could have been to them if they had been able to use technology for learning. They confirmed that using technologies like the internet and e-books meant that they were able to find information fast, which was not possible using a traditional library.

The Experienced Group are equally dependent on technology and rely on the internet to improve their knowledge. V commented that when he needs to get familiar with some new concept he goes straight to Google to learn more about it. Dependence on technology indicates that students are aware of its usefulness and impact on their lives. Ng (2012) concurs that digital learners like receiving information quickly and being able to multi-task so that they are able to *adapt to new situations*.

5.2.3.2 Concept of Opportunities for development

The concept of **Opportunities for development** relates to E-skills development in that the E-skills development takes place through technology usage as discussed in section 5.2.3.1. Therefore, to facilitate E-skills development, the instructor must provide opportunities for technology usage. The indicators of this concept contribute to the development of E-skills in a variety of ways.

Mandatory usage actually forces the student to use the technology when it is selected to complement a compulsory learning task. Ng (2012) agrees that students need a purpose to use technology. The instructor is able to influence usage by allocating a mark to the task.

Furthermore, McKeown and Anderson (2016) found that undergraduate students only completed tasks they had to and were driven by achieving a good grade, whilst post graduates were driven by the content value and their own knowledge development. Continuous usage is important for E-skills development, therefore mandatory tasks create an opportunity for students to continue using a technology (Wang, Myers and Sundaram 2013). Still, mandatory tasks selected for undergraduates must be selected with care, as discussed in section 5.2.1 due to their ability to overwhelm the student. Attaching a grade to an activity increases the priority of the activity for the student and he/she will make it part of his/her core workload to ensure he/she passes the module. The student may even neglect other learning tasks that may not count towards his final grade. An E-learning design must take note of this phenomenon and select activities carefully. The role of technology in E-learning will always be to supplement the module therefore developing E-skills is a secondary benefit of E-learning and should not overshadow the objectives of the module itself.

Regular use of a tool or technology may be instrumental in building the student's confidence, which improves with practice. Miss N stated that using a tool regularly throughout the semester, especially with first year students, solidifies their skill more effectively rather than using a tool once or twice and then expecting them to remember how to use it several months later. Mbu, who described her experience with online discussions, supported this notion. The regular usage of the tool aided her development such that she was better prepared for online assessments. Mbu's comments are supported by Youssef, Dahmani and Omrani (2015), who posits that more involvement with technology and using technology to perform goal-oriented tasks have a positive influence on all levels of E-skills.

Regular use may be related to *usage frequency,* which describes how often the student had to complete tasks using a tool. Wang, Myers and Sundaram (2013) found that experience and regular use of technology could be related to increased E-skills. Moreover, Ukwoma *et al.* (2016a) found that regular usage also increased student's research skills, a competence synonymous Level 4 Strategic E-skills described in section 2.2.2.4. In the early stages of the project, Novice users commented on the frequency at which they were required to post to their journal and complete online tasks. The frequency at which the tasks were to be completed did not balance with their technological ability to complete all the tasks within the

time. For this reason, the frequency at which tasks are required to be completed must be selected with the students' workload and ability in mind. Engaging with technology frequently does improve confidence, if the necessary resources, such as access to technology to complete the task and sufficient time within their workload, are available. A student has to share his/her attention between multiple courses, therefore a course that intends to build E-skills in addition to the core content could benefit from collaboration with other instructors of the same year of study to coordinate task completion dates.

5.2.4 The Category of Support for Development

Probably the most significant contributor to E-skills development is the Support that an individual receives. Support in this context is different from motivation. Motivation is related to influencing the students' intention to use E-learning, whilst support is more concerned with the assistance and feedback the student needs during usage. This type of support can be conceptualised into three distinct groups namely *instructor support, peer support,* and *supportive resources*. The concepts relating to this category, its indicators, source documents in which these indicators were detected, together with the total references in the source document that link to these indicators are represented in Table 5-4. Each concept is then discussed individually.

Table 5-4: Category of Support for Development

Concept	Indicators	Sources	No of references detected
instructor support			
	instructor feedback	I1,I2,I3,I4,I5,OB	23
	access to instructor	I1, I2, I5	4
	supportive language	I2,I3, I4	5
	connection to pedagogy	I5	3
	communicated usefulness	I1,I2,I3,I4,I5	19
peer support		I1. I2, I3, I4, I5	8
	Group learning or knowledge sharing	I1. I2, I3, I4, I5	12
	comparable experiences	I1, I2	4
	group relationships	I2	2
	Facilitating conditions	I2	1
	learning from others	I1. I2, I3, I4	4
supportive resources			
	training courses	I3, I5	4
	supportive technology	I1, I2, I3	5
	tools for diverse levels of support	I1, I2, I3, I4, OB	5

5.2.4.1 Concept of Instructor Support

Instructor support was the most frequently referenced concept from early coding, until the last interview with the Novice Users. **Instructor support** appears to moderate the levels of anxiety that novice users experienced. The absence of this type of support would leave the student feeling overwhelmed and confused. Za, in earlier interviews, showed frustration that they were required to complete the free online courses, but didn't know how or why. The anxiety she experienced was evident in her responses. On the other hand, in the second interview, Mbu's comment about not knowing how to do something, was much calmer, because she stated that if she communicated her difficulties with her instructor, the instructor pointed her in the right direction providing regular feedback that she needed to move forward. Miss N, in the instructor interview, confirmed that when they were given time to experiment and assistance from the instructor, students were less overwhelmed by the technology. The type of support needed ranged from hands on physical support in the initial

stages of development, where E-skills was very low, to more of an instructor presence for discussion in the later stages as shown in Miss N dialogue below:

> ***SS:*** *Can you comment on the kind of support needed by students with using technology at the start of the first year compared to the end of the first year?*
>
> ***Miss N:*** *At the beginning it's a lot more more. I wouldn't say handholding but more exposure where they need to see how to get here and how to do what is required and why they need to do this.*

The study of E-learning adoption conducted by Attuquayefio and Addo (2014) produced congruent results in which Facilitating conditions, specifically instructor support and technical support had a significant effect on E-learning adoption. If the students were forced to adopt the technology to complete a mandatory task, the degree of support available for usage would determine the effectiveness of that usage. In section 2.2.2, E-skills were discussed as distinguishable levels of skills and capabilities where the first level of E-skills, ***Technology Operation Skills*** consists of an individual's basic ability to operate ICT in terms of hardware and software, the second level ***Fundamental E-skills,*** was made up of abilities needed to use ICT to search for, evaluate and use information to effectively complete tasks related to work, study and everyday life. The third level, ***Information Analysis and knowledge Sharing Skills***, requires that the user critically analyse the information, debate and discuss the information in order to create meaningful knowledge and present the information creatively, and the fourth level, ***Strategic E-skills*** requires strategic use of ICT focussing on critical thinking, innovation and creativity and the use of ICT to facilitate the creation of knowledge and the presentation thereof in a knowledge society.

The initial training and demonstration of the tool by the lecturer in the present study assisted those having difficulty and created opportunity for the student to get assistance from their instructor as suggested by Tiyar and Khoshsima (2015). Zhang and Venkatesh (2017) suggests that training develops new skills, while Youssef, Dahmani and Omrani (2015) found that training affected Fundamental E-skills. Feeler (2012) contributed that instructor presence was needed at different levels. Instructor support therefore influenced first level E-skills

through training and demonstration by the instructor, second and third level E-skills through assistance and regular feedback and fourth level E-skills by being present as a supportive guide that is available if needed. Ter and Herrington (2014) suggests that a good E-learning design also includes timely feedback from the instructor who should be generally reachable.

The use of *supportive language* on digital platforms emerged in later stages of the analysis, because of its consistent absence as a reference, but presence in the actual dialogue. Student responses to questions were transcribed exactly as spoken and it was noted that students were unable to explain using proper English grammar and in some instances were unable to find the right English word to describe their thoughts. English being their second language may have also influenced their usage speed, but was not included in the time category, because it could not be tied directly to the data as required by GT Analysis (Charmaz 2014).

The use of supportive language in an E-learning design may not necessarily mean designing the classroom in a specific vernacular language, as this practice may actually discriminate against other groups who do not speak that specific vernacular language. The design can however, use simple language to explain concepts. This idea is consistent with a comment made by a novice student, that although she watches You-Tube videos to learn more about a topic, the videos may sometimes be difficult to understand and is not explained as her instructor would be able to.

> **Mbu**: But, sometimes it's not easy. You cannot understand it because sometimes, you know when you doing algorithms you not on that level when they explain it on you tube so you can't really understand it the way mam usually explains it so sometimes it gets a bit hard.

Even the more E-skilled students had similar challenges with the language used in You-Tube videos as shown in the extract below from interview 3. This is why Randy favours a tutor or lecturer's explanation.

> **Randy**: Yes mam maybe some kind, someone that you can consult if you get stuck on something that you get help with. You tube is good but you have to keep on

> rewinding to get that same explanation. If you don't understand but with the tutor that person can explain differently so that you can understand the way that you wanted to understand in. you tube videos are international and sometimes you can't understand maybe their teaching methods.

Szeto (2014) maintains that the instructor is the primary initiator of learning and an E-learning classroom would be the primary reference for student learning. Language used in learning materials should ideally be appropriate to the audience, in this case the students in the classroom (Mutula and Van Brakel 2007; Yilmaz 2017). South African students coming from rural schools in particular were taught through the medium of their respective vernacular languages. Hence learning exclusively from the internet and You-Tube videos is challenging for students since the language these videos tend to use is predominantly English. On one occasion when students in the case study were introduced to a You-Tube video to watch as homework, it was pointed out to the students that the videos had a language translator that allowed the dialogue to be displayed in Zulu, Xhosa or any language they preferred at the bottom of the video. The students were very impressed and immediately wanted to go and experiment even testing languages not native to Africa because they were curious.

Communicated usefulness and *connection to pedagogy* are closely related indicators of instructor support. References made to the connection of the technology to the pedagogy was predominantly found in the instructor interview, where the instructor was adamant that the pedagogy needed to be established prior to selecting a technological tool to complement the activity. The instructor found that selecting a tool appropriate to the learning outcome made it easier to explain to the students why the use of the technology would help the student achieve the learning outcome. This made the technology more acceptable and improved its usefulness to the student. Mohammadyari and Singh (2015) states that the usefulness of technology outweighs the Ease of Use and the individual will use technology anyway if he believes that it will benefit him.

When the instructor explained why the technology would be useful, it made sense for the student to endure the challenge of learning to use this technology to eventually enjoy its

benefits. For example, students reported that their instructor encouraged the use of You-Tube to learn about ordinary topics of interest and the use of the Khan-Academy for learning. This particular type of support seemed to be instrumental in developing higher level E-skills. When the student understands why the technology is useful in a task and its value or capability the student is then able to learn how to use it and apply it to other similar situations.

> **Miss N:** Connect yes, to what they needed to do. And that's what we want. The same would apply to any technological tool. And this is ECP foundation students. Because they understood the value of the tool, why we use it, when to use it, immediately now that they have got a task they realised that they have to bring that in. yea.

Q reported that now that he understood the usefulness of antivirus and protecting his data, he was able to apply these ideas to his own devices including his cell phone and is motivated to learn more about protecting his data.

An unexpected remark by Za demonstrated the influence of instructor support on the students' attitudes towards the technology and their fears. Za remarked that the interviews conducted for this research project was in itself helpful to her, because she was able to discuss her feelings and challenges with a faculty member who would listen. The group interviews further seemed to reassure them that they were not alone in the challenges they faced and helped develop their relationship with their peers, which ensued as *comparable experiences* as an indicator of peer support in the next section.

5.2.5.2 Concept of Peer support

The **peer support** concept appears to be as important and possibly even more instrumental in students' development as the support from their instructor. Peer related support is evident in indicators such as *group learning, comparable experiences, group relationships, facilitating conditions* and *learning from others*. Comparing these references with the scores , listed in Table 4-1, from assessments for group activities confirmed that novice students especially, performed better in group tasks than individual tasks. The category itself initially emerged as peer support and was later raised to a higher level of abstraction through comparisons with

other support related concepts. The individual support category was then selected to encompass the three concepts related to support that an individual student needs for developing E-skills. The participants accredited their development largely to assistance they received from other students who were more competent in E-skills. Mbu described them in interview 1 as *'the ones that know'*.

Randy, from the experienced group, provided significant detail that shed light on why the help they received from peers was so useful to them. Their friends were able to show them physically how to use the technology and use it with them in a way that allowed the student to watch and emulate. Smyth *et al.* (2012) posit that students may actually prefer to collaborate with their peers. Possibly peers may be able to complement the hands-on assistance with instructions using the students home language, however this association was never made or evident in the empirical data for this case study and therefore had to be excluded. Miss N confirmed that she, as the instructor, was not the only one who taught the student how to use the technology effectively, because their friends often showed them how to use the application needed for the learning task.

The more E-skilled peers assisted in the initial stages of E-skills development but gradually this support evolved into a *knowledge sharing* environment where even the students who had originally arrived at university with no E-skills, were able to share what they had learnt with others. Wang, Myers and Sundaram (2013) suggest that having skilled classmates motivates interest and knowledge sharing among classmates.

Q, a participant from the novice focus group explained how he had an interest in security and was able to assist his friends, but he struggled with programming therefore he consulted Mba when he needed help with coding, because Mba is as Za says 'good with codes'. What is significant is that both these individuals who support each other, had originally arrived with no E-skills and were both part of the novice focus group. Group work played a vital role in their development as it allowed them a platform to share what they had learned and learn from their peers. This arrangement worked well if the *group relationship* was favourable. Conflict within a group, where some members did not participate, created an unfavourable environment for sharing knowledge and task completion. Other *facilitating conditions* that contributed to knowledge sharing was a physical place that the group could meet and work.

Q describes how local libraries are not in support of group work as it causes disturbances to others. This means that group work needs completion on campus and requires time.

Indicators of *comparable experience* was slightly different as it involved sharing their challenges with learning to use technology and gave them the reassurance that they were 'not alone' as Mbu explains. A forum that allowed such discussions between similar individuals actually created an opportunity for them to identify each other and support each other by sharing what they have learnt. Wang, Myers and Sundaram (2013) suggest that peer mentors and mentees both experience learning through this type of peer supported learning.

5.2.4.3 Concept of Supportive Resources

The **supportive resources** concept includes indicators such as *training courses, supportive technology, and tools for diverse levels of support*. Training courses and demonstrations are valuable in the first two stages of E-skills development when the student knows very little about the computer(Tiyar and Khoshsima 2015; Youssef, Dahmani and Omrani 2015). Most students in the Experienced Group had received some kind of training in their respective schools, even if it was not a formal course, whilst those in the Novice Group immediately sought assistance from their peers who were able to demonstrate or show them individually how to operate an application or device. Miss N added that giving the students a demonstration of how to use a technology, for example LMS or any other applications at the beginning helped them become confident enough to explore on their own afterwards.

Supportive technology includes the usage of selected tools in an E-learning design to support the pedagogy as well as the student. Za reflected on how using the Discussion groups to communicate her ideas helped her express herself to others, where she normally would be shy to speak out loud. Ukwoma *et al.* (2016a) similarly posit that developing E-skills empowered students who normally shied away from group interviews to participate in writing through online discussions. Providing novice users with additional material or access to the lecturer through a dedicated chat can be instrumental in providing the necessary support to develop their E-skills level and address diversity among the learners. Provisions

for additional support to this group addressed students' feelings of anxiety and exclusion that the students were experiencing. This anxiety is known to be experienced by students new to technology as discussed in section 2.6.4 which describes previous works and section 5.2.1 which presents evidence of anxiety reported by participants.

5.2.5 The category of Motivation

The category of Motivation depicted in Figure 4-7, relates to factors that contribute to influencing students to improve their E-skills. The task of an instructor who aims to create an E-learning design that will assist in developing E-skills will include recognising factors that motivate students to developing themselves despite challenges.

The resulting category of Motivation was derived from such as intrinsic motivation and extrinsic motivation that was evident in the data and listed in Table 5-5.

Table 5-5: Category of Motivation

Concept	Indicators	Sources	No of references detected
Intrinsic motivation			
	course success	I1,I2, I3, I4, I5	19
	recognised benefits	I1, I2, I4	14
	curiosity	I3,I5	7
	fitting in	I2, I3	8
	self development	I2, I3	2
Extrinsic motivation			
	instructor motivation	I2, I3, I4	6
	emulation	I1, I4	2
	mandatory tasks	I1, I3, I5	13

5.2.5.1 Concept of Intrinsic Motivation

Intrinsic motivation is indicated by references in the data that show evidence of factors within the student that encouraged them to want to improve their skills. Students wanting to achieve *course success* are motivated by this need to be successful in the course and will learn how to use the technology if it affects their final grade in the course. For example, regular access and usage of Blackboard for the course was important to students, because they needed to receive the announcements relating to the course. Miss N also commented that if the technology was useful in achieving the course outcome then the student was likely to want to make an effort to learn how to use it. Some students are motivated by *self-development*, as Mtho stated, now that he was familiar with technology he would like to learn how to hack in a few years. V in the Experienced Group also developed to Level 2 Fundamental E-skills (described in section 2.2.2.2) in Grade 7 and thereafter became committed to teaching himself more and learning on his own, even when he moved to high school where computers were not available at school.

Many students *recognise the benefits* of technology to their learning techniques and even their social lives therefore explore the functions of different technologies that can be used to improve the way they learn and communicate. They are also able to recognise the benefits of technology for effective living, finding that they were now able to keep abreast of financial aid and bursaries on offer using the internet. Moreover, they were able to use the online forms to apply for financial aid and submit documentation needed without having to travel there or use the postage system that costs money. Multiple comments were made by students of all levels relating to the online application which they were required to complete for entry into tertiary education and how much easier it would have been if they were E-skilled. Tiyar and Khoshsima (2015) also found in a quantitative study of Iranian students who had some sort of E-learning experience that satisfaction individuals receive from usage affects continued usage because they are able to recognise the benefits of the technology.

Technology is everywhere and students need to learn how to use it in order to *fit in*. This indicator is the converse of exclusion anxiety discussed earlier. Exclusion anxiety refers to the

students anxiety arising from the fear of being left behind or unable to contribute in class. Motivation to fit in on the other hand inverts that factor forcing students to work towards their E-skills development in order to keep up with the way the world now works.

V of the experienced group commented that the way the world is going means that technology is being used in all sectors. An extract of his input is included below.

> **V**: What grew the love of computer for me, I saw an opportunity of developing myself, computer literacy wise, so I took initiative to go to the computer and try to learn more about it so I can stand for myself. There are other things that forced me to study computers em, looking at the world as it is now, we really need computer in order to be able to live in such a way that, when you had to apply to Durban university of technology you had to use a computer somewhere somehow. I look at that fact and I was inspired to learn about computers so that I will be able to do most of the, most of the, things myself.

Most experienced users reported their motivation to develop E-skills to have resulted from their personal curiosity to learn more about it. Sli especially reported that once he knew a little bit of what it was and got over his fear of 'breaking' the technology, he experimented to learn more about it. Curiosity appears to stem from some sort of initial knowledge about technology that sparks further interest. Evidence of this association is indicated in comments from Sphe, Sli, V and even Miss N.

5.2.5.2 Concept of Extrinsic Motivation

The **extrinsic motivation** concept is of particular interest. If students are self-motivated, they would be driven towards improving their knowledge despite challenges, but where there is no self-motivation and challenges exist, students are more likely to avoid the use of technology altogether, as suggested by the instructor interviewed in the present case and further supported by the findings of Yilmaz (2017). This concept focusses on external factors that motivate students to improve their E-skills.

The instructor, apart from providing mandatory tasks to force usage, may also motivate and stimulate interest in technology indicating *instructor motivation*. Instructor support is slightly different from instructor motivation. Support is more aligned to providing aid and motivation is more focused on stimulating interest and desire for knowledge. Multiple instances of the instructor's influence on technologies that the students explored exist in the data. Students made reference to their lecturer encouraging them to use games, YouTube, and motivating the student to overcome his fear of the device itself as was the case with Sli. Sli has had more experience with technology prior to university and made a valuable contribution in the interview with experienced students. He related his early experience with technology and initial fears. He was able to overcome his fears after reassurance from his teacher that the computer is flexible enough for a student to use without breaking it. It was this reassurance that prompted Sli to experiment and follow his curiosity.

The coding of interview data also shows indications of *emulation* to be a strong motivator for students. Students may be inspired by one of their peers or a character they watch on television and aspire to be as competent with technology as that person. Za for example expresses her desire to be like Mr X who is a more experienced student in her class so that she can also help others. In the initial interview, students related their excitement towards learning to use technology effectively when they had seen an actor look very sophisticated using a laptop in a local TV show.

Mandatory tasks appeared frequently in the data. Mandatory tasks compelled students to make use of the technology to complete the learning activity. This factor was raised to the concept level of abstraction for its influence on the anxiety of students. Despite the said anxiety experienced by novice users in the initial stages, they were ultimately able to develop their skills. The factor that steered mandatory task related anxiety towards E-skills development was the support that was provided to the student. The significance of Mandatory tasks to this research and the category of motivation is that Mandatory tasks motivate students to use technologies they would otherwise avoid and moderate the effects of anxiety.

5.3 A comparative view of focus groups

The most significant difference in the students' reactions to new technologies was that the students who had reached competence to the level of at least the first two levels of E-skills, had greater independence and did not require as much hands on assistance from the instructor. These students relied on instruction manuals, help options, Google and peers as was evident in Timmy, Sli, Randy ,V and Sphe's responses when asked how they would approach a new application they have not previously encountered:

> ***Sli:*** *For me personally I would use every feature that application has just so that I can just try to get my footing on how that application works*
>
> ***Sli:*** *That's just my personality I'm very curious [laugh]*
>
> ***Randy****: I would acquaint myself with someone like Sli. Those are people I look for. Let's see what we can come up with together. Because there is an interest there and then also with me but I don't know where to go.*
>
> ***Timmy****: What is mam the thing does it have a menu for help. On my side I would go to the help section and then read the instruction and start using the thing.*
>
> ***Sphe:*** *I would go for a manual*
>
> ***V:*** *I would go to Google straight mam. I wouldn't think about it. It's like I need to see, I would just google the coolest side of the app if I see it then I go for it.*

The Novice Group showed similar tendencies by the time they had reached the second and third level of E-skills, where they are starting to rely on the internet and each other to learn and less mention is made of the instructor, by the second and third interviews than there was in the first interview. Q, Za and Mba are self-motivated and curious by personality, much like Sli who was part of the more experienced focus group. This kind of personality seems to catalyse E-skills development, compared to the others in the Novice Group, like Dubs and Mini.

Q: *After you teach us, we can go to youtube and get some more information from youtube then I can use that information I got from youtube and the information I got from you to learn.*

Mbu *: You can look on the internet they will tell you. You can even look on you tube. There some things posted on [look at others] academic writing that Miss Posted, then you can watch it and teach yourself.*

Mba: *We find information from internet. And also we watch video on youtube. Like mam when I don't understand maybe you were teaching, so I want to get more or to know a better way how to do things that is difficult to me. I'm supposed to enter and look something that can teach me better.*

Mbu: *(laughing) I learnt from people, internet how to use to do a lot of things even in our subject, they are helpful so I did that,…. how to do anything on the computer.*

Za: *For me I, learn from other people some of the things I learnt from our subjects like OS.*

Q*: When I don't have a clue for coding I ask him, also like I have a clue on operating systems. If he don't know anything from Operating systems he come to me. We have each other.*

5.4 Chapter Summary

The five significant categories that emerged from the analysis of data, using Straussian Grounded Theory methods of analysis, address RQ4. These categories are the elements that students have identified to influence their E-skill development while they engaged in E-learning : Usage related anxiety, Resources to sustain development, Usage related E-skill development, Support for development, and Motivation.

Implementing E-learning amongst the users with no E-skills or low-level E-skills resulted in Usage Related Anxiety. The *Usage related anxiety category* encases factors that cause the student to feel anxious, apprehensive or otherwise scared of using the technology. Two main

concepts, Competence Anxiety and Mandatory Tasks, led to anxiety. Competence Anxiety resulted from their inability to use the selected tool or technology effectively, because they had not developed the first two levels of E-skills. The anxiety presented itself in feelings of exclusion, fear, task complexity, overwhelming workload, and a preference to use simpler technology or methods to perform the task. Depending on their personalities, the students exhibited differing reactions to the anxiety, where they either chose to persist or avoid the task altogether. Avoiding the task decreased the probability of developing E-skills. Mandatory Tasks emerged as the other major contributor to the students anxiety related to the usage of technology. These were tasks that the instructor declared as necessary to complete and usually allocated a mark to it. When these tasks were too frequent for the student to meet his/her deadlines, the student became anxious. The tasks that demanded many hours to complete due to some students not being E-skilled, caused the greatest anxiety when they had no access to the technology off campus.

The extent of E-skills development was dependent on the other categories. *Resources to sustain development* included access to computers or laptops and internet off campus. Those students who had access off campus had more time to use the technology and developed higher level skills from experimentation and exploration with various tools and tasks allocated by the instructor. Those limited by access to the relevant technology were forced to prioritise tasks to enable them to complete graded tasks at least in the limited time they had available to use ICT on campus. Time, in this category is an avenue the instructor may explore in E-learning design to manage diversity of access among students. For example, longer deadlines for some tasks can help prevent the task being omitted entirely so that learners can benefit from the completing the task to achieve course outcomes in addition to developing E-skills through usage.

The category of *Development through Usage* provided empirical evidence of E-skills development through E-learning tasks over an extended period. The indicators of opportunities to use technology were conceptualised and compared with indicators of E-skills development. Students showed signs of development of E-skills from lower levels of operational and information skills in earlier interviews to social skills related to Information and Knowledge Processing in the third interview. Some participants from both the novice and

experienced groups showed signs of strategic skills by the fourth interview. Opportunities for development, like hands-on experience could be mapped to Level 1 Technology Operation skill development (2.2.2.1). Frequent Usage and Repeated Usage made students comfortable with the technology and built their Technology operation skills as well as their fundamental usage skills (RQ3, RQ4). Regular Usage also gave students the confidence to build information processing and knowledge sharing skills and become more efficient (RQ4). The increased efficiency and effective usage resulted in them benefitting from the use of ICT tools and therefore becoming dependent on it. Mandatory Tasks provided the stimulation and incentive to challenge users to explore new tools and technologies that they were not familiar with (RQ3) (Youssef, Dahmani and Omrani 2015; McKeown and Anderson 2016). This stimulated knowledge sharing and collaboration amongst students and the development of information processing and knowledge sharing skills. Some had already showed signs of becoming more independent learners and preferred to use technology to explore on their own.

The *Support for development category* focussed on the types of support students indicated were influential in their development of E-skills and their "survival" in the E-learning course (RQ2). Hands-on support from their instructors and peers were needed more in the first two levels of E-skills development, whilst the more advanced levels of E-skills needed support in the form of guidance from the instructor and collaboration with peers (RQ3. RQ4). Collaboration with peers became evident after the first two levels of E-skills had been developed, showing signs that collaboration through technology supported advanced level skills that needed students to critically evaluate information and make decisions. Resources that support development were necessary to sustain development (RQ4). Diverse technologies and resources in E-learning not only improved students' understanding of a topic, but also strengthened their ability to adapt to new technologies and apply skills they had previously developed from similar technologies as Miss N, the interviewed instructor, pointed out (RQ3). They also provided support to students at different levels of E-skills development (RQ3, RQ4). Online training courses and supportive technology provided students developing lower level skills with additional training, if they needed to learn how to use a tool or technology in order to complete a learning task (RQ4).

The *Motivation* category emanated from examining the reasons for students persevering, even when access to the technology they were required to use presented a challenge. Students tended to be motivated by intrinsic factors like curiosity, wanting to fit in or pass the module and extrinsic factors like mandatory graded tasks, desire to emulate more skilled users as well as encouragement and influence from their instructors. Instructor motivation through E-learning may be achieved through a strong instructor presence in the E-learning classroom and mechanisms like journals, discussions and social media make the instructor more reachable when they become frustrated with the technology and are at risk of not completing the learning task as a result of that anxiety(RQ3). Motivation stimulates the students interest and intention to use the technology for learning and literature shows that involvement or use of technology is necessary for E-skills development (Wang, Myers and Sundaram 2013; Youssef, Dahmani and Omrani 2015; Ukwoma *et al.* 2016a).

E-learning tasks use ICT tools to enhance learning. Selecting these tools based, on their suitability to enhance the learning task, places the instructor in a position to motivate learners by explaining how the tool will be useful to achieve the course outcome (RQ3). Previous E-learning designs stress the importance of the alignment of the ICT tool to the pedagogy for course success (Horton 2012; Ter and Herrington 2014; Aparicio, Bacao and Oliveira 2016), but this alignment is critical to E-skills development as well (RQ2).

This chapter discussed the findings that emerged from the critical analysis of the results presented in chapter 4. The analysis was guided by Straussian Grounded theory methods and the interpretations of the results were presented in this chapter as concepts and categories as they relate to the research questions presented by this study. The final chapter consolidates these findings into a systematic framework for E-learning design incorporating elements that can contribute to E-skills development and meet the objective of this study.

CHAPTER 6 - Conclusion

6.1 Introduction

This chapter first provides a brief overview of the research conducted. The chapter then presents a summary of key findings and the core category that emerged from the Straussian Grounded Theory Analysis of the student case. The core category is then presented as a framework for designing E-learning tasks that influence E-skills development. The chapter presents a Theoretical model for E-skills development using E-learning technologies on Figure 6-1, capturing the elements of E-learning that influence E-skill development together with possible relationships between these elements as they have been perceived from the data. The primary aim of this research was to produce a framework for E-learning design that promotes the development of E-skills so that it may be used as a strategy to address diversities in student E-skills and develop student E-skills such that they are able to meet the demands of university and ultimately the knowledge economy. Figure 6-2 unifies the elements provided in Figure 6-1 to provide such a strategy. Finally, the chapter discusses the research contributions, limitations, and recommendations for future research.

6.2 Overview

The extensive integration of ICT into various sectors of everyday life like Health, Government Commerce and Education makes E-skills development a critical requirement to ensure inclusion in the modern society. Chapter 2 reviewed critical literature that allows us to understand the current status of E-skills levels in South Africa and globally. Literature suggests that South Africa has a long way to go towards achieving E-Inclusion, suggesting a further way to go towards achieving much needed E-skills. Poor socio-economic conditions limit many people from accessing, developing skills and using computers, laptops, the internet, tablets and other useful ICT tools. The government has made great strides in attempting to bring ICT to many communities, but have experienced challenges, such as the

lack of suitable staff to manage, maintain and use the technology effectively; secure equipment; and funds to support these initiatives.

The review of literature shaped the interpretation of what it means to be E-skilled and what specific types of competencies are required to achieve competence in each of the four identified levels of E-skills: technology operation skills, fundamental E-skills, information analysis and knowledge sharing skills, and finally strategic E-skills. Mapping E-skills into distinct levels facilitates the process of identifying elements of E-learning that can influence competencies at each level.

A constructivist philosophical view shaped the research design that was adopted to organise, collect, and analyse data from first year undergraduate students in a South African University of Technology. Chapter 3 provides the foundation upon which the data was collected and analysed to enable the discovery of knowledge relating to what affected E-skills development, how E-skills can be developed and ways in which E-learning can serve as a medium through which the users' E-skills may be advanced. A qualitative approach was selected for its aptness to the discovery of new theories and elements in a relationship like E-learning and E-skills. Qualitative methods were therefore adopted to find answers to the research questions, answers that were not available in existing literature at the time. A longitudinal case study of first year students provided the opportunity to track E-learning experiences and identify elements that affected E-skills development as students progressed normally through their course. The primary instrument of data collection was student interviews, which were then transcribed so that the student-experience with technology and their development could be examined. Students were repeatedly interviewed in two separate groups, to facilitate discussion and prevent intimidation among less skilled students. The instructor interview, although not originally planned, provided another perspective with which to view the student experience. Triangulation and verification of the student's actual development, with student accounts of development, was achieved by using test scores from modules that adopted a blended E-learning approach.

Chapter 3 discussed the rationale behind the selection of Straussian Grounded theory for data analysis. Straussian Grounded theory analysis provided a structured technique to rigorously analyse data in a way that restricted researcher bias. Straussian GT limited consideration to

only concepts and themes that can be traced directly back to the data collected. Straussian GT also allowed for theoretical sampling to focus the collection of data towards emerging themes in order to learn more about those themes and the conditions that affected them, whilst theoretical sensitivity enabled the analysis of data repeatedly, as concepts and categories emerged.

The UTAUT model provided the theoretical lens through which the data could be examined, because of its relevance to adoption of E-learning and Usage of E-learning as a technology. Many of the relationships present in the UTAUT model were represented in the data collected in this research. The recent UTAUT framework includes Performance as the result of usage. Previous authors have made mention that technology became easier to use once their subjects made continuous use of the technology, but failed to explain the reasoning behind this change in the user's perspective. Wang, Myers and Sundaram (2013) speculated that continued usage resulted in greater digital fluency, but no empirical evidence was presented. Digital Fluency bears similarities to E-skills. If a technology has become easier to use, it means that the user has developed his/her knowledge and ability to use the system. The conditions that influence the development of technology related skills or E-skills are of significant importance to this research, because it helps us understand how using technology can shape the development of E-skills and subsequently promote a knowledge society.

6.3 Towards a framework for E-skills development

Analysis of quantitative data collected from interviews in early stages of coding and conceptualising helped identify specific elements of E-learning task design that is summarised on the model presented in Figure 6-1. The elements include the students' need for support from peers and instructors; their anxiety from using technology and the lack of resources to complete tasks. Theoretical sampling of data related to these emerging themes found that communication was necessary to support and assist students with E-learning tasks. Inexperienced students particularly needed assistance with using the technology itself. The presence of motivation from peers and instructors regulated the presence of anxiety and encouraged students to learn how to use the technology despite its initial complexity. The

presence of support from instructors and peers during usage surfaced when students described how much they had learnt from technology, with technology and as a result of E-learning tasks. Where motivation pushes the student to use the technology, the type of support needed could be associated with specific E-skills levels, which are captured on the framework in Figure 6-2. Training, demonstrations and hands on support were necessary for students developing lower levels of E-skills and the presence of that kind of support is coherent with the student achieving competence in that level. Collaboration, team learning and knowledge sharing through continuous usage of E-learning leads towards the development of higher level E-skills.

The significance of the relationship between Usage, E-skills development and Instructor support forms the basis of understanding of how E-learning can make technology easier to use, thereby encouraging students to use, explore and experiment more with technology to develop their E-skills sufficiently and be able to seamlessly integrate into the world of work when they graduate. Many factors represented in the UTAUT framework of Venkatesh, Thong and Xu (2016) were detected in the data, but the core category was directed specifically towards a design of E-learning that advances E-skills.

The emerging relationships identified in the data analysis have been illustrated in Figure 6-1 as a theoretical model for E-skills development through the adoption and use of E-learning. Factors such as time, task, technology attributes, user competence, facilitating conditions, individual beliefs and outcomes of usage that exist in the UTAUT framework, that formed the theoretical underpinning of this research, were identified in the data and are represented on the Theoretical model in Figure 6-1. Hypothesised relationships between elements are represented as dotted lines on the model. These may be tested in future research, using quantitative techniques, to determine the degree of influence and the relationships.

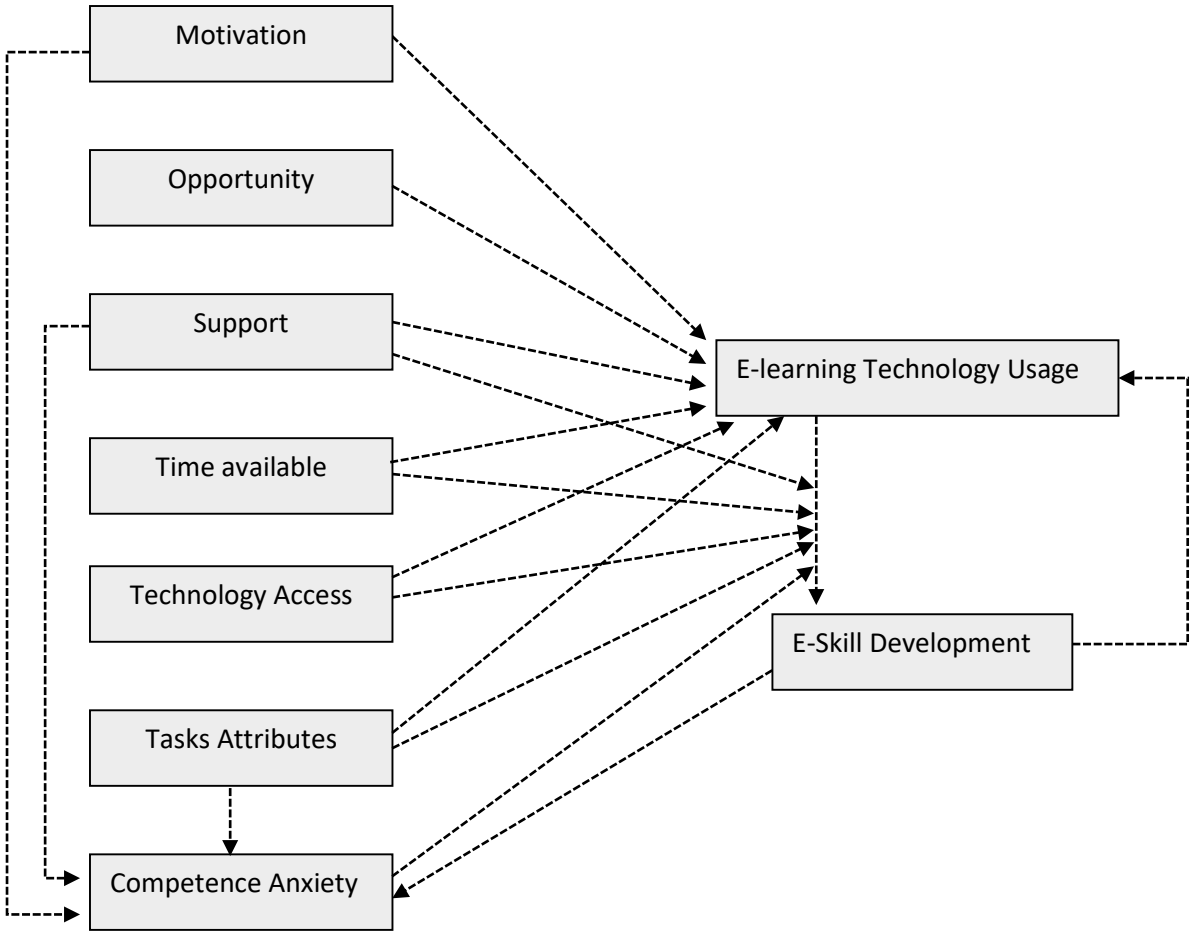

Figure 6-1. : Theoretical Model for E-skill development using E-learning Technology

6.3.1 A framework for E-learning design to effect Sustained Incremental Development of E-skills

Straussian GT analysis begins with identifying codes and indicators from raw data at low levels of abstraction and then continues the analysis of the data to create concepts that bind the indicators through a relationship. Concepts may further be grouped together to form a category of concepts representing a high level of abstraction, which may lead to a core category. This core category weaves the data together at a higher level of abstraction to capture the core relationships detected in the case and propose theories of how

concept/categories may be used to explain a phenomenon (Halaweh, Fidler and McRobb 2008; Charmaz 2014). Concepts and categories were presented in Chapter 5 and these categories formed the basis of the proposed framework for E-skill development through E-learning illustrated in Figure 6-2.

The analysis of emerging categories, and their underlying core relationship may be integrated into the core category of Sustained Incremental Development, which weaves together the students' experiences and offers a strategy to frame E-learning design in a way that steers students towards E-skills development. The core category that emerged from this study was that of *Sustained Incremental Development*. This category theorises that subjecting a student to incrementally complex technology dependent tasks, together with instructor support relative to the students current E-skill level, may result in E-skills development to the next level of E-skills.

The term 'sustained' represents the support offered to students particularly from the instructor. *Support for development* was identified at a high level of abstraction as a category that had influence over the categories of *Usage related Anxiety*, *Motivation* and *Usage Related E-skills Development*. Usage related anxiety was reported consistently among all types of users, including the experienced group, who reported that they experienced anxiety in their early encounters with technology. Anxiety arose when students' were presented with a technology that was too complex for them to use. The degree of complexity is hypothesised to have an impact on the degree of anxiety, as well as the subsequent reactions of the student. If the technology was too complicated, students tended to avoid it entirely, if possible. They performed tasks that were mandatory and prioritized the tasks according to the deadline and mark allocation. When obligated to use technology to complete a mandatory graded task, the students' anxiety was regulated through motivation provided by their instructor and peers. Students were willing to endure the challenge, because their instructors and peers assured them that the technology would be useful.

Once the student began using the technology, assistance was needed to use the technology effectively and this support regulated their competence related anxiety and was instrumental in their E-skills development. These relationships were illustrated by the Theoretical Model

depicted in Figure 6.1. Sustained, in the context of the framework, refers to the provision of physical and cognitive support for the development of E-skills. Sustaining the students' development of E-skills using E-learning, means careful consideration for the design of E-learning. The E-learning Design may address the need for support through careful consideration of student workloads and creating an environment in which students may seek support from their peers and instructor.

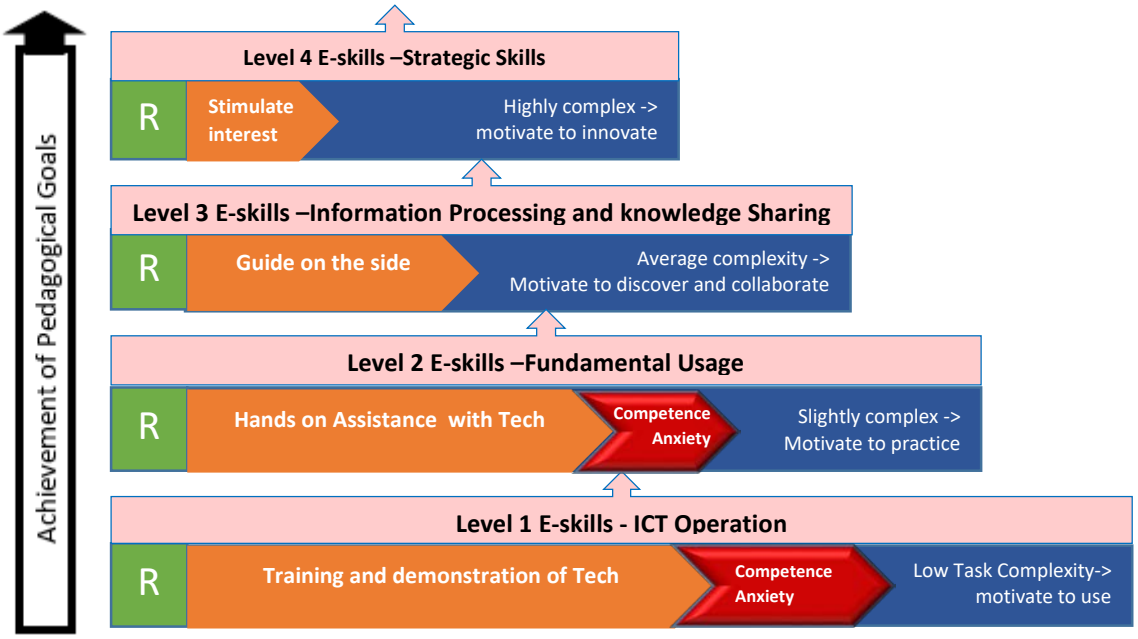

Figure 6-2: Framework for Sustained Incremental E-skills development through E-learning

Useful technologies may be used to support students in learning how to use the technology, like how-to videos. The type of support needed to develop each Level of E-skills was significantly different, as illustrated in Figure 6-2. Support is represented on each level in the diagram as an orange pentagon. To develop operational skills, students needed demonstrations and training oriented ***instruction***. Once the student was familiar with the basic operations of the technology itself, the student needed a greater ***involvement*** from the instructor or tutor for hands on assistance. The lower 2 levels of E-skills development gained from practicing how to use technology more often. To build students through usage, the high frequency tasks for developing low level E-skills were not too complicated, therefore were not time intensive and overwhelming. As the students gain confidence in using technology

and are able to perform fundamental tasks with minimal assistance, the instructor may start to include tools that are a little more complex to use to stimulate the next level of E-skills development. To facilitate the development of knowledge sharing and information processing skills, the instructor leans towards stimulating the students to learn through ***interaction*** with their peers and the instructor includes more opportunities for the students to communicate and discuss their learning in an online space. The instructor's physical role gradually diminishes and the instructor moves towards stimulating the cognitive development of the student, by facilitating discussion and encouraging ***independent*** learning directed at using technology, to find innovative solutions to problems relating to their discipline.

Incremental development is the result of the cumulative nature of E-skills, in that lower levels of E-skills need attention before progressing to higher level E-skills. For example, the instructor cannot expect a student to complete a learning task independently outside of the classroom if the student has never touched a computer before. The instructor needs to understand the audience and select E-learning tools that are complex enough to stimulate interest, but achievable within the constraints of their workload. The learning outcome of the course is still the focal point of E-learning and if the student cannot do the task then he/she cannot achieve the learning outcome associated with the task. Designing the E-learning classroom for incremental development, means gradually increasing the technological complexity of tasks to stimulate interest, enquiry and of course E-skills development towards the next level of competence. The pedagogical approach to E-learning design is critical to student success in the module as well as their E-skills development. Blended learning designs are most suited to first year students or students who have none to low level E-skills, like some first year students. On the other hand, flipped classrooms encourages the use of technology for collaboration and independent learning. This design is effective for developing advanced E-skills, but is best suited to students who already know how to operate the computer and internet, find information and present them using different media on their own.

Sustained incremental development means stimulating development by providing the correct level of complexity that the students perceive to be achievable with support, assistance and

motivation from their peers and instructors. As students develop competence in each level of E-skills the instructor may increase the technological complexity of the task to stimulate the student to achieve the next level of competency. The development of E-skills is therefore incremental. The instructor is able to design the classroom and E-learning activities to facilitate peer support, and address diversity. More experienced users can assist others. Moreover, diversity in E-skills within a classroom means that the instructor can provide support to students with higher E-skills using digital media outside the classroom and provide hands on support and demonstrations to students new to technology within the classroom.

Figure 6-2 shows how task complexity gradually increases to stimulate the next level of skill development whilst the nature of support evolves and the instructor's role becomes less significant for the student to learn how to use new technologies. Tasks become less frequent at higher levels of E-skills development to make way for an increased complexity or cognitive load on the student and the subsequent demand it has on the students' time.

The diversity issue may be addressed with the use of power users to assist their peers. Mentees and classmates who become mentors have a symbiotic relationship whereby the mentee receives the benefit of having the support of his more experienced classmate to assist in learning to use the technology effective (Littlejohn, Beetham and McGill 2012). In addition, both individuals benefit from having a prolonged exposure to the task and content itself. The arrows depicting incremental levels and the achievement of pedagogical goals have intentionally been included on the highest level to capture the essence of knowledge and skill development which is endless.

6.4 Contributions of the study

The objective of this research was not to replace or compete with existing frameworks or models directed towards designing successful e-learning classrooms. The idea behind this research was to complement any E-learning design that improves student success in achieving

course specific outcomes. The framework provides researchers and instructors with a unique perspective of how to identify the students' E-skills level and enhance the pedagogical design of E-learning tasks to support the development of students' E-skills. This supplementary framework contributes towards increasing student satisfaction from using E-learning and enables students to make optimal use of learning technologies to be successful in the module itself. More importantly, it provides a mechanism to support students with low level E-skills who often co-exist with more experienced peers in tertiary institutions. The framework proposes constructs that may be adopted without compromising the success of the E-learning module itself.

Many E-learning designs exist that are directed towards the use of technology enhanced learning activities to promote student success in a course. The aspects of design discussed in this research are directed towards advancing E-skills. To achieve E-skills development in addition to course success, an instructor may choose to adopt a previously tested E-learning design and supplement it within the framework for E-skills advancement. The findings in this research contributes to the body of knowledge that relates to both E-learning as well as E-skills. It provides a framework that any instructor may use as a strategy to improve the adoption of E-learning and address E-skill diversity in the classroom in a way that can develop student E-skills on multiple levels so that they will be equipped to meet the demands of the university environment and ultimately the technology driven workforce.

6.5 Limitations

Firstly, this study is confined by the results of a single case. Although the researcher made efforts to improve the reliability of the case by verifying students reports of E-skills development with their participation in the LMS and their test scores, the findings documented are relevant to this case and cases that share similar characteristics. Secondly, the case included first year students from a single undergraduate course and could have benefitted from the experiences of students enrolled in different faculties.

6.6 Recommendations

There is consistent evidence in the transcripts of poor grammar which indicates that expressing themselves in English is challenging for the students whose 1st language is isiZulu or IsiXhosa. What is interesting to note is that despite the consistent presence of poor expression through the English language, the students did not directly mention the English language as one of the challenges they experienced when learning to use technology. This, despite the fact that all learning material at the university as well as most sources on the internet including YouTube use English as the medium of communication. Language was not pursued as a category, as it did not emerge as a dominant theme influencing E-skills development however, the relationship between E-skills development and second language English speakers is a point of interest for future research.

The UTAUT framework provides theoretical underpinning to the theoretical model suggested in Figure 6-1. The model demonstrates how regular usage of E-learning technologies may influence E-skills and illustrates specific elements of the E-learning task design that may moderate this effect. This model may be tested in future research using quantitative techniques to determine the degree of influence of each element and relationship.

Since the model was derived from an educational background the proposed model may be applied in multiple educational environments to test its rigour. The model may also be tested in other environments to determine its applicability to improving E-skills through the use of E-learning in organisational contexts.

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APPENDIX A : Group Interview 1 Transcript

Group Interview : Novice Group **Date: 24/03/2017 12:00PM**

SS: [Welcomes participants and explains the purpose of the interviews]
What was your experience like using IT for learning in University?
Mbu: Complex
Za : The typing [nods and shrugs from others]
Dubs: An uploading. Need a lot of practice
Q: Feel pressure when I don't know how
Mbu: Feel left out at first when you don't know how to do something. You have to find someone next to you for support
Za: We don't know how to use internet but now we have to look at internet all day. We have to get used to this way ofthings and communicating on the internet
SS: Coming back to uploading, how do you feel about uploading documents on blackboard
Mba: It is easier than writing and printing
Za: and the discussions are helpful to those that are shy. You can see different styles that people are chatting. In the class you are afraid to say anything because you don't know if it is going to be right.
SS: What about other types of technologies that you have used for learning? They can be part of blackboard or separate.
Q: The videos are helpful. You can get basic simple information to understand and if you want more information to help you, you can get it from the videos.
Dubs: The online test [shrugs, others shake heads, widen eyes] is challenging.
Nati: The timer adds more pressure when you busy
Mbu: but it also reminds you of how much time you have left
Hlongwane: The multiple choice is easier [shrugs]
[silence]
Mbu: We also use journal a lot in Miss Ns class. We have to upload and she sets goals regularly
Nati: But its difficult to use. We don't know how to use it then it takes so much time to do it.
Za: But she says it must be finished. Maybe if we don't have to do it all the time because each time takes long.
Mbu: An then we don't now why we are using it. I takes a lot of time
Mba: And we don't have access to internet at home. IF we don't have enough time to finish here then we cant finish it outside DUT. Even the online courses we need internet access.
SS: Tell me about the online courses you took.
Mbu: Miss N tells us we must finish this free online course by this date and then another one by that date
Za: But we don't even know how to register for the course. We are not sure how to do it. WE don't know if we are doing it right. It is scary, we don't know if it will work and we have to do it ourselves.

[Some of the discussion was excluded since the group seemed to be complaining about lecturer N which had to be neutralised without preventing them from wanting to share information relating to the discussion]
SS: Then how did you overcome that challenge
Mbu: We get help from others in the class. The ones that know how.

Q: And we help each other. WE we learn how to di this then we show our friends and that's how we do it.

[silence]

SS: Ok, Can you tell me some of the things that you did with technology at university or at home (if you have access) that have to do with your learning.

Group: [hard to catch names they were talking too fast] Downloading slides and notes, uploading assignments, online tests, watched videos, announcements, emails, discussion, journal, free online courses

Q: But the announcements mam, we can only see them if we log into blackboard, then we have to have data at home. IF you have no data then you can't see the announcements.

Mba: Only when you are in school. Then you can see the announcements and do the work. [nodding from those sharing that experience]

[silence]

SS: So what made you interested to study computers

Za: You know Mam, when you watch TV, you see like on Generations[local TV show] the guy will come in and put the laptop on the table and then start doing things on the computer and you want to be like that. [Others nodding]

SS: Is there anything else you would like to say about your experience?

[general no]

APPENDIX B : Group Interview 2 Transcript

Group Interview : Novice Group **Date: 11/05/2017**

SS: Welcome everyone. We are here to talk about communication. When we say communication we talking about how you are able to communicate with other people using technology. Anything that's happened now that you have been on university? you have been using technology to learn, has that changed the way you communicate at all? No is a valid answer. At any stage.

Sandi. Yes mam is has changed, because now I because now I, I can even send some emails but last time I didn't know how to send.

SS: You must talk louder because our secretary in the back talks too loud, right, so you going to have to overpower her, so..you can now send email.

Sandi: Yes

SS: and previously you weren't able to send email, email is one type of communication using technology. What else have we been able to use to communicate? Like your social media? Have you used social media before you came through[to the university]?

Group. Yes

SS: Ok let's talk about why you used social media before and why ..[pauses and leaves to let secretaries know that we are recording.] Ok. So lets talk about social media and how you used social media as a technology to communicate before and how you use it now. Why did we use it before we came here[to DUT] and now what kind of uses do you find for social media? Any social media. It can be facebook, watsapp, whatever you like.

Mbu: Before we came here it was. We used to chat with our friends, post our pictures, we still do that. But now, we have a watsapp group. Where we communicate as students where we tell each other projects, assignment, what we need to do that's how we can use it. Then we have facebook. We look for bursaries. You know you see all those kind of things that just come. Just educate yourself.

SS: Anything else you can think of. [pause, wait for responses] Not sure? Anything at all? Ok not social media now. You used to speak before using technology, you used to use your cellphones and we here[at this meeting] because we didn't use computers a lot before we came here[to DUT], so now that we here we are able to communicate using technology. How do you use technology now aside from the social media to communicate?[pauses] Aside from watsapp. You use your emails, right. We talked about emails.

Group. Yes

SS: Anything else that you use.

Hugo: Blackboard. We use Blackboard.

SS: Blackboard?

Hugo: For announcements.

SS: Do you look at the announcements regularly? IS it important to you?

Group. Yes mam.

Manny. Yes it is important. It is important.

SS: You have to talk freely. Don't look at me like I'm the ghost of doom Im not[laugh]. You just have to tell me, this is what im doing and things that are new and exciting that you have learned as well. We want to hear about it so we can learn from you and learn from your experiences.

MBU: Ya we only access Blackboard while we are, we stay here in school. When we outside we don't have access to internet so.

SS: You mean that when you get off campus you don't have access?

All. Yes
SS: Ok so that's still a problem[noting]. Because I remember we spoke about that previously. That being a problem. Ok. Are you in res?
MBU: No
SS: At home?
MBU: Yes
SS: Ok. Then on campus. We still talking about communication. What about communicating using different tools on blackboard. What do you use.
Hugo: Discussion.
SS: How would you say you use the discussion group. Is it different, is it same all over in your subjects. Do you use it. Would you like to use it in certain places. Anything you can think of.
Mbu: You know when we use discussions especially in Logic. They help us cuz by the time we get to the test, we can type fast and you can think fast because you used to doing it in claSS:
SS: So the actual action of typing on the discussion group, you saying is helping you with typing.
Group: Yes.
Mbu: By the time you get to the test you dont need to panic and think it's a test. You like ok, it's a test, you need to do this.
SS: Ok, what about other types of discussion you would have.
Mbu: Miss N talked about discussions that we are going to have, then you just type whichever problem you have you just type it out and she will answer you.
SS: Ok so you've done that in which module?
All. Skills Development.
SS: Anything else. Journals thinks like that.
Mbu: Jounals. In skills we do a lot of journals. Every week [all students giggle] you have to add to the journal. Then she looks at it and gives you a mark for it.
SS: Ok so that's also a type of communication with yourself and you lecturer where you document things. Ok. What about learning. How do we use technology to learn.
[Silence, thinking]
SS: Do you think technology helps you learn at all or is it just interesting and fun to use. IT is[laughs]?
Q: Its helping
SS: How? Don't say the things you think I want to hear. Because I don't want to hear that.
All. Giggle.
Dubs. ok. WE have our notes on Blackboard and we receive them on blackboard. Yes.
Ali. And activities mam. Like in Logic, we used to do activities in Blackboard. Algorithms.
SS: Notes are one thing in Blackboard. What we have to remember about technology and learning is that it is not just limited to Blackboard, all sorts of things that you use technology for. I saw your videos[for cornerstone] and they were lovely videos. [laughing] So that process of creating a video is using technology. Ok so that is also included. So what have we learned from that experience with technology.

Mbu: WE learned to make videos. WE acting doing Drama in cornerstone. So we learned to , we learn a lot from others in your group. We were a group of 5, then you had to learn, ask whoever and learn how to do things. Someone knows the camera. Knows and understands very well can just teach you how to do it yourself and then you put it in a computer and do all that process of. You understand better.
SS: So you made a video, which other people had to watch [All. Yes]. And at the same time you used a video to watch and learn things from [all. Yes] So, now that you've been on the other side. The person that's making the video, not the students watching the video the lecturer

made. Hows that informed you in any way. Changed how you think about videos at all. Have you learnt anything, aside from how to make a video. [Silence] Not at all. That's valid don't worry. You a lot less talkative today. WE need to bring nkosi in here then all of you will start jabbering away. [all laugh]

Mbu: IT was helpful in understanding. IT was helpful for you to work ina group. Because sometimes there is a problem where the group doesn't work and think the way you think which is very hard. But getting. I was very lucky to have a group that understands and just want to work and just get everything done togerther without any conflict and that was great. And in terms of doing other things. Like spreadsheets. We did a spreadsheet assignment. We had a group. WE was. I was in a group. There was two of us doing it. So we had to understand it together. We were learning together so it made it easier for us to understand it. You can teach. You always teach and teach[eyes rolling] but when its time for you[students] to do something you, you what is this. What did she say and you asking yourself…You understand it when you do it.

SS: Ok so how did you learn before you were here?

Mbu: Your books. You write whatever you need to write down then you look at the teacher and she talking talking talking . Ok Goodbye. Gone.

SS: Then you do the homework.

Mbu: Oh yes the homework.

SS: Ok so what did you rely on to learn. [looking at …] you have a lot to say I know you do. How did you learn because I know you learn.

Q: At Now mem?

SS: No No then. At school. When you were learning for matric.

Q: When we were learning. The teacher would come with the textbook and then bring the notes then after , after we are bringing the notes then after that we sit down with the homework or the test we are reading . we are going to read the notes then we write **exactly** what we learnt from the notes but now we can. After you teach us, we can go to youtube and get some more information from youtube then I can use that information I got from youtube and the information I got from you to learn.

SS: From youtube?

Q: From you tube and the information I got from the lecture.

SS: Ok so first you in the lecture and you listen to the lecture and afterwards you try and look for information on youtube.

Q: Yes mam. And then I want to get more information about what you teach us.

SS: Do you also do that? Go and look for information on youtube about whatever?

[students shaking heads]

SS: Not really. Do you go look for information after we done with lectures, whichever lecture it is.

Mbu: Depends. Sometimes you get a problem and you don't know where to start then you stuck you look for information.

SS: Where do you look for information. How do you look for information?

Mbu : You can look on the internet they will tell you. You can even look on you tube. There some things posted on [look at others] academic writing that Miss Posted, then you can watch it and teach yourself.

SS: ok. So you source information from different places. You said you tube. You said you look for information just broadly on the internet. Library?

Q: mmm sometimes

Mbu: sometimes

SS: sometimes?

Q: yes mam because we like I'm not staying in res so I'm use local library. Local library it must be **quiet**. If you are working with a group they will send you out because you are making noise

SS: Oh so when you use the normal municipal libraries you can't work in those groups that you l ike to work in. So you don't go to the library?

Q: That's why I don't go to the library.

SS: What about the one here? They have these rooms.

Mbu: Yea Discussion rooms.

SS: Discussion rooms and you can go to the discussion rooms. Tried that? [all laugh]

Q: Discussion rooms?

SS: mm. They have room like this right. And they've got a table and links for internet and all of those things. So you go with your group and you can have a discussion without interrupting the rest of the library. So you make a booking at the library and then you can go in and use it.

[another student walks in. settle in]

SS: Ok so you don't like to source information from the local library its no goog. From here do you source information?

MBU: Yes.

SS: But you prefer?

BB internet

SS: internet. Why?

MBU: Its fast

SS: but you are aware that when you use the internet there is an overload of information

MBU: Yes I know

DD: Yes mam.

SS: Ok so how do we sift through that information? How do you know what is going to be useful and not useful.

Q: If you are doing an assignment. The information must have a source. Like the author. IF there is no author and there is no web reference the information is not right because at the end we must be referencing this information.

SS: Ok. And our very quiet friend in the corner. What's your experience with technology and learning.

MO: Many things

SS: Like what?

MO. Using computer. Its easy now to use a computer.

SS: Its easy to use the computer.

MO. Yes. **Now**.

SS: Why do you think it's easy to use a computer?

MO: Because mam. WE do many works with the computer.

SS: I can't hear you very well.

MO: WE get some slides. When you are studying.

SS: Which slides? Are these the ones your lecturer provides or the slides that you find in your search?

MO: The lecturer provides.

SS: Ok. How else do we use technology?

Mtho: WE use technology to correct our spellings and grammar.

SS: Nice yea. And? Why do we use technology?

Q: Sometimes we use our technology for security.

SS: For security? Tell me about that.

Q: Before we, we are not aware and we don't know of using technology like we don't know what the antivirus is there for. And we don't know why we upgrade the antivirus. [others agree] So since we are here we know what is the use of antivirus and why we need to upgrade the antivirus.

SS: Ok. Antivirus is one aspect of security. There's lots of other aspects of security, what kind of things are there, that your experience her has taught you. Passwords are part of security by the way.

Dub. We also learnt that we need to protect our password. We need it to be more… [struggles to find the word.

SS: more difficult for someone to guess?

Dub. Yes [laughing]

SS: Ok. How's those online tests going? Are you writing them. Are you still enjoying them? Are they helpful?

Mdu. WE getting used to it.

[another student arrives. Everyone giggles]

SS: Ok maybe you can tell us then. Has technology changed the way you learn in any way? How are you using technology now compared to the way you used it 1.5 months ago when we spoke.

Za: Yea, there is a difference for me. I tend to find the computer more easier for me. Because the computer has more options. IF you press something for mistake, and you don't want to get in that option then you are able to go back. When you are using a phone, when you want to undo what you just did it just undo **all** the process [laughing]

SS: Ok so when you started you are saying that you would have rather used your phone than this computer.

Za: Yes.

SS: Now you find that you would rather use this computer than this phone.

Za: Yes

SS: And the tablets as well? Do they help

Goup: Yes they do

SS: How?

Mba: IT help me too much mam

SS: How?

Mba: Before we come here, many others they have what is this.. smart phone. We are not able to get access to the internet. But now we use tablet we even we **actually** know to enter Blackboard and do work. Discussion work when im at home or when im at res. So I **can** use tablet.

SS: So you use the tablet to talk to your friends, you use the tablet to find information…what kind of things do you use it for?

[many students] to check emails mam

SS: Ok one at a time then I can record you[laugh] Ok the emails

Q: we use work document to type our work at home

SS: Ok.

Mdu: WE use excel. Yea.

Za: Slides. We use it to type our work.

Mba. WE find information from internet. And also we watch video on youtube. Like mam when I don't understand maybe you were teaching, so I want to get more or to know a better way how to do things that is difficult to me. I'm supposed to enter and look something that can teach me better.

SS: Yea. What about using the tablet for entertainment. What about watching movies?

Mbu: WE also use it for that. We still use for that.
SS: You do watch movies and use it for entertainment. Uhmm what else do you use it for. Not just for learning. Anything?
BB: Listen to music, social media.
SS: How do use it. Do you stream these videos, how do you get access to them?
MBU: use wifi
SS: Here?
BB: yea then you go to the internet and type whichever music video you want to watch?
Za: An then for us, the train people, we also have free wifi in stations.
SS: Really [surprised]
Za: Yes.
SS: Wow and hows that helped you? what do you do with that free WIFI. How do you use the free wifi? You can watch generations on call[laughing]
Za: Yes I can watch generations, all the topics I've missed and then I can do anything.
SS: With your tablet, with free wifi?
Za: Yes
SS: Ok so you using wifi not just here[on campus] but you using wifi wherever wifi is available.
Za: Yes
SS: How do you know when the wifi is available?
Mbu: The tablet picks it up.
Q: Does a port scan so that it can scan when the wifi is available. Then it tell you
Za: Then there is a notification saying there is sign in for wifi and then that
SS: Then you sign in and you're able to use the wifi?
Za: yes
SS: So what do you do with this free wifi? Are you watching Generations? What else. Even the fun stuff
Mbu: Watching series. Cartoons if you like cartoons. And then watch music videos. Different music videos all the time so wse just watch them.
SS: Do you read about things that you interested in at all? Not just things here for school work. Do you read?
Mbu/Za/Q: Yes.
SS: Download games?
Q: Download e-books as well.
SS: You download e-books?
Q: Like eh Fundamentals [subject Fundamentals of computer security] we don't have a book for fundamentals. Then I was downloaded the e-book for fundamentals
SS: Ok. How are you finding these e-books and using the e-books?
Q: Since I was got the author for fundamentals then the title for the book, then I was use my cellphone and then download it.
SS: So you searched on the author and title and found the book. Have you guys[others] used e-books?
Group: No
SS: Ok [to Q] tell us about your experience with the e-book. Cuz you using the phone or the tablet to read from the phone and tablet. Whats your feeling about that?
Q: Because on Fundamentals we got the slides, so we don't know more about that information so I read the slides and when I read the book I get something that is not visible in the slides.
SS: Ok But tell me about the experience with the e-book. Trying to read a book on this thing. Whats it like.

Q: When you read e-book on the tablet, you can highlight any words you like. If we are going to have a test on chapter one. If there is a definition is difficult to understand, you can highlight it then read it many as you can.

SS: So you can go straight to that chapter. [to others] Does that sound interesting?

Mbu . Ehh [signalling not so much]

Q: Like if chapter 9 is on page 300 . you can tell the number of page and the total number of pages. You click number of pages and type 300 then you go right to the page.

SS: Yea. What else about the e-book do you like

Q: E-book have got a picture, a lot of examples.

SS: And its free. Its nice when the books are free

Mbu: yes

SS: I like the books that are free. Then I download even when im looking for books for you guys then I look for free ones then I know you can all get it otherwise you paying like R500 each for the book which is a lot. That's nice when you able to get a book available for free. Anything else?

Now lots of you have said different things. Like, you're connecting to wifi in the train stations, he's reading from e-books, you're using your tablet to send emails, am I right. And you're all watching videos on the tablets and youre watching videos on whatever devices. Lets take you back about 6 months ago, and looking from there to now, would you say you would be able to pick up how to sense where there is wifi [students giggling] let alone connect to the wifi and start using the wifi.

Za: First of all I heard about a thing called wifi and did not understand what exactly is that. And then now I can tell that a wifi is you know. I don't know if I can say it is like a network or what.

SS: IT is. That's exactly what it is.

Za: A network that you can get access to internet for free.

SS: Its not always for free. Like some wifi you have password. IT is password protected. IF you subscribe to wifi, you have wifi contracts, like a phone contract so you get a little modem which you plug into your device and conntect different devices in your home. Then you want to password protect. Why? Because people are going to steal your data. What other feeling do we have about technology now and moving forward. How do you see yourself using technology in the future. Where you want to go where you think you can go[with it] anything.

Mba: Mam can I say. Technology is a part of our life. The way I look for future.

SS: In what way.

Mba: [laughs] So we know when I wake up in the morning I supposed to take a phone or look at it is a technology, [shy], so mam, I can say technology, I have developed, I have been developed from using technology, now, I think the from the back, years ago, months ago, I didn't know how to use technology, especially on internet like wifi you know everything. Like that. You know everything. Im here at DUT, I start to use it and I know that it helpful. I know that it will it will be not easy for me to separate from the internet and technology.

Group :everyone laughing and nodding

SS: You can't separate from the internet anymore

Mba: I know. Its useful, internet, or technology mam, I have, I have.

SS: If you have to say it in your home language say it.

Mba: You will not understand mam.

SS: I don't have to understand now, I can get it translated later. Or one of you can translate. Eish

Q: Mam I can say before every phone is like security, password, but you can add another security on that phone. Like someone borrow your phone and take a music, but want to look privacy, you can lock privacy by adding other security.

SS: So security is something that is important to you.

Mbule: Yes.

SS: So we can lock up different sections of your phone to protect your privacy, so that if she borrows your phone and wants to use certain sections and if you have assignments saved there you can protect it.

Q: Yes mam, if she say she want to send some music, you can open only the music, if she goes to other sections, its locked.

SS: you lock so you protected it. Ok so how do you think you are going to use technology going forward?

Mtho: Technology going forward I think it more useful to us, and for myself I think in 3 to 4 years, maybe I can even know how to hack, so..[everyone laughs]

SS: so you want o learn how to hack? Its interesting. They actually have courses for that, they have hacking courses.

Group: [gasping, disbelief]

SS: Yea

Q: But mam, when you know how to hack, you know how to prevent the hacker.

SS: Yes Yes. HEs clever this one hey. Eh, Technology and learning. What are your thoughts. Even when you are not here at DUT. You are here now, but learning is a part of our lives, where we go and no matter how old we are. What are your feelings about learning and technology and creating knowledge. When we say creating knowledge, we mean learning new things offering your thoughs about things, future, what would you like to do. Dream?

Za: I would like to help children from rural areas, like if from high school they will have to have access to computers and getting used to computers and then like[now] have to finish grade 12 and then by choice you have to go and do the computer course separately. I feel like I wish I could help children to learn computers from school,

SS: What do you think that will do for them, if you did that. What would that have done for you, if you knew how to use the internet in grade 12, before you did grade 12.

Za: IT would help a lot. When they needed to get into the university or the colleges that use mostly computers or technology they would have like experience they will not be left behind.

SS: So that's important to you

Za: [emphasise] Yes

SS: Do you think if you knew how to use technology before you did matric how you know now. Would that have changed matric in any way?

Group: Yes, Yes mam

SS: How?

Mbu: Because after matric, you know they tell us we must apply for university 1, you must apply on line, so if you don't know how to use a computer, how do you apply online? So you have to apply for university , you have to apply for financial aid. First you don't know what's happening. They tell you all these things, you don't know whose gonna help you but if you knew back then you would have done better.

Za: if you get that opportunity where they take you and say here the computer, do the application online. You will sweat [laughing] every part of you

SS: You don't know what to do because you scared now.

Za: You scared

Mbu: This is what happens, you know when you see a computer, you just get scared. Because you don't know you'll if you touch this computer and something will happen you know,it will break or something. We used to be like that before

SS: That's with everything new isn't it. Even if I tell you, because I know you mentioned the last time we spoke that when something is new then you scared I remember the last time you said it takes longer for you to use it because it is new for you.

SS: Ok that's with applying. I'm talking about before you started matric. IF you knew how to use the internet in your matric year or if you had this kind of technology in your matric year, do think it would have changed the way you learnt for matric?

Group: yes

SS: And the knowledge you gained in your matric year

Q: Yes mam it will be changed. Like mam if you, you are studying mam. You can use the previous papers. All the papers are available on the computer. Once you don't know how to use a computer, you cant get those previous papers on the computer because you know nothing about computer.

SS: Ok so you would access previous papers so that you can practice and study ok.

Q: Like in matric there is if doing commerce, there is a lot of books there is a New Era, there is a CAPS so on internet you can get all those books, you can study all over those books. Find what is the difference between all those books. Obvious there is a different authors. With different author there is different taught. When , after you get those information which one is different from other one. What is the purpose of getting these things and other one. And you can take the one which is useful to you.

SS: Ok. You saying no. Tell us why you say no.

Kanye. I learn from the rural areas. In rural areas there is a lack of connect. Even now. IF I learn at home, it[tablet] is like a toys I cant . There is no wifi, there is no data.

SS: Theres no data, even if you had the data you can't connect to anything because there is no connection in the rural area.

Za: IF I had access to wifi at schools. At school there is free wifi that would have been helpful because with the tablet or the computer, because if you missed something or the class, you would be able to go search on the internet and get some videos to teach you. Like fore physical sciences, life sciences and geography I think if you that would help if you

SS: All the sciences:

Za: Yes. And then if you learn on the internet and you using the videos, then those lectures that are teaching, that would be helpful

SS: If you had in when you were in matric and you were able to access say in your school, you would use it for finding more sources to look for information and to learn from when you don't understand the teacher or lecturer

Za: Yes

SS: Anything else

Hugo: Yes mam and even we can even know how to use this machines for scanning, printing our work in the library

SS: Ok so you have learnt how to use tall of those things for your work. Ok when you scan what do us the scanner for usually?

Hugo: Like these papers for financial aid. You scan it and email to financial aid.

SS: Ok so now you able to scan that using technology. Where do you send them.

Hugo: Eh we send them some of them for these financial aid, NSFAS

SS: Online applications so you can send supporting docs instead of walking around. Yea. That good. Anything else?

Q: Like if I'm sick today. And the due date of assignment is today I can't come to school. I can use the technology to submit the assignment. I'm going to scan it or type it and send it.

SS: You can all talk together. You were all fighting the last time. Anything you want to add. Bus stop. At any stage afterwards, if you feel thought about something, interesting that you able to use technology to do now compared to what you did before anything that relates to technology and your ability to fit into your environment, your ability to learn, send me an email, come see me. Write a note and put it under my door. While talking about that I was just thinking about something, communication and technology we were talking. How do you see people communicating here and the workplace. What do think about the way people communicate here and the work[place . Somebody told me they watch generations, and when they watch generations the guy came with the laptop and he put it there and he was doing something and it looked so exciting so that's one way you would know how people use technology in the workplace. What do you think about the way people communicate in the workplace the way people communicate in this new environment.

Q: Like mam we use this new app, its called IMO, you can see that person on the tablet, so you can talk using tablet, download and talk with another person who has IMO. You can see that person and talk.

SS: Oh so its like a video conference call.

Q: and sometimes practice assessment is perfect. If we are in lab we can practice how to type. Now we can type, that time we [shakes head]

SS: So it's about more opportunities. More you type, the faster. Was this typing thing worrying for you?

Group: emphatic yes]

SS: Really?

Q: Yes mam. A lot of us

Za: Because of time. You thinking of the time and then when you check its already 4 o clock and then you check you type only half a page and you have to type 2500 word and [shakes head]

Dubs: You don't have enough time, you have limited time to be here on campus while you have to go because you don't stay in res, and time you have to go and you have to finish the document and you haven't finished the assignment.

Za: You have to make assignment, maybe tomorrow, you have homework, you have to learn, you have a test and then

Dubs: Time is ticking

Group: time

Za: You have to type. Im hungry I have to go to station and stay for 45 minutes maybe and wait for the train so

SS: What was the scariest thing about the technology if you think back on technology. What else was scary about it. Typing was horrible we [now] know that but what else was scary that you really needed to learn fast and wanted to know immediately ?

Za: To turn on the computer and then how to shut down.

SS: Ok. Anything you can help me. Tell me what helped you learn to type faster?

Group: Game

Mbu: theres a game from skills. Very helpful

Ng: And very interesting.

SS: I can check with miss N.

Q, Za, Dubs: Zombies. The zombies

Dubs: You have to memorise the words and type faster so the zombies don't kill you.

SS: When you played the game it helped you type faster.

Dubs: And learn the word. While you typing the word, you memorise the word so you not looking the word.

SS: So the typing was a huge problem and now its not a big problem.

Group: yes

SS: I still look at the keyboard even after 20 years im still looking at the keyboard. Anything else you want to add before we stop.
Za: Just to thank you mam.
SS: But thank you for coming because I can't do this without you.
Za: This is so helpful mam
SS: How?
Mbu: To have someone who understands us.
SS: To talk?
Mbu: To just talk.
SS: About your experience?
Mbu: yes .Even when you learn more from each other like IMO thing
Someone else :
And ebook things.
Za: The talking
SS: That's interesting if we had like just getting you guys together just to chat, ok hows it going what are you learning that sort of thing, so you find that this could be something for you.
Mbu: its helpful
Mbu: Reasuring that you know , You not alone.
SS: And identify other people and help. You guys said that as well, the group work because that person knew something you didn't know and you knew some thing so that helped in your learning. Yea
Q: mam you can say group work has got a positive and also a negative.
SS: Depends whos in your group
Za: Yes of course.
SS: If you got him in your group you fine[pointing to Q] Whats wrong Mba?
Mba: [smiling]
SS : shes calling you Mba?
Mba: No mam. Why are you saying she mam.
Group:[laughing]
SS: Ok. Thank you guys for coming in . you are so helpful. Please fill in these forms. Whatever I write does not include your names. It includes the information and your experience, and how we can help other students. Like what you've given me is so important. Now everything you've said. I will dissect it I will look at it and try and learn from it and put it together in a way that will help students in future. You can fill those things.
Mba: mam you can say, you can read and what you going to say the phone is going to …
SS: oh voice to text yes, you can take your voice and convert it to text. Im actually hoping to do that. Im hoping to take this play it back and convert it text instead
Q: Even technology has a positive and a negative. So I learn to use, a technology. Like when you have a personal information, so the hackers can see using technology. What I learn is that everything must have security, so you can be safe.
SS: So security is very important. Thank you. Please if you can fill it and give t back to me. Thank you.
End

APPENDIX C : Group Interview 3 Transcript

Group interview : Experienced group **Date: 22/09/2017**

Greetings, introduction of the research. Description of the consent forms.

SS: you had already been familiar with computers before you came to university am I right?

ALL: Yes

SS: OK, What I would like to know is how did you learn how to use the computer, was there a course you went for, did you play with it? Anything that helped you to use it and learn some more. That's the first thing, give me some ideas on that. Anybody. Who wants to go first?

Sphe: for me I started using computers, it was in at grade 7. The secondary, the school that I went to we had a module we had a subject computer literacy but it wasn't for marks so we were doing it just for our understanding and our knowledge. From there ,so what helped me it was my curiosity on how to use it.

SS: Ok curiosity. How did you learn how to use more of it.? What did you do. Did you go for a course? Aside from the Computer literacy. That one taught you the basics so what did you do afterwards?

Sphe: Afterwards I think I made myself familiar with this more but I didn't take any extra courses.

SS: Ok. So what did you do?

Sphe: after completing my secondary, I asked my parents to buy me one and then you play more often with it.

SS: ok.

Timmy: Ok me, I became familiar with the computer I think it was grade 5 in school. It was a like a subject. They used to teach us how draw pictures, they eh what is this, play games how to type, how to get familiar with typing and then in grade 7 they taught us to start using word , word, writing letters, do everything. And then in grade 10 I started the subject called CAT. Computer application technology and yea it was all I get familiar with all the types of apps in the computer and get used to the computer, yea.

SS: Ok so when you say get used to it. How do you get used to it,

Timmy: I can say mam in grade 10 most of the week like Monday to Friday I was labs attending CAT. Doing all the stuff learn how to become fast with the computer

SS: So you had classes every day,

Timmy: Yes, classes every day doing everything, yea

SS: V

V: Mam, my story is that eh we did a bit of computer in primary I think it was grade 7. We were only taught the basics of the computer sadly I went to a high school that did not have computer studies so I had to teach myself computers so basically I taught myself how to use computers, what gre the love of computer for me, I saw an opportunity of developing myself, computer literacy wise, so I took initiative to go to the computer and try to learn more about it so I can stand for myself. There are other things that forced me to study computers em, looking at the world as it is now, we really need computer in order to be able to live in such a way that, when you had to apply to Durban university of technology you had to use a computer somewhere somehow. I look at that fact and I was inspired to learn about computers so that I will be able to do most of the, most of the, things myself. Looking at the nearest library at home mam, em, there, we had assisters, there were assisters at the library mam but most of the time they do show you how to do these type of things on the computer, they did offer classes mam, but em because of time mem I couldn't attend those classes because I was still at school so I had to do more with, I had to attend school more

than attending those classes in the library so I just thought I should teach myself so that I could work with computers

SS: that's excellent but what did you use to teach yourself. How did you teach yourself?

V: How did I teach myself?

SS: What type of things did you do that helped you learn more?

V: At first I had to, I had to search.

SS: Internet?

V: Yea. I search the internet what are the coolest things a computer can do? I started watching videos on you tube and I started even eh, I started, I started, to know about applications development which is programming because I was searching the videos on youtube, theres such thing that it called programming and as I was watching that, the curiosity grew mam

SS: So curiosity is a huge thing. Sli

Sli: For me mam, when I got into high school my parents bought me a computer so it could be easier to do my homework but I was afraid to use it because I don't want to do something wrong and kill it or something but when I got into CAT in grade 10 my teachers told me, sat me down and told me , isizela I'm afraid to do stuff, he said that there is no button to kill a computer. From there I started fooling around I even went into the computers at my school I went into every program file, everything that I could find I just went into it and tried to use it. I even got into my schools network one. [laugh] I deleted a lot of the files. For me what helped me with computers is I like fooling around. Every file every function everything I just like testing to see what happens for me that's what I do.

SS: Thank you. Mr Randy

Randy: Mam. I'd say, I got familiar with computers I think it was at primary school, and from about grade 3. It was basic computing we were just playing around with games. Em, typing and stuff like that up until grade 7 I think and then I went to a high school that didn't offer computers at school, so my grandparents bought a computer, it was an old computer just to have in the house for me to do assignments and play around with basically. And then after high school I got into videography as you know so, in the industry your whole life is basically on a computer so I picked up a lot of computer and computational things from there it was a thing of, how do these guys create like programs that create such beautiful graphics and stuff like that so I wanted to get involved in a program that will help me with the creation stage of such beautiful things you know that help us and in the videography field and other fields as well of communication .

SS: and then you landed up here.

Randy: Yes mam

SS: Now here on campus on this course, you've used technology a lot for learning, for the purpose of learning you've used blackboard, you've used different things and the purpose of using that specific technology or that application was so that you could learn more about the subject area. Lets take any subject .Pick any subject that you do.

V: Logic

SS: Ok Logic. Lets pick logic, right now in logic you would use different tools in blackboard like you would chat for example on the discussion group. You chat previously on watsapp. You said howzit Randy, howzit V this this this. But when you chatted using our discussion group it was a different kind of chat. A different kind of discussion it was a quest for knowledge so what are your feelings about how you can use technology to learn. What kind of things would you like to see more of. What kind of things would help you learn more about a subject. Anything? Do you think there is anything that will help you learn more about a specific subject, you know when you do things for the first time, its hard, and its new, and it's difficult, to understand Are there things out there on the internet anywhere that you think might help you learn your subject content better.

Sli: Subject content better?
SS: Any subject of course. Doesn't have to be specifically logic it can be any subject.

Randy: No mam one point maybe that we can make is that accessibility is a huge thing.
SS: To internet or computer?
Randy: I think I dunno, maybe internet for you guys, maybe a computer as well mam. Eh so, even if we are learning, for example if you give us homework it is difficult to engage and start doing that homework after we come out of class because the labs are full and in the afternoon we have to go back home where we don't have a computer you know. So now we don't have access and the resources to do that so yea, that what I would say mam.
SS: OK
Sli: For me its youtube. If I don't understand something, the first place I go is you tube.
SS: I think we all do. Even I do that.
Randy: you become better acquainted though if you do it with someone physically so maybe tutorial tutors mam, I don't know maybe round the clock tutors maybe if we can ask I don't.
SS: I think in the res they do have tutors all the time.
Randy: Yes mam maybe some kind, someone that you can consult if you get stuck on something that you get help with. You tube is good but you have to keep on rewinding to get that same explanation. If you don't understand but with the tutor that person can explain differently so that you can understand the way that you wanted to understand in. you tube videos are international and sometimes you can't understand maybe their teaching methods.
V: I think to emphasise on his point I think the computers the access is big. Because as we doing this course I think each and every student needs to have a computer. We do need computers.
SS: Do you mean at home or more at least more access to the computers here on campus.
V: not necessarily more on campus only mam, more at home
Randy: yea I can say mam from the community and I'm pretty sure we can all say that from the communities we come from, computer literacy is very low, because, access , there's no access to computers and whenever there is access people do not understand the importance of computers so they end up burning down labs or ..
V: And the other thing is that we have more time at home than at school.
SS: So what would you do with it. If you had it at home what would you do with it. Lets say everybody got computers to take home. You got the tablet but I mean a full computer to take home. How would it help you? What would you do with this computer that you've got that would help you learn.
Sli: I would say mam for some people it will make it comfortable to use a computer. You can see with some people in the labs, like the first years they sit in front of a com[puter and then they like scared like what am I going to do next am I gonna do something wrong you know its like that.
Sphe: I think in the computer world there is no point where you can say I have learnt everything.
ALL [yea, yea]
Sphe: So to have it at your home it will give you more chances to know it. So I think yea, so that's what I can say.
Timmy: But together with that, if you have a computer device at home. But you don't have internet. What you gonna do with it ?
Sli: Well theres scratch bra. [laughs]
Randy: You know I think in your case. What are you using, you made appoint of you tube right. I think now
Timmy: if you wan tto access you tube what you gonna do, you don't have interent. Internet should go in hand with that devices ..

Sli : Download, you can download videos from youtube
Sphe: Yea, you can download on campus and take it home
Randy: So that's a solution
Sphe: it depend on what im using it for. When im using scratch I don't need aany interent.
Sli: Yo don't need internet, that's the thing.
SS: So you solving your problems, good
[laugh]
SS: Anything else. Anything that will help students especially first year students to learn how to use computers easily and be comfortable with it. Because youre the experts. Well you more familiar. So if I can find what helped you learn then I can do more of that to help them so if theres anything you can think of you can tell me. If you go home and think oh wait what about this then you can drop me an email . if you don't think of something now its fine.
Sphe: Its not easy , not easy to think. Some of these things just happen when you in front of the computer, you know.
X: The first thing is to learn how to type.
SS: Sorry I didn't catch the first part ?
X: the biggest issue is to learn how to type. We too slow to type.
Sli : oh yea. Some still type like this [shows one finger typing]
X: like we too slow we must learn like a game online to learn how to type faster.
Randy: Like if you know of a game that helps you to type
Sli: WE did it in skills .
Randy: I forgot about that game, it should be on the thing. On the network in the lab, it should be there as an application available to us.
X: WE can do the thing online
SS: so the biggest problem in the beginning is learning how to type.
X: yes mam I can say that from my point of you
Randy: Yea, yea mam. And also what spe was saying for some of us is very scary because you don't know if the file has been saved or not, because someone can call you for something as menial as that, like how do you save this file, im not sure if it is saved. So also just acquainting people with the commands of the computer how to use those commands and stuff like that.
SS: ok so if you are given something brand new. Lets say I give you some application that uses some tool on blackboard. How would you go about acquainting yourself with that thing?
Sli: For me personally I would use every feature, that application has just so that I can just try to get my footing on how that application works
SS: Ok . so even the ones I didn't ask for, you would use that
Sli: That's just my personality I'm very curious [laugh]
SS: Yea. That's fine. Im giving you an assignment right. Go use this thing. What would be your first thing to do. Hell go and start opening everything and testing everything.[turning to Randy] what would you do.
Randy: I would acquaint myself with someone like Sli. Those are people I look for, lets see what we can come up with together. Because there is an interest there and then also with me but I don't know where to go.
Timmy: What is mam the thing does it have a menu for help . On my side I would go to the help section and then read the instruction and start using the thing.
Sphe: I would go for a manual
V: I would go to Google straight mam. I wouldn't think about it. Its like I need to see, I would just google the coolest side of the app if I see it then I go for it.
SS: I must admit, I go straight for google. IF you have anything else otherwise im good. Thank you for coming to chat to me today. [end]

APPENDIX D : Group Interview 4 Transcript

Focus Group Interview 4 – Novice Group **20/10/2017**

SS: Theres just one more interview that we need to conduct, a little bit of information about how you learnt. I need some feedback on from you guys about how you went about learning all these new skills because last time we met we spoke about how you are able to connect to wifi and many new things, so how did you learn how to do these things? Did you learn from the internet? Did you learn from other people? Did you learn as you were experimenting, just an idea about what helped you and inspired you to learn more.

Za: For me I, learn from other people some of the things I learnt from our subjects like OS.
SS: OS? What kinds of things did you learn from OS?
Za: The operating systems.
SS: Oh do you mean the content of the subject itself?
Za: Yes.
SS: On what the operating system is ?
Za: Yes
SS: Ok. Mbu is in a daze today whatsup.
Mbu: (laughing) I learnt from people, internet how to use to do a lot of things even in our subject they are helpful so I did that,…. how to do anything on the computer.
SS: So how did you learn to connect to wifi
Za: connecting to wifi?
SS: Who taught you how to connect?
Za: X.
Group: X yea (laughing)
SS: X? Ok so you learnt from X. So you learnt from a friend.
Mbu: Yes
SS: So why did you learn it?
Mini: Because we want to connect to wifi
SS: So you can connect to wifi. Why do you need the wifi?
Mini: So that we can use the internet in our device.
SS: Why do you need the internet?
Mini: So that we can learn, because IT, it is about the internet and content of IT (separated?)
Q: And socialising
SS: And socialising. Q?
Q: What I'm learning. Ok. I was learn to each other I came. Mr T I know, he is good for coding.
SS: Who is MR T?
Group: Mr Mba.
Za: He's good with codes
Q: When I don't have a clue for coding I ask him, also like I have a clue on operating systems. IF he don't know anything from Operating systems he come to me. (Other's agreeing). We have each other and we use internet like the game ping pong. The game Ping pong, from the start I didn't know where I going to start with it. Then I use the internet to see, how I going to start with this game, to bounce all of this.
Mbu: Even Miss N is helping us with a lot of things that we do. The way she always says to go to Khan academy teach yourself and then you do the exercise.

SS: So how is that working. How is that teach yourself working for you. Are you able to teach yourself?

Mbu: Some things you are, some things are hard to understand but you go to her and she explains it.

Mini: Because it is not easy to study on internet. Because if you want to ask question, you can't ask question because it is a, it is a internet.

SS: Where on the internet. Oh you cant ask questions on the internet because you have ok. So you have to use multiple sources so that you can learn. One of them is to go and look at the internet or you will ask Q or Mba or Ex.

Za: Also youtube mam. You tube is also useful.

Dd: I want to comment on youtube, even what Miss N gave us. She teach us a lot about going to youtube. Even if we want to do something that is normal like to cook, she make it clear that youtube is the easiest way to know things.

SS: In most cases you are looking for things that are relating to your subject, so. I just want to understand why do you go looking for information what would make you look and learn. So let's say there's this something in watsapp, there's some activity in watsapp. How would you know about it to go look for it? What would you do? Why would you go looking for something?

Q: Like I use it because the things you search for on your own its not easy to lose. Like when you write the test it not easy to forget about the thing because you searched on your own. The things you teach us in class it is easy to forget even in my lecture I maybe not pay attention. But when I search with my own time I can give that thing more attention because I want to know what this thing is about. Like an application. I did the application on the tutorial. Then I search for application and I download it on my device what em it is. Then that videos will explain to me well.

Mbu: But, sometimes it's not easy. You cannot understand it because sometimes, you know when you doing algorithms you not on that level when they explain it on you tube so you can' t really understand it the way mam usually explains it so sometimes it gets a bit hard.

SS: So then you need a another source to balance that. So if you use an application the first time and then you use it the next and the next and the next time , how has your ability changed to using that particular technology. Lets say you were doing some activity using technology now, take wifi for instance, you were connecting to wifi and this is the first time you are seeing it, right, how does it change the next time you do that type of connection, let's say you get another phone and you want to do a similar thing. How does it change? Even things like your discussion group, when you first started how did you use it and then what happened the following time you used the discussion group. Was there any changes? Remember that each of those things that you use have many features to it whether its connecting to wifi or the discussion group, you would use it one way, how did your usage change and your knowledge change.

Mbu: At first when you use the discussion, first you scared cuz you use for the first time you like ok, there's the response, then the second time you like ok I'm used to it I can…, then the third time and fourth time it's easy we just post whatever we want to post and you not scared anymore and beside you got used to your classmates now.

SS: So its about the people with the discussion group. What about the features of the application.

Q: From the first discussion it was a lot of problem then once you come to the next the problem you experience and start to get the solution to the problem.

SS: Any other reasons why you would go looking to learn about technology

Za: Yes mam

SS: Which is?

Za: I like being like Mr Mba I like being like Ex, being helpful to others, yes

SS: That's what you like. That is a very admirable thing. [pause]Ok, if there is nothing else you want to tell me, remember again that if you thing of something you can always email me or even come visit, that's all I needed for today. I think that's all the interviews needed. Thank you very much.

Q: One more thing. You know thins thing about this is a prime number, this is not a prime number, in the class it was hard to get that thing. When I sit alone I think I got it.

SS: For you, you working alone and then it seems to be better for you [Q] but for you [Mbu and Za] you prefer to work in a group so that you learn more. Ok. You can pop me an email anytime you think of something.

APPENDIX E : Instructor Interview Transcript

Interview 5 – Instructor **20/10/2017**

SS: The first thing I wanted to ask about, looking at the students from last year 2017, because we used a lot of technology when we worked with them. I know you have used technology as well. So would you say that you've used technology in your teaching last year and even this year.

Miss N: Yes , Yes

SS: What was your reasoning behind using the technology for teaching and learning. How do you think it improved your teaching and their learning.

Miss N: Ok, Uh, alright for me from a teaching perspective, I think technology is something that has always been a passion for me so it wasn't something that was a challenge it was something that I play around with a lot. I just enjoyed it myself so I thought if I could bring in this into the classroom especially for this generation of students because they very much into social media and technology etc so I just thought that would be a good alignment in terms of their lifestyle and their way of working. Way of doing what they doing.

SS: Uh. Do you think that some technologies or tools are more complex than others to use?

Miss N: For me or for the students?

SS: For the students

Miss N:For the students, ok, for the students, um, when you say technology are you referring to like a laptop a device or are you referring to an application.

SS: Application or devices. It can be either. Like stuff that you would ask the students to do on the computer and they might some of these activities easy and some more difficult to do.

Miss N:Yea I think that if you just leave it to the student where you just expose them to the tool and say go in an play around with it , it can become confusing or complex for them but the way in which I generally introduce a tool is, the first encounter for the student is more like a demo or tutorial where I take them through what is the tool for, why we using it, how will it benefit you for this particular type of task and I haven't really found students to really battle with it. Yes, you ge a few students that are confused about certain concepts or certain features of the tool which they very quickly ask for clarity in the lab lecture and then they get on with it so I haven't really experienced that.

SS: So you find that when they have difficulty you respond giving some kind of feedback or support and then they able to get on with it.

Miss N: To carry on .yea. Because the tool is not just . They not exposed to the tool t say here's a tool use it. When they exposed to a tool, the introduction to the tool is a demo which I generally do with them so its not just watch a video on how to use this app and then go and do it, its an actual demonstration as to how this tool is helping them with the task that I've given them, so I generally tend to connect the 2 so I haven't really experienced that where students are really way off in terms of where do I go what do I do.

SS: How do you think your descriptions and your feedback or support for these students is different from what they would watch on a youtube video . Sometimes they would watch a "how to" YouTube video. How do you think that different from what they instructor would give the student.

Miss N: In my case its more about how does this part of the tool relate to that part of the task, how does that relate to that so there is a mapping of the tool features that im expecting them to explore and the application that im expecting them too do using the tool. So I generally join the dots at the beginning so that they know why they using this and how this will help them in a particular part of the assignment or class activity whatever.

SS: So right at the beginning they know why this is useful and why it will benefit them so they need to explore further.

Miss N: They see the value of it basically that what I start with.

SS: Can you describe the computer literacy or e-skills of the students in your class at the beginning of first year?

Miss N: Mm. Ok if you looking at foundation there were about 30 odd students in each class and 2 classes. There are people that do not or haven't worked with computers or that particular type of application before but I often find that once that demo is done while they in the lab and even if they stuck its not just me walking around trying to help them its their friends showing them its , um , they very quickly pick up . on the app.

SS: How do you think that complex tasks technologies affect the student who has never used computers before?

Miss N: If they don't know how to break down the task and know exactly what the outcome of that task is then I don't think the level of technology is really. They could have the most sophisticated piece of technology or the most basic piece of technology but if they don't know what they need to do ,using that technology they not going to get anywhere. So for me it's the technology is just the tool to get the task done. The actual thinking and understanding of the concepts and subject matter etc is actually more important so if they don't know the outcomes of the task the technology is not. It doesn't . For me they need to have that solid understanding. The technology comes last. It's a tool so its just to aid them in what they are doing.

SS: So if we had to give them some thing that difficult to use and say do it on your own and I (instructor) am not going to help you this person's never seen this technology, haven't used computers before and already not sure, how do you think this will affect them in terms of their motivation.

Miss N: So if its just given and say me out of the picture say go ahead and figure it out well I think a lot of them tend to depend on their classmates as well but, for me ive never left hem to their devices, it was always about . Even it was a complex task with a complex tool, give them some time to experiment and make them know that I am there.

SS: So why would you do that? Why would you let them know that you are there?

Miss N: Because often. Teaching and learning is a human social interaction so for me you need to relate to people, to someone whether I'm there online or physically, they need to be assured that there is somewhere they can go if theres a problem with it. And I get that in both, I get them posting through blackboard or through an email saying "I tried to submit my assignment through blackboard but its not working, it didn't upload but I tried" etc etc, you kow so immediately you give them a screenshot and say click her do this do that and then they ok to go ahead.

SS: Can you comment on the kind of support needed by students with using technology at the start of the first year compared to the end of the first year?

Miss N: At the beginning its a lot more more, I wouln't say handholding but more exposure where they need to see how to get here and how to do what is required and why they need to do this.

SS: Like a watch me kind of thing.

Miss N: Yes. See this is how you would attach a file and then you click and submit. So its more the demo , its crucial for me in the beginning stages. Then once they get the hang of the tool they basically go on with it. I did a simple example with them yesterday where I needed them to join groups online in blackboard and participate in discussions with just their groups and I didn't do anything about discussion tool, didn't tell them a single thing. And people were asking, how do I put an emoji here how do I do this how do I do that? So it was them leading the lesson in terms of, because this is the task and I'm not going to tell you but let's see how you actually do this and I found they were hands up say "how do I do this" and then there someone saying "I got it you click here go here". So I think when they in that environment they just need to know the basics about getting into the tool or the environment the specific features of it, once they there there's a lot of peer teach and peer learn there so for right at the beginning with blackboard, introduce them to the tool and show them the key places and now when they go into specific parts of it they were more or less finding their way through. So I didn't need to be there saying you need to click this button and type here. They knew it's a text space and I need to type.

SS: After some time?

Miss N: After some time yes. At the beginning it was a little bit intense just for them to get the ins and outs but as we progress no.

SS: So towards the end of the year they are much more..

Miss N: They competent

SS: Independent?

Miss N: Yea, Yea. Because with me the tool is featured on a weekly basis. IT does not have to be every lesson but during a week of that lesson, they are being exposed to using some kind of feature of the technology (Referring her to Blackboard). So they basically learning on their own as they carrying on. Its not like they coming back at the end of the year and we saying go back and do this where some of them may have forgotten. We doing it on a continuous basis.

SS: From your experience as an academic and working with students do you think that if their instructor does not give them a task that requires use of a technology that's challenging that they would go and use it or learn how to do it.

Miss N: No they wouldn't. They wouldn't [adamant]. If they not, if its just thereto say heres something go and play around with it. If its not attached to a mark or if its not attached to anything of significant value to them while they here as a student they don't do it.

SS: So when you say significant value do you think that just marks or do you think for their own benefit as well, maybe useful.

Miss N: Well our first year student, the groups that I've been interacting with it has been about the mark. So if there's no mark, there's no chance you getting much done or much out of them because also if you look at the semester and the workload for the students, if its not important if there no mark attached they wouldn't. And we did that for IS1. We said its just review quizzes just go in and do them after the weeks lecture or end of the chapter actually and test your knowledge to see whether you understood. Nobody did it. Then we sent out a notie and announced in class "You need to attempt these quizzes because we taking a percentage of it towards your coursemark and there we have whole 420 trying to get on and do this course because now we saying we going to attach a mark. But when we said its just there at the end we finished the chapter just go and see whether you really understand what we did in this section. No[they didn't do it] so whether the class size is 30 or 500 we've seen that is generally the response from students.

SS: What are your thoughts on introducing regular challenging tasks to students in order to build their skills?

Miss N: Using the technology?

SS: [agreeing] Using technology. We need them to use technology for different things when they leave the university not just word and powerpoint. We need them to be functional when they leave her[university] so we need to build that skill by the time they leave. How do you feel about introducing challenging technologies with the aim of building their skills.

Miss N: Ok. As long as the task has a weighting as I said a mark attached to it. It's a good idea. Because now you incentivising then to complete the task. Bringing in the idea of competition, them pushing themselves to complete this task and attain some competency in terms of some skill for the use of technology so it has its plusses and minuses. On the other hand if the student is going in and battling and cannot get past this then immediately that idea of giving up and saying this tool is just not for me and I'm not using it. They throw it aside and go and do something else. I think it's important to know how to explore a new tool and that's what generally happens in that week where you introducing the technology where they know what is the purpose of this how is it used, why would I want to use it and what can I do with it. So if a student thinks along those lines and you give them something new and say go and do it, straight away they going to think ok so why would I need to use this. Why can't I do this manually so it's about them evaluating the tool itself. So if they have that skills then they can see why this is important

SS: And you are there to

Miss N: To provide that support sort of like a help-line then I think it will obviously benefit them because technology is changing as well. Then on the reverse, you see them with their cell phones and you give them a Nokia 8110 back in the day which was just the keypad [laughs] now you give them this fancy phone within a few minutes they have adapted and they know where to go to find what.

SS: So we don't really teach the tool. We expose them to the application to technology and learn how to adapt to new technologies because its never going to be the same all the time

Miss N: UH-UH [shakes head]. So it's about them understanding the purpose and the feature of the tool so that when they in a situation and they now need to do something that they can relate to then they can say hey but that a tool that helps us to do that so lets go use it. And it doesn't have to be a tool that technology based it could be a tool like we use this information research model where they have to know how to search for information and categorise it how to do an assignment. Its more like an information literacy model which we taught them and then we gave them an assignment that they had to apply it. Then a few weeks later we gave them a group task but we didn't talk about that model that we taught them in the beginning in Feb/ Mar when lectures stared and the first thing when I asked them what's the first thing you do now they said "we need to go apply the model" and for me, at that point I didn't know that was most important because for me you in a group and the most important thing would be getting to know your group members and decide on who is the group leader. But straight away they linked that this is a task that we've been given that we need to search for information for so there's a

tool that we learnt. WE need to bring in that tool because this is an information searching tool.

SS: So they were able to connect he model

Miss N: Connect yes, to what they needed to do . And that's what we want. The same would apply to any technological tool. And this is ECP foundation students. Because they understood the value of the tool , why we use it, when to use it, immediately now that they have got a task they realised that they have to brin that in .yea.

SS: That's it from me thank you.