

# **An e-readiness toolkit for novice students at the Tshwane University of Technology**

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Thesis submitted for the degree *Doctor Philosophiae* in  
Curriculum Development at the Potchefstroom Campus of the  
North-West University

Promoter: Prof AS Blignaut

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## DEDICATION

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This thesis is dedicated to my husband, Robert Marais, and my children, Stefan and Carina van Vuuren, for their love and moral support during my period of study. Without you this would not have been possible.

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## ABSTRACT

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Education is pivotal in many facets of life and should specifically be restructured for interaction and use in the global ethos of the elevated technology of the 21<sup>st</sup> century. The 21<sup>st</sup> century workforce of South Africa (SA) does not have the expanded skill set (competencies) required to adapt, to innovate, and to function optimally according to 21<sup>st</sup> century requirements. Consequently, the technological revolution has a collective and an individual impact on students, as well as on Higher Education (HE). Ubiquitous technologies are futuristic tools which currently compel educators to assist 21<sup>st</sup> century students to prepare for the ever widening global marketplace. In the current context, South African students who enter HE, do not have adequate e-literacy skills to cope with the demands of their disciplines. One such example is the undergraduate students of the Department Office Management and Technology (OMT) of the Tshwane University of Technology (TUT). Undergraduate students grapple with a mismatch between expected and actual Information and Communication Technology (ICT) literacy competencies.

The aim of this thesis is to model an e-readiness toolkit for undergraduate students in order to reduce the e-literacy skills gap school leavers experience when they enter a Higher Education Institution (HEI). For this reason the author decided to perform a randomised pre- ( $O_1$ ) and post-test ( $O_2$ ) control group experiment to determine how the independent variable, the e-readiness toolkit (intervention), influenced the dependent variable, the e-literacy skills of novice undergraduate students. In this way, crystallised results test the intellectual conundrum, measure if the research objectives are accomplished and confirm the  $H_0$  and  $H_A$  research hypotheses of this study.

This study makes use of a single bounded case study research design, with an explanatory concurrent equal status mixed method approach. Deductive and inductive reasoning structure the quantitative and qualitative methods in a parallel manner, although empirical findings are primary to the qualitative confirmatory analysis. The qualitative data set of open-ended questions and a focus group interview are analysed using Atlas.ti<sup>TM</sup>. Empirically, this thesis determines firstly, if there is a significant interaction effect between Control and Experimental groups; and secondly, if there is a significant interaction effect between Contact Centre Management (CCM) and Office Management and Technology (OMT) courses, and where the differences are. The qualitative systematic literature review informs the researcher's knowledge gap on themes such as literacy, e-literacy skills, e-readiness curricula, digital divide disparities and the role HE plays in the development of human capital.

In conclusion, I found that digital divide differences contributed to inadequate e-literacy skills in undergraduate OMT students at TUT. The e-readiness intervention was essential for undergraduates to minimise the e-literacy gap between high school and HE. Participants' remarks indicated ample differences in e-literacy skills perceptions and tangible capabilities after the e-readiness intervention. In addition, empirical results of the two-group experiment indicate no statistical significant effect in Control

groups, therefore the  $H_{01}$  hypothesis is accepted and  $H_{A1}$  rejected. Furthermore, experimental results indicate a significant effect in Experimental groups, thereby accepting the  $H_{A2}$  and rejecting the  $H_{02}$  hypotheses.

This thesis hopes that the e-readiness toolkit will be utilised as supplementary e-literacy skills training material to advance undergraduate students, mainly because of fundamental digital and e-readiness divide differences prevailing in South Africa.

## **KEYWORDS**

- e-literacy
- e-literacy skills
- e-readiness
- classic experiment
- control group
- experimental group
- Tshwane University of Technology

## OPSOMMING

---

Onderwys is vandag deurslaggewend in alle aspekte van die lewe, en moet juis daarom herstruktureer word om aan te pas by die globale etos van die 21<sup>ste</sup> eeuse gevorderde tegnologie van interaksie en draadlose gebruike. Die Suid Afrikaanse 21<sup>ste</sup> eeuse werksmag beskik nie oor die nodige vaardighede om volgens die huidige moderne tegnologiese vereistes suksesvol te kan aanpas, te kan innoveer of behoorlik te funksioneer nie. Gevolglik het die tegnologiese revolusie 'n gesamentlike asook 'n individuele impak op studente, en ook op Hoër Onderwys (HO). Hierdie alomteenwoordige tegnologie voorsien opvoeders egter van toekomstige gereedskap om 21<sup>ste</sup> eeuse studente beter op te lei vir die hedendaagse uitgebreide globale mark. In die huidige konteks beskik Suid Afrikaanse studente, wat verder by Hoër Onderwys opleidingsentrums wil studeer, nie oor voldoende e-geletterdheid om aan die vereistes van hulle onderskeie dissiplines te voldoen nie. Een so 'n voorbeeld is die voorgraadse studente van die Departement Kantoorbestuur en Tegnologie van die Tshwane Universiteit van Tegnologie (TUT). Studente worstel met die gaping wat hulle ervaar tussen verwagte en werklike inligting- en kommunikasie-tegnologie (IKT) geletterdheidsvaardighede.

Die doel van hierdie tesis was om 'n e-gereedheidsopleidingshandleiding (ingryping) vir voorgraadse studente daar te stel om die e-geletterdheidsgaping wat skoolverlaters ondervind sodra hulle by 'n Hoër Onderwys Instansie (HOI) registreer, te verminder. Om hierdie rede het die outeur besluit om 'n ewekansige voor- ( $O_1$ ) en na-toets ( $O_2$ ) kontrolegroep-eksperiment te doen. Tydens die eksperiment word die invloed van 'n onafhanklike veranderlike, die e-gereedheidsopleiding (ingryping), op die afhanklike veranderlike, die e-geletterdheidsvaardighede van voorgraadse studente, bepaal. Hierdie bepaling en assosiasies toets die navorsingsvraag, bepaal of die navorsingsuitkomst bereik is en poog om die hipotese  $H_0$  en  $H_A$  stellings van die studie te bevestig.

Hierdie studie is 'n enkel begrensde gevallestudie navorsingsontwerp, en is benader met 'n gelyke status, multimodale navorsingsmetode. Deduktiewe en induktiewe redenasie vorm die kwantitatiewe en kwalitatiewe samestelling parallel met mekaar, waarvan die kwantitatiewe ontleding eerste gedoen is en daarna die kwalitatiewe bevestigende ontleding. Kwalitatiewe data bestaande uit oop vrae en 'n fokusgroep onderhoud is met behulp van Atlas.ti<sup>TM</sup> sagteware ontleed. Empiriese toetse het eerstens, betekenisvolle interaksie-effekte tussen Kontrole- en Eksperimentele goepe en tweedens, betekenisvolle interaksie-effekte tussen die Kontaksentrum- en die Kantoorbestuur en Tegnologie kursusse bepaal, asook waar die verskille lê. Die kwalitatiewe sistematiese literatuuroorsig verlig die navorser se kennis rondom temas soos e-geletterdheid, e-geletterdheidsvaardighede, e-gereedheidsillabusse, digitale gapings asook die rol wat HO speel in die ontwikkeling van menslike kapitaal.

Ter afsluiting, bevind resultate dat digitale gapings 'n bydraende faktor tot onvoldoende e-geletterdheidsvaardighede van die Departement Kantooradministrasie en Tegnologie se studente in TUT

is. Die e-gereedheidsopleiding was noodsaaklik vir voorgraadse studente om sodoende die e-geletterdheidsgaping tussen hoërskool en HO te verminder. Opmerkings van deelnemers toon aan dat hulle persepsies en e-geletterheidsvaardighede na die e-gereedheidsopleiding verskil het van wat dit voorheen was. Daaropvolgend dui empiriese resultate aan dat daar geen statisties betekenisvolle interaksie-effekte in Kontrolegroepe gevind is nie, en dus word die  $H_{01}$  hipotese aanvaar en die  $H_{A1}$  verwerp. Bykomend dui empiriese resultate aan dat daar betekenisvolle interaksie-effekte vir Eksperimentele groepe gevind is, en sodoende word die  $H_{A2}$  hipotese aanvaar en die  $H_{02}$  hipotese verwerp.

Hierdie tesis vertrou dat die e-gereedheidsopleidingshandleiding aangewend sal word as bykomende e-geletterheids-opleidingsmateriaal vir voorgraadse studente, as gevolg van digitale gapings asook die gebrek aan e-gereedheidsparaatheid wat eie is aan Suid Afrika.

## **SLEUTELWOORDE**

- e-geletterdheid
- e-geletterdheidsvaardighede
- e-gereedheid
- klassieke eksperiment
- kontrole groep
- eksperimentele groep
- Tshwane Universiteit van Tegnologie

# SOLEMN DECLARATION



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students at the  
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submitted for the degree  
Doctor Philosophiae in Curriculum Development  
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# CERTIFICATE OF ETHICAL CLEARANCE



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|-----------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|----------------|---|---|---|---|---|------|---|--------|---|---|---|---|---|-------------|--|--|----------------|--|--|--|--|--|------|--|--------|--|
| <b>Project title:</b> An e-readiness toolkit for novice students at the Tshwane University of Technology  |                                                                                                                                                                                                                                                                                                                           |                  |                |   |   |   |   |   |      |   |        |   |   |   |   |   |             |  |  |                |  |  |  |  |  |      |  |        |  |
| <b>Project Leader:</b>                                                                                    | Prof AS Blignaut                                                                                                                                                                                                                                                                                                          |                  |                |   |   |   |   |   |      |   |        |   |   |   |   |   |             |  |  |                |  |  |  |  |  |      |  |        |  |
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| <b>Approval date:</b> 2014-11-20                                                                          | <b>Expiry date:</b> 2019-11-19                                                                                                                                                                                                                                                                                            | <b>Category:</b> | N/A            |   |   |   |   |   |      |   |        |   |   |   |   |   |             |  |  |                |  |  |  |  |  |      |  |        |  |

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    - the required annual report and reporting of adverse events was not done timely and accurately,
    - new institutional rules, national legislation or international conventions deem it necessary.

The IRERC would like to remain at your service as scientist and researcher, and wishes you well with your project. Please do not hesitate to contact the IRERC for any further enquiries or requests for assistance.

Yours sincerely

Linda du Plessis

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## LIST OF ADDENDA

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- [Addendum 1.2 NWU ethical approval](#)
- [Addendum 2.1 QSLR](#)
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## LIST OF ACRONYMS

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|            |                                                                                                                 |
|------------|-----------------------------------------------------------------------------------------------------------------|
| ANCOVA     | Two-way analysis of covariance                                                                                  |
| ANOVA      | Analysis of variance                                                                                            |
| C          | Control group                                                                                                   |
| CALL       | Community Access to Lifelong Learning                                                                           |
| CAQDAS     | Computer Assisted Qualitative Data Analysis                                                                     |
| CASP       | Critical Appraisal Tool                                                                                         |
| CAT        | Computer Applications Technology                                                                                |
| CCM        | Contact Centre Management                                                                                       |
| CD-ROM     | Compact disk – read only memory                                                                                 |
| C/E        | Control and Experimental                                                                                        |
| CRIC       | Central Research and Innovation Committee                                                                       |
| CTT        | Classical Test Theory                                                                                           |
| DHET       | Department of Education and Training                                                                            |
| E          | Experimental group                                                                                              |
| EBSCO      | Elton B. Stephens Company                                                                                       |
| e-SI       | e-Skills Institute                                                                                              |
| FET        | Further Education and Training                                                                                  |
| FREC       | Faculty Research Ethics Committee                                                                               |
| HCD        | Human Capital Development                                                                                       |
| HE         | Higher Education                                                                                                |
| HEI        | Higher Education Institution                                                                                    |
| HSRC       | Human Sciences Research Council                                                                                 |
| ICT        | Information and Communication Technologies                                                                      |
| IRT        | Item Response Theory                                                                                            |
| ISETT SETA | Information Systems, Electronics and Telecommunications Technologies Sector<br>Education and Training Authority |
| ISI        | Information Society Institute                                                                                   |
| IT         | Information Technology                                                                                          |
| MMT        | Mixed Method Typology                                                                                           |
| myTUTor    | Tshwane University of Technology Management Learning System                                                     |
| NeSPA      | National e-Skills Plan of Action                                                                                |
| NRF        | National Research Foundation                                                                                    |
| NSDS       | National Skills Development Strategy                                                                            |
| NWU        | North-West University                                                                                           |
| OMT        | Office Management and Technology                                                                                |
| PDF        | Portable Document Format                                                                                        |

---

|          |                                                                                  |
|----------|----------------------------------------------------------------------------------|
| PV       | Post Variable                                                                    |
| QSLR     | Qualitative Systematic Literature Review                                         |
| SA       | South Africa                                                                     |
| SAITIS   | South Africa Info Tech Industry Strategy                                         |
| SDSS     | Student Development and Support Services                                         |
| SES      | Socio-economic statuses                                                          |
| SLL      | Siyakhula Living Lab                                                             |
| SLR      | Systematic Literature Review                                                     |
| SPSS     | Statistical Package for the Social Sciences                                      |
| TEL      | Technology Enhanced Learning                                                     |
| TELIT-SA | Technology Enhanced Learning for Innovative Education and Training, South Africa |
| TUT      | Tshwane University of Technology                                                 |
| UK       | United Kingdom                                                                   |
| UNESCO   | United Nations Educational, Scientific and Cultural Organization                 |
| UIS      | Institute for Statistics                                                         |
| UoT      | University of Technology                                                         |
| UoTs     | Universities of Technology                                                       |
| V        | Variable                                                                         |
| WiFi     | Wireless Fidelity                                                                |
| WWW      | World Wide Web                                                                   |

## GLOSSARY

|                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| e-Literacy                                    | e-Literacy refers to the awareness, skills, understanding, and reflective approach that is necessary for an individual to operate comfortably in information rich and ICT enabled environments                                                                                                                                                                                                                                                             |
| e-Literacy skills                             | e-Literacy skills refer to the mastery of technical skills to use ICT that includes: knowledge of computing devices; knowledge of digital technologies; skills in using networks; be able to identify, find, access, capture, manage, integrate and evaluate information; to construct new knowledge; analyse and synthesise digital information and resources; ability to engage in social networks; and to possess critical thinking skills              |
| Computer literacy                             | Computer literacy is defined as the knowledge and ability to utilise computers and related technology efficiently, with a range of skills covering levels from elementary use to programming and advanced problem solving. Computer literacy can also refer to the comfort level someone has with using computer programs and other applications that are associated with computers; and how computers work and operate                                    |
| e-Readiness                                   | e-Readiness is a measure of the degree to which a person, country, nation or economy are ready, willing or prepared to take advantage of benefits which arise from ICTs                                                                                                                                                                                                                                                                                    |
| Classic experiment                            | An experiment involves three major pairs of components: independent and dependent variables; pre-testing and post-testing; and experimental and control groups. Experiments examine the effects of independent variable on a dependent variable. The independent variable takes the form of an experimental stimulus which is either present or absent. The experimenter compares what happens when the stimulus is present to what happens when it is not |
| Control group                                 | A control group is the group in the experiment that does not get the independent variable. The control group is used as a comparison in order to determine the effect the independent variable has on results                                                                                                                                                                                                                                              |
| Experimental group                            | An experimental group is the group in the experiment that gets the independent variable. The researcher studies the independent variable to affect, or to cause the results on the dependent variable of the experiment                                                                                                                                                                                                                                    |
| Fully mixed concurrent dominant status design | In this design, the quantitative and qualitative phases are mixed concurrently at one or more stages or across stages, with the understanding that either the quantitative or the qualitative phase is given more weight                                                                                                                                                                                                                                   |
| Functionalist                                 | A functionalist believes that society is held together by social consensus, in which members of the society agree upon, and work together, to achieve what is best for the society as a whole                                                                                                                                                                                                                                                              |
| Mismatch                                      | The difference in e-literacy skill capabilities                                                                                                                                                                                                                                                                                                                                                                                                            |
| Pragmatist                                    | A pragmatist is a person who tries out ideas, theories and techniques to see if they work in practice. Pragmatists are practical and down to earth; they make practical decisions and solve problems. Their philosophy is that there is a better way, and if it works, it is good                                                                                                                                                                          |
| Tangible                                      | Concrete e-literacy skill capabilities                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Tshwane University of Technology              | Tshwane University of Technology (TUT) is a higher education institution in South Africa that came into existence through a merger of three technikons: Technikon Northern Gauteng; Technikon North-West; and Technikon Pretoria. It comprises six satellite campuses and caters for approximately 60 000 students. These campuses are: Pretoria; Soshanguve; Ga-Rankuwa; eMalahleni; Nelspruit; and Polokwane                                             |

## **CHAPTER 1: INTRODUCTION**

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  - 1.2 Assumptions and nature of social science
  - 1.3 Concept map and boundaries of research project
    - 1.3.1 e-Readiness
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  - 1.8 Ethical aspects of the research
  - 1.9 Significance of the study
  - 1.10 Structure of the study
  - 1.11 Chapter summary
-

# CHAPTER 1

## INTRODUCTION

---

### 1.1 Problem statement and rationale

The core of the technological uprising relates to computers, data, information, communication, and multimedia technologies which are often referred to as Information and Communication Technologies (ICT). In South Africa (SA), the 21<sup>st</sup> century workforce does not have the expanded skill set (competencies) required for adapting, innovating, and functioning optimally according to 21<sup>st</sup> century requirements and is currently grappling with its low literacy levels (Bharuthram & Kies, 2013:412). The majority of South African students who enter Higher Education (HE) do not have the adequate literacy levels to cope with the demands of their disciplines (Marsh, 2000:4). Education is pivotal in many facets of life and should specifically be restructured for the global ethos of the 21<sup>st</sup> century's high technology's interaction and use (Folley, 2010:99; Jefferies & Hyde, 2010:133; Tapscott & Williams, 2010:21).

Ubiquitous technologies are futuristic tools which compel educators to assist 21<sup>st</sup> century students to prepare for the ever widening global marketplace. Larsen and Golden (2006:114) assert that it is the task of educators to develop the skills, confidence and competencies of students in order for them (students) to become flexible and adaptable in the fast evolving world of technology. While Bruce and McDonald (2006:24) claim that employees of the future should be able to respond to new competencies and be technologically astute, Karim (2007:online) argues that with the ICT revolution, a highly skilled and internationally recognised work force is needed. Therefore the upcoming South African labour force should be equipped to meet the changing technological needs, and inevitably, emergent technology, in order to meet the requirements of the workplace.

The technological revolution has a collective and individual impact on students, as well as on HE. Time is of the essence, and the use of ICT must be considered to enhance teaching and learning. The recent past has shown the growth, influence, and impact of Web 2.0 technologies on the world, especially on the younger generation. Ubiquitous learning environments inspire beyond the traditional model of teachers, students, classrooms and laboratories (Bement, 2007:online; Jefferies & Hyde, 2010:138; Uzunboylu & Tuncay, 2009:281). In the endeavour to prepare students to utilise ever increasing technologies, as well as to prepare them for the digital workplace, educators should ensure that diverse and differentiated teaching and learning (French, 1999:79) is possible and effective. A paradigmatic learning shift is possible through the utilisation of e-learning where learners actively engage in their own learning process. Learners are required to interact with e-learning tools, as well as with other Information Technology (IT) components. In SA, Comprehensive Universities, Universities of Technology (UoTs), Further Education

and Training (FET) Colleges as well as private training institutions are essential in developing the e-literacy skills of their students.

The Tshwane University of Technology (TUT) has for a long time utilised supportive e-learning tools. e-Learning tools compel students to engage with new means for communication like search engines, electronic libraries, computer networks, multimedia, content portals and distance as well as web-supported learning. It was found that students often work individually, relying on their own basic skills rather than utilising campus resources, and they support interventions and social groups to achieve success (Tshwane University of Technology, 2015:1-2). There are many factors influencing access and success at universities which by their very nature is complex and multi-dimensional. These factors include social and academic milieus. Social factors include school background and socio-economic status, while academic factors include pedagogy, language, e-literacies, teaching and assessment practices, and curriculum structure. While there is evidence of a range of programmes within institutions aimed at student success, many of these are located at Student Development and Support Services (SDSS) units where there are many operational constraints.

TUT grapples with a mismatch (difference in level of understanding) between the expected and actual ICT competencies of its undergraduate students. There is a gap between those who are e-literate (those who have the necessary e-literacy skills and competencies) and those who are not. Insufficient knowledge and skills, as well as inadequate infrastructural components, are some of the main causes of the e-literacy among TUT students. However, this situation is similar to the digital divide as observed in many places around the world.

Against the background of the above rationale for the envisaged study, the research question that drives this study is: *Is e-literacy skills training required for e-readiness of novice TUT students?*

## **1.2 Assumptions and nature of social science**

Two opposing views stem from different conceptions of looking at social reality and are constructed on correspondingly different ways of interpreting individual and social behaviour. Educational research takes up views such as a natural view (Cohen, Manion, & Morrison, 2011:5) or an interpretive view. The first view is concerned with discovering natural and universal laws regulating and determining individual and social behaviour as being real, whilst the latter view describes and explains human behaviour and emphasises how people differ from inanimate natural phenomena and from one another. When a person treats the social world through a belief system and a set of principles, in a nomothetic way, s/he approaches social science as an objectivist (Cohen *et al.*, 2011:6). On the other side of the coin is the subjectivist who understands social sciences as being idiographic.

Conceptions about the social world are approached through four sets of assumptions (Burrell & Morgan, 1979:22) viz. ontology, epistemology, human nature and methodology. Ontology refers to the

investigation of the essence of the phenomena, whilst epistemology refers to the science of knowledge (Babbie, 2013:4), how knowledge is acquired and communicated to other human beings. Human nature concerns the relationship between human beings and their environment (Cohen *et al.*, 2011:6). These assumptions ultimately infer the methodological choices of a researcher. Methodology choices reside in research paradigms, a way of looking at your research phenomenon (Cohen *et al.*, 2011:5), and communities of scholars. A paradigm is a way of looking at your research phenomenon being either objective, a positivist, or subjective, an anti-positivist.

With my conceptualisation and understanding of research paradigms as clarified by Cohen *et al.* (2011:3-11) and Burrell and Morgan (1979:107), I position myself in the pragmatist and functionalist positivist paradigm to approach social research. The mixed methods approach is premised on pragmatist ontologies and epistemologies. This approach works beyond quantitative and qualitative (Cohen *et al.*, 2011:23) exclusivity or affiliation and integrates both numeric and narrative approaches and data. Quantitative and qualitative methods are necessary and relevant to meet the needs of a researcher rather than the allegiances or preferences in order to answer research questions fully. Pragmatists adopt a methodologically eclectic, pluralist approach to research, and draws on positivism and interpretive epistemologies based on the criteria of fitness for the purpose, and applicability and regarding reality as both objective and socially constructed. Pragmatism (Cohen *et al.*, 2011:23) is essentially practical rather than idealistic, and is practice-driven. It is a matter-of-fact approach to life, oriented to the solution of practical problems in the practical world. It prefers utility, practical consequences and outcomes and heurism over the singular pursuit of the representation of reality.

My point of departure in this research project is to narrow my knowledge gap by means of a coherent conceptual framework. In doing so, a theory (Hitchcock & Hughes, 1995:20) employs the use of concepts, systems, models, structures, beliefs and ideas and hypotheses in order to make statements about particular types of actions so as to make analyses of their causes, consequences and processes. Theory (Cohen *et al.*, 2011:11) is seen as being concerned with the development of systematic construction of knowledge of the social world. The conceptual framework of this study includes a substantive theory (Potgieter, 2013:27) offering explanations in a restricted setting, which is limited in scope and expressed as a hypothesis.

### **1.3 Concept map and boundaries of research project**

Trafford (2008:online) asserts that a conceptual framework is necessary to give coherence to ideas and to clarify relationships between research components so as to provide and shape research conclusions. Consequently, I address the research question of this study by giving a theoretical background in terms of three main concepts as indicated in the title of the study: (i) e-readiness; (ii) e-readiness curriculum strategies; and (iii) development of human capital. Figure 1.1 on the next page indicates the main concepts of this research.

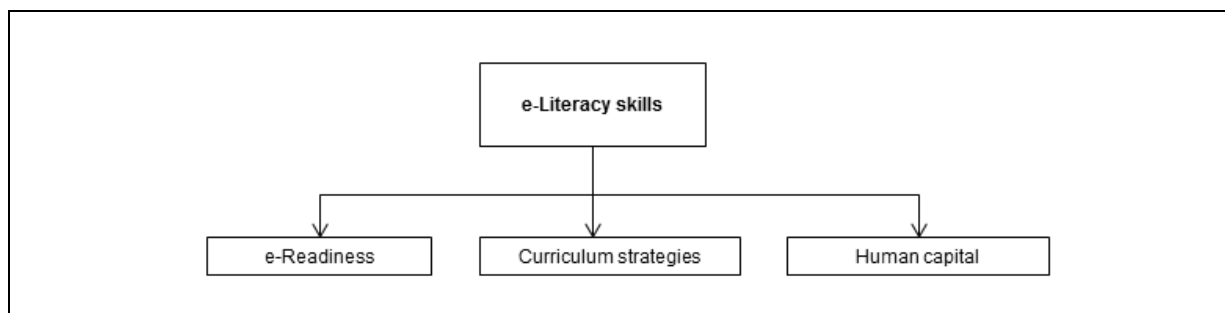


**Figure 1.1: Concept map and boundaries of research project**

### 1.3.1 e-Readiness

e-Readiness is generally defined as the degree to which a society is prepared to participate in the digital economy with the underlying concept that the digital economy can help to build a better society (Naidoo & Klopper, 2005:135). Alaaraj and Ibrahim (2014:1) state that e-readiness is a state of play of a country's ICT infrastructure and the ability of its consumers, businesses and government to use ICT to their benefit. Similarly Moolman and Blignaut (2008:168) refers to e-readiness as the availability and have access to IT infrastructures, the policies to support, and to participate in the international global network. Consequently, e-readiness is a construct that constitutes different components such as e-governance, e-services, ICT awareness, e-business, e-entertainment, networking, ICT skills and ICT infrastructure and so forth.

At present SA experiences an e-readiness divide which is the gap between those who are illiterate and those who are not. Hence, many South Africans admit to the importance of ICT, and that we need associated knowledge to build an equitable, prosperous and globally competitive economy. Substantive evidence indicates a serious skills shortage to enable the effective use of contemporary ICT, commonly known as e-literacy skills. SA is slipping down the international e-readiness rankings (South Africa, 2010:iv). Such shortage of skills and competencies in IT and business hamper business growth. Telecommunication skills such as routing and switching networking skills are sought after in various business sectors. At the juncture of business models an IT person is required with a variety of digital skills and professional versatility including multi-discipline knowledge with technology understandings. Therefore, the workplace needs a hybrid professional. Employees should enhance their skills in order to meet the challenges of globalisation. The new workforce should be equipped with literacies that support them to be flexible, since e-literacy requires a consciousness of technological forces that affect culture and human behaviour. It is not just about being literate to use a computer effectively. Taylor, Goede, and Steyn (2011:36) assert that the importance of computer literacy must be emphasised for learners to realise the important role computers will play in their future.

Dobberstein (1993:431), Kellner (2001:69) and Vincent (2003:342) state that literacy should be seen as a skill that is naturally acquired or developed through training. Literacy is therefore a condition to equip people to participate in the local, national and global economy, culture and politics. These authors list

different types of literacies like computer literacy, media literacy, information literacy, visual literacy and technological literacy. As we develop computer knowledge and technological preparedness, computer literacy evolves into e-literacies or new literacies to meet the challenges of the new technologies. Taha (2006:69) and Klecun (2008:268) believe that students require e-literacies in order to make effective use of e-resources to cope with the complexities of knowledge based resources in many domains. Similar skills should be incorporated in e-readiness programmes in order to develop interventions to promote e-literacy.

Technology is used in an expansive way to support teaching and learning. There is emergence of technology enabled spaces and adaptive technologies that offer new and exciting opportunities in terms of contextual, ambient, augmented, distributed and social networked learning. Lecturers regard it as part of their professional responsibility to design for learning while using a variety of forms of digital technologies (learning technologies). Students have the opportunity to take their learning from place to place as e-portfolios and learning records. They make choices about how, when and where they want to further their education. In order to maintain this coherence, infinite technology pathways have become available to study at Institutions of Higher Education (HEIs) in SA. Undertakings such as *The professional comperacy<sup>1</sup> development of postgraduate students* (Blignaut & Els, 2010:106) and an *Investigation and evaluation to which e-learning mode will be suitable for students at HEIs* (Odunaike & Chuene, 2010:12) have recently indicated valuable recommendations. The Department of Higher Education and Training (DHET) (South Africa, 2012), Universities and specifically in this case, TUT, gives teaching and learning with technology precedence (Swanepoel & Van Staden, 2009).

The South African National e-Skills Plan of Action (NeSPA) (South Africa, 2010:i) focuses on the calamitous skills shortage. The key goal of e-literacy as defined in the act is to “have an impact on employment readiness, particularly in relation to school leavers, university graduates, the unemployed, unskilled youth and those living in rural societies” (South Africa, 2010:81). Therefore the e-Skills Act refers to the ability of people to use and create all forms of ICT to improve life opportunities in their personal, work environment, community interactions, educational spaces and, their participation in and contribution to governance processes. As a result e-skills for employment readiness, e-business skills, e-community skills as well as the skills to e-participate in governance processes towards self-reliance and social cohesion are the focus point. At present the South African Government, in association with HE, established nine (one per province) collaborative e-skills knowledge production hubs. In addition, there were contracts between the Information Society Institute (ISI) and the e-Skills Institute (e-SI) in the Department of Communications to deliver eight integrated e-skills projects by the end of 2011. During an e-skills summit a projected timeline for the expected outputs and performance metrics with regard to the bridging of the e-skills gap in SA was established (South Africa, 2010:77).

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<sup>1</sup> A fusion of “literacy” and “computer literacy.” Define the combination of operational reading and writing and computer usage skills.

Insufficient e-literacy skills are not unique to SA. In the United Kingdom (UK), for instance, similar projects have been initiated to alleviate e-literacy skill issues. Apart from the 6 000 government online centres, several other projects were initiated in the communities such as Community Access to Lifelong Learning (CALL) Programme, Wired Up Communities Programme, and Everybody Online; to mention only a few. These programmes aim to offer free Internet access as well as facilitated IT skill courses (Klecun, 2008:273).

### **1.3.2 Curriculum strategies**

Some of the main restraints of ICT in education in SA are financial constraints, insufficient computer literacy amongst teachers, insufficient training on the integration of computers into different learning areas, and the absence of an adequately developed curriculum for teaching computer skills (Howie & Blignaut, 2009:348). The term “curriculum” refers to the planned learning experiences of an educational institution. It is generally accepted that curricula should be reviewed on a regular basis to ensure that institutions stay abreast of the latest developments and to uphold their current accreditation. Savelyeva and McKenna (2011:56) claim that the curriculum changes are a fundamental challenge to the dominant paradigm in HE, whilst Naude, Wium, and du Plessis (2011:771) assert that institutions should support their staff in terms of professional development activities and ensure sufficient capacity to help a smooth process.

In first world countries, the term computer literacy refers to the assumption that a student has adequate computer knowledge. However, in rural and disadvantaged communities, this knowledge set is often different from the assumption. Hence, computer literacy should be taught in the context of the community, and course materials should be designed carefully to ensure they are relevant to the teaching and learning environment, as well as representative of the workplace environment the person is likely to enter (Bass & Heeks, 2011:25; South Africa, 2010:93). One example of such course materials is the *Integrated competency course for a postgraduate curriculum* (Blignaut & Els, 2010:106).

### **1.3.3 Human capital development**

Abrahams and Goldstuck (2012:109) pose the question: How well does SA wear the label of being an innovative developing country? The majority of South African firms (which are small or micro) and, the majority of households (which are large and low-income) experience numerous obstacles to digital access (Abrahams & Goldstuck, 2012:122). South Africans’ low income, inadequate assets, insufficient access to a communication infrastructure, as well as the low availability of content in local languages, often prevent them from participating in the digital revolution. The digital divide in SA (Fuchs & Horak, 2008:100), as well as in other developing countries (Barroso & Martinez, 2004:264; Capurro, 2010:35; James, 2008:275; Kress, 2009:42), relate to the inequalities between individuals, households, business

and geographic areas, as well as differences in socio-economic levels. The digital divide not only relates to disparities between people's access to ICT, but also to the inequality between countries and within countries due to the respective countries' acute strategic political and developmental issues (Klecun, 2008:268). The explosion of a variety of e-services raises concerns over the digital divide. Blignaut (2009:591) points out that the digital divide has an access and a usage dimension. The access dimension deals with having access to a computer or the Internet, whereas the dimension of usage deals with users' usage patterns of computer equipment and the Internet in order to obtain satisfaction from it. It is not necessarily true that a person who has access to the Internet, will utilise it, although peer and corporate pressure or a feeling of being left behind can motivate a person to improve his/her computer/technological skills.

Currently thirteen per cent (13%) of schools have access to one or more computer and young African children do not receive adequate initial education (early childhood education) in their home languages (Brown & Brown, 2008:111; Howie & Blignaut, 2009:348). At present, local producers of Internet content focus on the media, finances, retail, tourism and entertainment sectors, and not on content development. Online educational content is just starting to emerge, as computer access in schools is limited and only now becoming more widespread. It offers a partial solution to teachers and schools, since it postulates improved professional status, and also increase capacity and provides opportunities for career development and progression (Matodzi, 2006:27). Yet, limited offering of creative and pre-packaged subject matter prevails. The Gauteng Online Schools project, which aimed to utilise ICT to support learning, indicated that approximately 1 100 schools have limited access to educational content, and that there is limited access to online textbooks and other learner supporting materials (Abrahams & Goldstuck, 2012:134-135).

#### **1.4 Research objectives of the study**

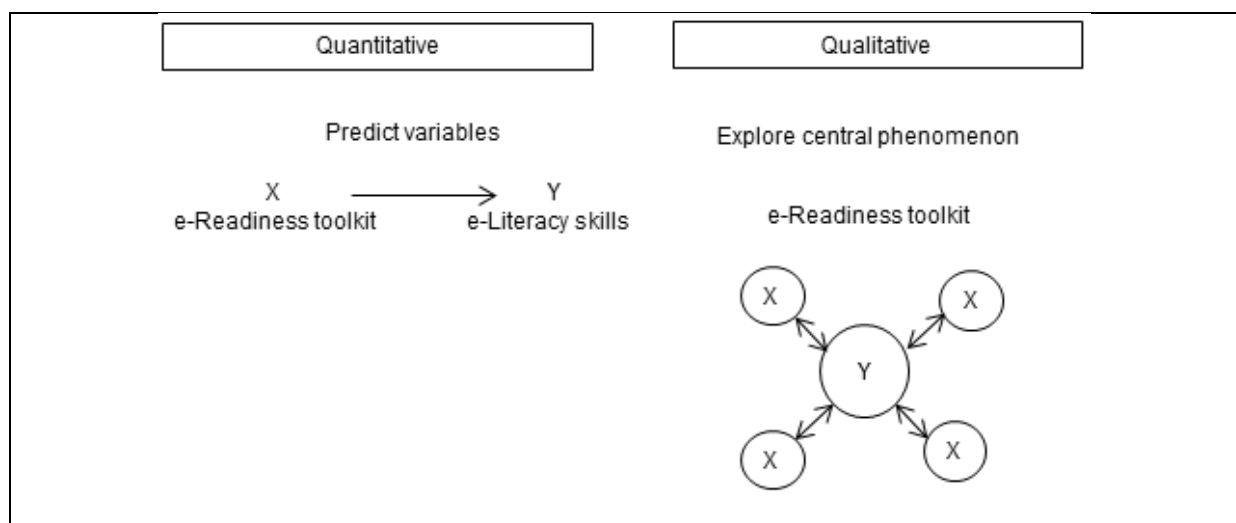
The primary research objective of this study is to test the intellectual conundrum: *Is e-literacy skills training required for e-readiness of novice TUT students?*

The secondary research objectives are:

- Objective 1: to theoretically determine the nature of e-literacy skills and digital divide discrepancies nationally and internationally, incorporating human capital development.
- Objective 2: to theoretically identify and analyse prevailing e-readiness curricula strategies.
- Objective 3: to empirically determine if e-literacy skills' training is efficacious for novice undergraduate students at TUT.
- Objective 4: to develop an e-readiness toolkit for novice students at TUT.
- Objective 5: to verify if the e-readiness toolkit is meaningful to novice students at TUT.

## 1.5 Research design and methodology

The study consists of a qualitative systematic literature review, an empirical study and a fully mixed concurrent dominant status design. In this design, the quantitative and qualitative phases are mixed concurrently with the understanding that the quantitative element is given more weight as the qualitative element. The literature review aims to provide an insight and understanding into the research problem, as well as the necessary background to guide the empirical part of the study. This research study is a case study grounded in an experiment where parallel mixed (Cresswell, 2012:540) quantitative and qualitative components will occur simultaneously (Teddle & Tashakkori, 2009:26). The objective of the quantitative component is to test the research hypotheses. The qualitative research component will explore and confirm the central phenomenon, the effectiveness of the e-readiness intervention. I demonstrate the quantitative and qualitative components of the research project in Figure 1.2.



(Adapted from Cresswell (2012:129))

**Figure 1.2: Quantitative and qualitative approach of research project**

Brase and Brase (2010:26) claim that experiments are the most stringent and restrictive data gathering technique with the goal to study the effects of changing a variable at a time. Moreover, Cresswell (2012:309) maintains that the between-group design is the most rigorous technique available to education researchers. For this reason a true experiment containing a two group pre- and post-test design (Cresswell, 2012:311; De Vos & Fouche, 1998:131) will be implemented.

To allow individuals within the population an equal probability of being selected, systematic random sampling will be utilised. Using this process the researcher advances the internal validity (Vermeulen, 1998:44) of collected data. Voluntary participants' e-literacy skills levels (pre-test) will be established in both the Control and Experiment groups. Individuals in the Experimental group encounter experimental treatment whereas those in the Control group do not. Pre- and post-test measures and observations obtained will be compared and related between the Control and Experimental groups to perceive if they are statistically similar or dissimilar.

### **1.5.1 The literature study**

To emphasise my content area of interest, a qualitative systematic analysis (Britten, Campbell, Pope, Donovan, Morgan, & Pill, 2002:210) will constitute the first phase of this research and will be conducted on study subjects such as: e-literacy skills; digital divide; e-readiness including e-readiness curricula as well as the development of human capital.

Both primary and secondary sources combined with the Internet and electronic databases will form part of the review. Popular databases such as Cambridge Journals Online, SpringerLink, ScienceDirect, Nexus, Emerald, EBSCO Host and ProQuest will be utilised to locate electronic research journals, book sections, and chapters in books and other related articles. Educational journals such as: *Innovations in Education and Teaching International*; *Journal of Library & Information services in Distance Learning*; *Teaching with Technology*; *The Electronic Library*; *Information Technology and People*; *Perspectives on Global Development and Technology*; *Education and Information Technologies* as well as *Computers and the Humanities* will be explored for relevant articles, and will form the foundation of the theoretical premise of this research as described in secondary research objectives one and two.

To carry out the literature review (Okoli & Schabram, 2010:4), a content analysis of hand-picked literature are done using inductive reasoning and systematic coding. By doing so, I will firstly conceptualise the theory, secondly discover patterns and concepts (Babbie, 2013:390), and lastly be able to note relationships between concepts. Coded articles are analysed with the intention to confirm identified relationships. I will clarify the synthesised literature review through a literature map (Cresswell, 2012:95) to indicate overlaps in information, and where information extends the existing literature. Corresponding relationships identified in the qualitative systematic review are integrated with concepts derived from the quantitative and qualitative data analysis. By using this method the researcher can interplay theory with analysed data and succeed with the validity and reliability (Babbie, 2013:336) of data. I furthermore believe that the trends, themes and topics identified through the analytical process I apply in the qualitative systematic literature review, as well as the data collected and analysed in the quantitative and qualitative phases of the study, will conform to the manifestation of my statistics.

### **1.5.2 Research methodology: Quantitative**

To start my research process I anticipate to complete a baseline evaluation by means of a pre-test (De Vos & Fouche, 1998:141). Inferences from the data collected in the quantitative component, secondary research objective three, leads to the formulation and design of the curriculum toolkit and intervention, secondary research objective four, as well as to test the research hypotheses. The pre-skills test (Cresswell, 2012:297) identifies what students already know (knowledge) and can do (skills), as well identify gaps they may have in terms of the requirements of HE. Collected quantitative data are analysed (Babbie, 2013:22; Creswell, 2003:136; Teddlie & Tashakkori, 2009:23) using the Statistical Package for the Social Sciences (SPSS) (Cresswell, 2012:179). Descriptive statistics (Babbie, 2013:460) identifies

underlying constructs of e-literacy. Reliability of the e-readiness questionnaire is measured using Cronbach's alpha and inter-item correlations. Supportive inferential statistics (Babbie, 2013:477) like t-tests, ANOVA and ANCOVA (Cresswell, 2012:327) will furthermore determine associations between independent and dependent variables so as to test the non-directional hypotheses.

#### **1.5.2.1 Research hypotheses**

Cresswell (2012:187) states that hypothesis testing is a procedure for making decisions about results by comparing an observed value of a sample with a population value to determine if any difference or relationship exists between the values.

Hypothesis testing requires that a researcher utters either a directional or non-directional but explicit claim. According to Cohen *et al.* (2011:609) a non-directional hypothesis predicts that there will be a difference or relationship between two conditions or two groups of participants, but it does not state the direction of the difference. Berenson, Levine, and Krehbiel (2012:358) contend that the logic of hypothesis testing involves determining how likely the null hypothesis is to be true by considering the data collected from a sample. The non-directional hypotheses for this study are:

- H<sub>01</sub>: There is no statistically significant effect in Control groups between the pre- and post-test of e-literacy skills
- H<sub>A1</sub>: There is a statistically significant effect in Control groups between the pre- and post-test of e-literacy skills
- H<sub>02</sub>: There is no statistically significant effect in Experimental groups between the pre- and post-test of e-literacy skills
- H<sub>A2</sub>: There is a statistically significant effect in Experimental groups between the pre- and post-test of e-literacy skills

#### **1.5.2.2 Variables**

During research, the operationalisation process (De Vos & Fouche, 1998:113) is when a researcher develops specific research procedures and defines certain central constructs that can result into empirical observations. The central construct is the effect of the investigation and is referred to as the dependent (Cresswell, 2012:115-116) or Y variable. The cause or independent variable, X, influences the dependent variable (Teddle & Tashakkori, 2009:24), and is ordinarily the condition the researcher tries to explain. To answer a research question is to uncover how the proposed cause and the proposed effect relate to each other. Field (2009:13) states that to infer cause and effect, the cause, in this case the e-readiness intervention, and effect, the e-literacy skills of undergraduate students, must occur close together in time. The cause must occur before an effect does and the effect should never occur without the presence of the cause. These conditions imply that causality can be inferred through corroborating evidence. In this experimental research project, I strive to provide a comparison of situations in which the cause, X variable, is present and absent (Cresswell, 2012:301; De Vos & Fouche, 1998:116). I cross

reference the Y, X and confound variables to items in the research instrument in Table 1.1 so as to verify my intellectual conundrum.

**Table 1.1: Related X, Y and confound variables**

| Dependent variable (Y) | Independent variable (X) | Confounding variables                                                                                                                                                   | Items in questionnaire                                                                       |
|------------------------|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| e-Literacy skills      | e-Readiness intervention | Preparedness of students<br>Socio-economic status<br>Urban and rural settings<br>Connectivity<br>Occupation fields<br>e-Skill perceptions<br>e-Readiness training needs | V17 – V18<br>V19 – V23<br>V7 – V9<br>V24 – V28<br>Assessment no<br>V35 – V114<br>V117 – V141 |

### 1.5.3 Research methodology: Qualitative

Subsequent qualitative data as required for secondary research objective five, are collected via open-ended questions (Cresswell, 2012:220) as well as a focus group interview (Cohen *et al.*, 2011:436; Cresswell, 2012:218). McMillan and Schumacher (2001:455) assert that a focus group interview is an efficient strategy to increase the quality and richness of data as soon as a researcher creates a social environment where group members are stimulated by the perceptions and ideas of each other. I am determined to keep indicators such as undergraduate students' perception on the relevance of e-literacy skills, what contribution did the e-literacy training bestow upon him/herself, and were the e-readiness oriented training outcomes met, in mind during moderating (Bryman, Bell, Hirschsohn, Dos Santos, Du Toit, Masenge, Van Aardt, & Wagner, 2014:235) the focus group interview.

I am further determined to remain faithful to the context of secondary research objective five by following a trial of links between data. In order to do so, I utilise Atlas.ti™ qualitative data analysis computer program (Cresswell, 2012:241). Teddlie and Tashakkori describe the inductive process as “the process that involves the discovering of patterns, themes and categories in the researcher's data” (2009:25). Data are categorised and subcategorised (Dey, 1993:102) according to coding schemes determined from the annotations of participants. After coded data are categorised and sub-categorised (Dey, 1993:103), the data are described in a logical sequence, and are integrated with concepts derived from the qualitative systematic literature review as well as quantitative data in order to provide substantiation of evidence.

Jointly, the researcher's theoretical and conceptual framework, quantitative data, as well as the inductive inferences and predictions, facilitates and verifies the research conundrum (De Vos & Fouche, 1998:91; Teddlie & Tashakkori, 2009:26). Table 1.2 on the next page summarises the parallel mixed methodology approach of the research project.

**Table 1.2: Parallel mixed methods strategy**

| Rationale                                                                                | Strategy     | Quantitative data | Qualitative data | Meta data |
|------------------------------------------------------------------------------------------|--------------|-------------------|------------------|-----------|
| Determine and categorise e-literacy skills entry levels of novice undergraduate students | Pre-test     | √                 |                  | √         |
| Develop an e-readiness toolkit for novice undergraduate students                         | Intervention |                   |                  | √         |
| Establish if the e-readiness toolkit was meaningful to novice undergraduate students     | Post-test    |                   | √                | √         |

## 1.6 Population, sampling and geographical demarcation

First time undergraduate students registered at TUT, a public HEI, are selected as participants in this research project. The TUT is situated in the Gauteng province of SA. McMillan and Schumacher (2001:401) assert that when a research site is selected the research problem to be investigated must be present, and can thus be studied. I mentioned the rationale for this study in §1.1 therefore, I intend to execute it on one of the six learning sites of TUT, namely Pretoria.

Participants must have a National Senior Certificate, and have no formal qualification at any HEI in SA. They are taught in the traditional way and have at their disposal a management learning system (myTUTor) for their basic educational needs. The accessible population (Cresswell, 2012:142) are from one academic department but two vocational fields and share common characteristics and sampling elements such as entrance requirements, and are regarded as a homogeneous population, as a result they are included into this mono-method study. To simplify my choice the researcher defines the unique characteristics and parameters of the target population (Mouton, 1996:132; Tashakkori & Teddlie, 2010:356; White, 2005:113, 114) in a sampling frame in Table 1.3.

**Table 1.3: Sampling frame**

|                                   |                                                                                                                                                                                                                                                                                                                                     |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Unit of analysis</b>           | e-Literacy skills levels of undergraduate students at TUT                                                                                                                                                                                                                                                                           |
| <b>Nature of population</b>       | Undergraduate students of TUT enrolled for two vocational diplomas                                                                                                                                                                                                                                                                  |
| <b>Population characteristics</b> | Obtained a National Senior Certificate in the year prior to enrolment at TUT<br>Must be a first entering student at a HEI<br>Socio-economic status of participants differs<br>Derive from urban and rural settings<br>Enrolled for different occupation fields<br>Possess different e-literacy skills<br>Age of participants varies |
| <b>Target population</b>          | The size of the target population is incumbent undergraduate students of one academic department situated on the Pretoria learning site of TUT                                                                                                                                                                                      |
| <b>Accessible population</b>      | The average first year intake for the department is 220 students. The target population is estimated at 220 students                                                                                                                                                                                                                |

The e-literacy entrance skill levels of undergraduate students coming from different socio-economic backgrounds, different surroundings as well as different occupation fields are significant in obtaining results and findings. For this reason I utilise systematic random sampling (Vermeulen, 1998:53) to allocate participants to Control and Experimental groups. Using this method, the researcher may formulate claims that are representative and make generalisations to the population (Cresswell, 2012:143). I base my sampling decision on the advantages and disadvantages of this technique to

garner successful responses to my research problem question. Issues the researcher faces, however, are the accuracy from which the sample are drawn, the level of confidence and the amount of sampling error (Cresswell, 2012:146) that can be tolerated, or the permissible sampling error (Du Plooy, 2009:112) rate.

## **1.7 Measuring instruments**

I visualise data collection (De Vos & Fouche, 1998:90; White, 2005:127) as a series of interrelated activities aimed at gathering information to answer my research question. To be able to accomplish the stated research objectives and outcomes, placement testing (Cohen *et al.*, 2011:481) are done. A commercially produced parametric (Cohen *et al.*, 2011:479) e-literacy skill questionnaire consisting of closed and open-ended questions (Cresswell, 2012:220) are adopted and customised (Cresswell, 2012:157) into the e-readiness questionnaire.

The questionnaire aims to determine the e-readiness as well as the under-preparedness of new-comers. Indicators such as biographical information, socio-economic status, occupation field, particular electronic device ownership, connectivity, e-literacy skills perceptions, as well as the application of e-literacy skills will form the basis of the e-readiness questionnaire. The under-preparedness of students is determined via the situational test, a hands-on assessment, comprehending three main categories such as basic skills, functional skills and proficient skills. Practical considerations stipulated by Cohen *et al.* (2011:402-403) are taken into account during the adaptation (Bryman *et al.*, 2014:210) of the questionnaire. A baseline evaluation of the e-readiness questionnaire and situational test are piloted (Bryman *et al.*, 2014:209; Cohen *et al.*, 2011:84) by members who are not be employed in the actual full study.

## **1.8 Ethical aspects of the research**

Ethics is defined as “a matter of principled sensitivity to the rights of others” (Cohen *et al.*, 2011:84). Codes for research are recognised throughout the world and place an emphasis on the humane and sensitive treatment of research participants (Hoffmann, 2012). Social researchers must take into account the effects of the research on participants, and act in such a way as to preserve their dignity as human beings. Miller, Imrie, and Cox (1998:248) point out that even though researchers have the privilege to search for truth and knowledge, it should never be at the expense of individuals in society.

I deem ethics important as there have been many cases of abuse of people’s rights in the quest of social research. Therefore it is my responsibility as researcher to ensure that this research project is ethically (NWU (North-West University), 2013:online) conducted. I intend to follow the general principle of *primum non nocere* (Cohen *et al.*, 2011:85) across three research ethics requirements namely autonomy, non-maleficence and beneficence (De Vos, Strydom, Fouche, & Delport, 2012:115; Vermeulen, 1998:17). For autonomy I assure participants privacy, confidentiality and ambiguity. I will gain permission from gatekeepers (Cresswell, 2012:211) and get informed consent from participants. No student are

manipulated and I will not use deception to secure participation (Cresswell, 2012:231). Regarding non-maleficence, I ensure that at every stage in this research process, the participants, their communities and alma maters, will not be maligned and harmed in any way. The e-readiness questionnaire and situational test are submitted for ethical clearance at both the Research Ethics Committees of TUT and North-West University (NWU). Ethical clearance number REC2014/12/008 (Addendum 1.1, TUT ethical approval) is valid for TUT and ethics number NWU-00183-14-A2 for NWU (Addendum 1.2, NWU ethical approval).

As researcher, I ensure that no obvious mistakes are made during statistical analysis and that consistent inductive coding is applied. I furthermore ensure that data and definitions are compared with rigid codes and themes, and declare that no negative or discrepant information that might be contradictory to the themes be given. I stay committed to reporting my analysis and interpretations as scientifically, i.e. as precisely and without prejudice, as possible. I therefore declare my own bias as researcher.

## **1.9 Significance of the study**

From a theoretical perspective this study makes a valuable contribution to the existing body of knowledge by investigating the importance of e-literacy skills for 21<sup>st</sup> century skills development and factors that influence the acquiring of e-literacy skills specifically in learners around HEIs in SA. e-Literacy skills are a requirement in the 21<sup>st</sup> century, therefore learners need self-confidence as they participate in the ever-evolving world of technology in HE and other environments.

Policy makers and governing bodies of other UoTs would be able to benefit from the findings of the study in that it could provide insight into the importance of skills development, especially the 21<sup>st</sup> century workforce.

From a practical perspective this research study can benefit undergraduate students by letting them undergo e-readiness training at the onset of their enrolment. This might facilitate their ability to use e-learning platforms and let them reap the riches thereof.

An e-readiness training curriculum are developed and recommended to other academic departments of TUT to utilise in order to prepare their undergraduate students for e-learning platforms as e-learning is offered.

This proposed study resides under the research focus area Technology Enhanced Learning for Innovative Education and Training, South Africa (TELIT-SA) and contributes towards the research output of TELIT-SA. It fits into the sub-programme *Frameworks for using TEL in HE* as it ultimately contributes towards how to address the obstacles of inadequate e-literacy at HEIs.

## **1.10 Structure of the study**

### **Chapter 1: Introduction and background of the study**

This chapter introduces and gives the background of the study. The importance and purpose of the study are discussed and the research problem is defined. The primary and secondary research objectives and hypotheses are clearly stated to guide the flow of the research. In this chapter, the research methodology and design and a description of the benefits of the study including important ethical considerations will be discussed.

### **Chapter 2: Review of body of scholarship**

Chapter Two explores constructs on the nature of e-literacy, e-skills, e-readiness and connotations of the digital divide. Concepts on human capital combined with prevailing e-readiness curricula in HE will be discussed. The qualitative systematic literature review attempts to get a better understanding of inherent definitions, characteristics and problems of the research phenomena. This is done from viewpoints of various other researchers and academic literatures.

### **Chapter 3: e-Readiness toolkit**

The main focus of this chapter is to explain the background and structure of the e-readiness toolkit. The intervention manual is not bounded to software application versions and covers course material with specific learning objectives and learning outcomes in nine e-readiness constructs. User friendly tutorials and hands-on instructions are presented and described for a tutor and a learner.

### **Chapter 4: Research design and methodology**

The research problem, research philosophy and conceptual framework, primary and secondary research objectives, and hypotheses as well as the means of testing the hypotheses are presented in this chapter. The chapter discusses the research design and methodology in more detail, outlining the specific methods used to gather empirical and qualitative data. The reliability and validity of the study are also looked at in this chapter as well as the design of the data collection instruments. Lastly, data processing and analyses are explained by means of quantitative and qualitative data analysis techniques such as descriptive and inferential statistics as well as inductive reasoning.

### **Chapter 5: Empirical findings**

This chapter highlights the personal demographical data of the respondents as well as other descriptive statistics around e-literacy skills perceptions. The chapter then presents research findings obtained by means of inferential statistics using t-tests, ANOVA and ANCOVA. Means and standard deviation results

of empirical data are provided as frequencies and percentages in tables and graphs. Reliability of the e-readiness questionnaire is confirmed by means of Cronbach alpha ( $\alpha$ ) and inter-item correlations. Statistical significant effects are endorsed with effect sizes.

## Chapter 6: Qualitative findings

Chapter Six provides qualitative findings from the focus group interview and open-ended questions. Data are interpreted and conceptualised to discover patterns, themes and categories related to secondary research objective five as well as to crystallise data.

## Chapter 7: Conclusions and recommendations

The last chapter summarises the study and its findings. The research objectives, research question and hypotheses are revisited. Limitations of the study, contributions to social science and areas for further research are presented. The chapter concludes with the researcher's journey through a PhD.

### **1.11 Chapter summary**

Chapter One provides an introduction to the research study. Not only does it introduces the research problem statement, research question and primary and secondary objectives, but also emphasises the significance and value of the study. I clarified my research paradigm and placed the title of the study into context by stating the main theory concepts and boundaries of the study. The research and design indicate the methodology I will follow including the research hypotheses, dependent and independent variables as well as a population and sample frame. Other important issues such as measuring instruments, ethics and a layout of the thesis' chapters are provided.

Chapter Two is dedicated to the qualitative systematic literature review on key concepts of this study. It provides the theoretical background on which this investigation is based.

## **CHAPTER 2: REVIEW OF BODY OF SCHOLARSHIP**

- 2.1 Introduction
  - 2.2 Methodology of the qualitative systematic review
  - 2.3 e-Literacy skills
    - 2.3.1 Literacy, the predecessor of e-literacy
    - 2.3.2 e-Literacy conceptualised
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-

# CHAPTER 2

## REVIEW OF BODY OF SCHOLARSHIP

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### 2.1 Introduction

The impetus of this qualitative literature review (Okoli & Schabram, 2010:6) is to analyse the progress of a specific stream of research on e-literacy, e-literacy skills, e-readiness and connotations of the digital divide. Notions on human capital development combined with prevailing e-readiness curricula in HE are discussed in order to enhance an understanding of inherent definitions, characteristics and action plans, as well as problems of the phenomena. To attain such perceptions, journal articles, research papers and other related literature were searched and compared by looking at concepts and how they relate to one another in order to identify new and emerging issues worthy of investigation and exploration (Creswell, 2007:30; Kennedy, 2007:139; Teddlie & Tashakkori, 2009:109).

### 2.2 Methodology of the qualitative systematic review

I followed the seven step guide of Britten *et al.* (2002:210) to perform this systematic qualitative analysis of the literature review. I searched popular electronic data sources (Merriam, 2009:156) such as SpringerLink, Nexus, ScienceDirect, Emerald, EBSCO Host and ProQuest using bullion searches on keywords "*literac\* or e-literac\* or eliterac\* or electronic skills*" and "*readiness or e-readiness or ereadiness*" and "*develop\*\**" as well as "*digital divide.*"

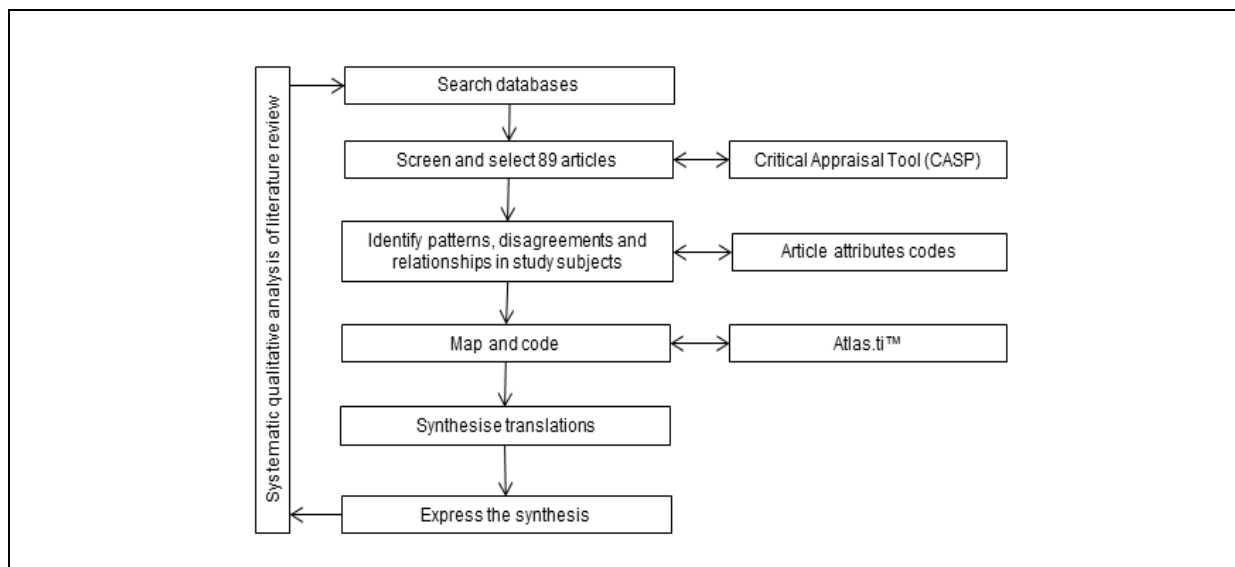
For an unbiased assessment, and to enhance the validity and trustworthiness of my literature, a forward and backward article search was executed. I used published and unpublished articles, institutional and technical reports, conference proceedings, theses, working papers and other grey literature related to study subjects perceived from the conceptual framework of this study. One hundred and nine articles relevant to the keywords were screened according to the Critical Appraisal Tool (CASP), (CASP, 2013:online), a tool explicitly utilised to screen academic literature (Addendum 2.2, CASP). A final list of eighty nine full text articles and Government documents were included in the qualitative analysis. From there the articles were further analysed and indexed according to a coding system suggested by Chong Ho Shon (2012:25), for important qualities such as critique on previous literature, gaps in literature, previous research findings and so on. The coding system, which isolated important qualities in articles together with their meanings, is listed in Table 2.1. The probed articles were exported into a Microsoft Word<sup>TM</sup> document (Addendum 2.1, QSLR). This step facilitated me to better understand the research project's underlying principles, to recognise previous literature, sources of disagreement as well as relationships between study subjects.

**Table 2.1: Article attributes codes**

| Code | Meaning                            |
|------|------------------------------------|
| CPL  | Critique of previous literature    |
| GAP  | Gap                                |
| RAT  | Rationale                          |
| RCL  | Results consistent with literature |
| ROF  | Results of findings                |
| RFW  | Recommendations for future work    |
| RTC  | Results to the contrary            |
| SPL  | Summary of previous literature     |
| WTD  | What they do                       |
| WTDD | What they did                      |

(Chong Ho Shon, 2012:25)

I then followed systematic mapping, using Atlas.ti™ as an inductive process of coding to analyse the by now selected articles, and imported them as primary documents into a HU Literature Review, (Addendum 2.3, Atlas PhD Literature review). Significant segments in articles were categorized according to conceptualised keywords, and resulted in 25 codes and 541 quotations. Thereafter codes were grouped into families to identify structures and relationships between them and to synthesize translations. Figure 2.1 presents a systematic literature map for the execution of the review.

**Figure 2.1: Systematic map of qualitative analysis of literature review**

From the integrated data set (Addenda 2.2 and 2.3), a non-biased and objective literature review was prepared, with the originality in using the work of others, and discusses interpreted literature related to three themes. The first theme will discuss e-literacy skills definitions, e-literacy skills interpretations as well as the attainment of e-literacy skills. The second theme deals with matters pertaining to the digital divide as conceptualised, and discourses the digital divide for Africa and South Africa, including some difficulties it poses for e-readiness. The last section clarifies the importance of e-literacy skills for human capital development (HCD), factors hindering the growth of HCD, and the involvement of HE's in HCD.

## 2.3 e-Literacy skills

The purpose of this section is to give an overview on notions of literacy and changes in computer literacy practices, as conceptualised from the inductive analysis with Atlas.ti™. Figure 2.2 illustrates themes associated with e-literacy, and e-literacy is discussed using three headings: (i) literacy, the predecessor of e-literacy; (ii) e-literacy conceptualised and (iii) e-literacy skills attainment.

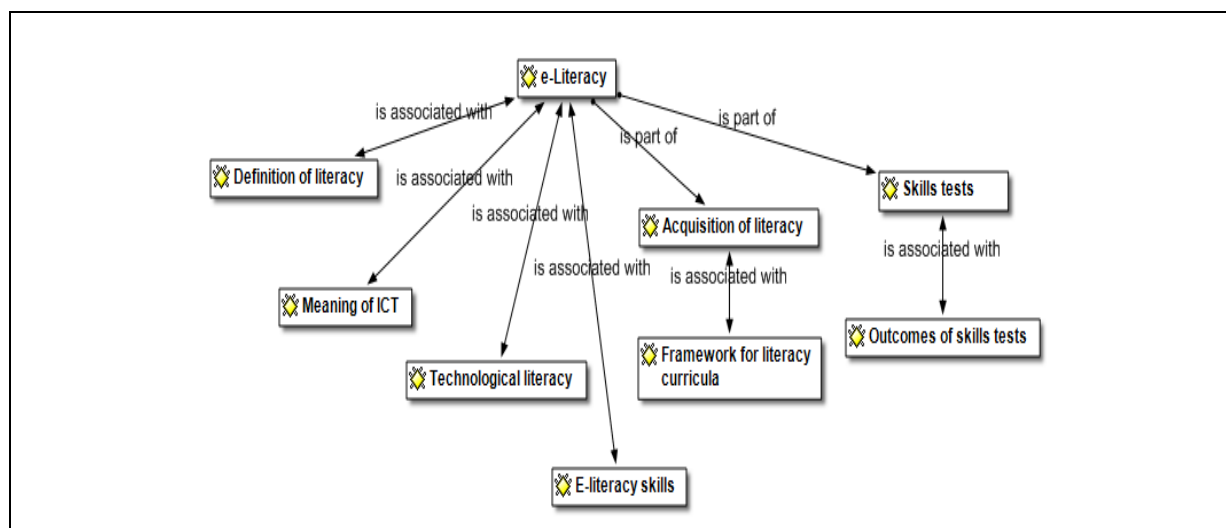


Figure 2.2: e-Literacy themes from qualitative literature analysis

### 2.3.1 Literacy, the predecessor of e-literacy

Different notions of literacy became noticeable from this investigation and have changed (Warschauer, 2003:40-41) over the past hundred years. In the nineteenth-century (classical period), literacy was viewed in terms of knowledge of literature and attention to rhetorical appropriateness. Literacy pedagogy involved rote learning, oral recitation, copying, and imitation of what was considered correct speech and writing. The nineteenth century's literacy curriculum was based on exemplary texts such as the Bible, a narrow selection from Greek and Roman literature, and handwritten readers. This public schooling paradigm corresponded to the needs of an aristocratic social structure, in which land, power, and knowledge were concentrated in a few hands, and education involved obedience to tradition and power. Following the mass industrialisation of the early twentieth century, a Deweyan (Prawat, 2000:834) progressive paradigm of literacy emerged. During this paradigm, literacy was viewed as a form of self-expression. Literacy pedagogy involved teacher/pupil interaction, as well as the discovery method. This curriculum included civilians in order to produce good citizens, adventure stories in order to tap into students' interests, and self-generated written texts in order to foster creativity and imaginative thinking. But the progressive model never fully took hold; instead, it was in constant struggle with a more technocratic paradigm that eventually wore out. Within this technocratic paradigm, literacy was viewed in terms of the skills needed for functioning effectively in society. Literacy pedagogy involved programmed

instruction, learning packages with teacher as facilitator, and mastery learning of a common set of objectives. The literacy curriculum was based on the sub skills of literacy competencies.

While it was possible to learn about literacy practices in the past, recent research (Dobberstein, 1993:431; Kellner, 2001:69; Vincent, 2003:342) indicates that literacy involves the gaining of skills and knowledge to read and interpret texts, and to successfully navigate and negotiate the challenges, conflicts and crises of literateness. McMillan (1996:165) declares that literacy has extended beyond the skill of only articulating, understanding and writing. A literate individual is considered to have a far broader and deeper education than that conferred by merely the ability to read and write. Literacy includes functional, workplace, family and scientific attributes in order to function adequately in a contemporary society. In its broadest sense, literacy is a powerful means to empowerment. This is consistent with the statement made by Duffelmeyer (2000:290), that literacy is an awareness of forces that affect the micro- and macro level conditions within which people acquire literacy, and how they perceive the meaning of literacy, whilst Warschauer (2003:46) contends that literacy is a social practice, involving access to physical artefacts, content, skills, and social support.

Looking back chronologically over literature, we see that technological transformations are aligned to bring major changes in literacy practices. New types of computer and Internet based literacy practices emerged, therefore technological paradigm shifts transformed (Beetham, McGill, & Littlejohn, 2009:9; Hoffman & Blake, 2003:225; Simsek & Simsek, 2013:128). Because the focus of literacy shifted towards its integration into computing technologies, it shapes our current definition of computer literacy. Hoffman and Blake (2003:227) and (Warschauer, 2003:111) are of the opinion that literacy is finding greater common ground with other literacies, for instance computer literacy, information literacy, multimedia literacy, and computer-mediated communication literacy. These new literacies not only stem in part from the new technological features of the computer, but also from the broader social setting (Larsen & Golden, 2006:115; Stoiciu, 2001:39) in which computers are used. Across frameworks (Voogt, Erstad, Dede, & Mishra, 2013:404), it is agreed that collaboration, communication, digital literacy, citizenship, problem solving, critical thinking, creativity and productivity are essential for living in, and contributing to, our present societies. Wireless-enabled environments, portable computing and mobile devices are omnipresent and indicate the significance of e-literacy.

### **2.3.2 e-Literacy conceptualised**

Many research articles (Burnett, Merchant, Pahl, & Rowsell, 2014:90; Gormley & McDermott, 2013:21; Shepherd & Goggin, 2012:66) substantiate the fact that, as we developed computer knowledge and technological preparedness over the years, “computer literacy” evolved into “e-literacies” or “new literacies” to meet the challenges of new technologies.

The term computer literacy emerged in the late 1970s, together with the spread of the personal computer (Warschauer, 2003:111), and is synonymous with technical abilities to use computers and to master

programs. Within a decade, the term computer literacy became widely discredited among educators, because it was generally referred to as the most basic form of computer operation, such as turning on a computer, opening a folder, and saving a file. Similarly do different authors refer to computer literacy as the most basic and trivial form of computer skills (Dobberstein, 1993:432; Goodfellow, 2011:131). For example, Kellner (2001:69) states that computer literacy is the technical knowledge and skills of reading, writing, research and communicating, including heightened capacities for critically accessing, analysing, interpreting, processing and storing of both printed and multimedia material.

Konar, Kraut and Wong (cited by Dobberstein, 1993:430) contend that computer literacy is made up of three components: awareness; skills and knowledge. Awareness refers to a familiarity with capabilities. Skills require keyboarding and the use of computer applications, whilst knowledge refers to understanding the technical workings of computer equipment. Literacy is therefore a condition to equip people to participate in the local, national, and global economy, culture and society. Other writers' contextual views of computer literacy are that it encompasses the social and ethical context of computing, and hardware and software components of a computing system (Blignaut & Els, 2010:101; Hoffman & Blake, 2003:223). Dobberstein (1993:429) and Akoojee and Arends (2009:192) argue that computer literacy skills vary from person to person, and are influenced by the context in which computers are used. These are referred to as functional literacy skills.

Thus, in my opinion, computer literacy involves technical abilities pertaining to developing basic typing skills, mastering computer programs, accessing information, the effective use of e-resources and exploiting of computer technologies for a variety of purposes, ranging from interpersonal communication to creative illustrations. In other words, computer literacy is the ability of people to use all forms of communication technologies to improve life chances in personal spaces, work environments, community interactions, and participation in governance processes.

However, if people do not concurrently acquire critical computer literacy, they will not be able to change the conditions of their lives, for it is critical computer literacy (Duffelmeyer, 2000:290; Hoffman & Blake, 2003:225; Warschauer, 2003:38) that allows us to comprehend our relationship with computer technology and its uses, its possibilities, and its meanings. Besides, Kellner (2001:72) argues that people should learn new forms of literacy, which should involve how to use computer technologies, do research, gather information and to perceive a new literacy culture as a terrain that contains texts, spectacles, games, and interactive multimedia. Taha (2006:69) and Klecun (2008:269) support this when they declare that "electronic literacy is required by learners in order to make effective use of e-resources whereby learners have to cope with the complexities of knowledge and knowledge resources in many domains."

Although very little was said about computer literacy and its significance, this led to a further inquiry to investigate skills and attitudes that are needed for living and working in the 21<sup>st</sup> century. It is generally agreed that 21<sup>st</sup> century skills are often referred to as e-literacies (Voogt *et al.*, 2013:404), which involve the ability to discover and access information, the ability to read, to scan texts and computer databases,

including websites, and to access information and images in a variety of forms (Burnett *et al.*, 2014:97; Kellner, 2001:73). Goodfellow (2011:133) and Simsek and Simsek (2013:134) link 21<sup>st</sup> century skills to digital literacy or e-literacy. For them digital literacy includes a subset of skills such as learning and thinking skills, communication, creativity and innovation, collaboration, media and ICT skills. There are numerous literatures available on digital literacies (Billon, Lera-Lopez, & Marco, 2010:66; Fuchs & Horak, 2008:114; Goodfellow, 2011:133; Modarres, 2011:5; Simsek & Simsek, 2013:129; South Africa, 2010:85; Stoiciu, 2001:39) but for the sake of brevity I will stop here.

In this section I tried to make sense of what it means to be computer literate. This clarity highlighted the importance of the ability to transfer and apply skills to new situations and environments as they occur in the 21<sup>st</sup> century. A further inquiry leads to the acquisition of e-literacy skills.

### **2.3.3 e-Literacy skills attainment**

Modern technologies and globalisation brought rapid changes in all aspects of human life. As a result, e-literacy skills become increasingly important, and as a result these skills influence the quality of life in young and old. Every day more information is created, and continuous development requires new knowledge and skills. There is a need for faster and timely education which is open, and at the same time, widely available. At present there is an increased interest in smart phones for teaching and learning, mainly because smartphones expanded its wireless broadband networks, power and bit capacities, as well as its communication opportunities (Milosevic, Zivkovic, Manasijevic, & Nikolic, 2015:213). Portability, immediacy, individuality, connectivity and accessibility are some of the most important features of a mobile device that has the potential to help improve the quality of teaching, learning and education management (Traxler & Vosloo, 2014:26). The spread of cellular phones to all corners of the world, especially to remote areas of Africa, opened new prospects to introduce digital channels for learning, communication and the retrieval of information (Semali & Asino, 2014:82). The uptake of mobile phones in developing countries created hope in people at the bottom of the income pyramid to become part of and participate in the telecommunication society. Portability, simplicity and affordability of the mobile phone made it a natural fit for educational initiatives in places where personal computers and Internet connectivity are rare. Kavanaugh, Puckett, and Tatar (2013:285) found that some users used smartphones as scaffolding technology to learn how to use a desktop or laptop computer. The ability to learn on the move, at anytime and anywhere, is becoming increasingly popular and is in accordance with the trends of lifelong education, distance education and e-learning; it presents an integral part of the global computerisation of the society, a process that is already happening and that cannot be stopped.

Different research has addressed various aspects (Sarrab, 2015:835) of mobile devices and their role and usage (Chudgar, 2014:28), as well as their effectiveness in educational domains. Current research has not indicated any significant differences in e-literacy skills attainment by using mobile phones, but has shown that new social practices have evolved, due to the increased use of digital technologies. Velghe

(2014:112) argues that mobile phones have made certain forms of literacy more accessible to a vast number of impoverished and marginalised people. Text messages, instant messaging chats, blogs, tweets and Facebook status updates have created platforms for literacy and literacy acquisition. Blazun, Vosner, Kokol, Saranto, and Rissanen (2014:7) indicate that people living in old age homes, who had the opportunity to learn how to use the world wide web (www), were less lonely and more social after basic ICT training. Semali and Asino (2014:95) concur that the expansion of mobile literacies created an environment where Namibian and Tanzanian people improved their wellbeing, which led to both social and economic improvements.

In developed countries the term e-literacy refers to the assumption that a learner has a wide range of knowledge about how the world works. However, in rural and other disadvantaged communities, the knowledge set is often different from these assumptions. Hence, e-literacy needs to be taught in the context of the community, and should be designed to ensure they are relevant to the environment where training and learning are taking place, as well as representative of the working environment the person has been trained for and is likely to enter (South Africa, 2010:93). This corresponds with the opinion of Akoojee and Arends (2009:192) that the nature of intermediate-level ICT skilling in South Africa needs to be understood in the context of some key terms which might not be consistent with their usage elsewhere. Ample literature on interventions to promote critical literacy (Duffelmeyer, 2000:304), including the use of technology for learning (Jefferies & Hyde, 2010:139), suggests that students must be offered a change to develop critical computer literacy and that lessons should be put into practice. Other researchers (Billon *et al.*, 2010:60) claim that it is necessary to expose students to multiple technology related issues and perspectives in order to promote more productive use of some technologies. Klecun (2008:279) investigated the absence of e-literacy skills in sporadic ICT users with the intention to develop and evaluate interventions that promote e-literacy. The findings indicate that people seek to learn to use ICT for different reasons, and suggest that a curriculum should not only focus on office software and IT skills, but should encompass a variety of e-literacy skills and that these skills should be linked to other literacies.

Literature found parallel studies conducted on the design and implementation of e-literacy curricula. In an e-learning environment, Taylor *et al.* (2011:36) identify factors that influence the successful learning of computer literacy. In so doing researchers came to the conclusion that steps should be taken to help learners overcome computer anxiety, and that learners should realise the importance computers will play in their future. Blignaut and Els (2010:106) make an attempt to get closer to knowing which computer literacies, or comperacies (McMillan, 1996:168) as they refer to it, are required by postgraduate students, and prepared a *Framework for the professional development of comperacy required for post graduate studies*. This framework suggests a curriculum that is divided into basic computer components, comperacy skills and information competency. Similar action research projects (Duffelmeyer, 2000:304; Klecun, 2008:268) indicate designs of e-literacy curricula and courses based on these. Their aim was to explore the development of critical literacy in first year students, and to evaluate interventions to promote e-literacy. Another framework, *Guidelines for teaching and learning of information literacy to ECP*

*students*, suggested by Naidoo and Raju (2012:41), indicate that computer literacy training must be offered to digitally disadvantaged students before formal training starts.

Since computer literacy took its place as one of many forms of literacy, Hoffman and Blake have used a *Merging literacy model* (2003:231) as basis in developing a computer literacy course. This model anticipates future trends in technology, and the topic computer *literacy for tomorrow* concentrates on how to learn to use computing technology, to expand information literacy, as well as the integration of computing technology into modern society. In another model for the development of computer literacies, Bass and Heeks (2011:6) designed an *OPTIMISM* model by which universities and Ministries of Education in African developing countries, especially Ethiopia could evaluate their progress on the updating of their computing curricula. The United Nations Educational, Scientific and Cultural Organisation's (UNESCO) Institute for Statistics (UIS) (Unesco, 2012:11) has developed a literacy assessment and monitoring programme that allows countries to assess the full spectrum of their populations' literacy skills through a standardised reading and numeracy assessment. Yet, the effective use of new technology requires a step-change in local skill levels, including a step-change in ICT related university education. Countries are challenged to develop curricula and courses that are closely related to specific technologies. In the UK, for instance, similar projects are initiated to alleviate e-literacy skill issues. Apart from the 6 000 online centres established by the UK Government, several other projects were also initiated in the communities such as Community Access to Lifelong Learning (CALL) Programme, Wired Up Communities Programme, Everybody Online, to mention only a few. These programmes aimed to offer free Internet access as well as to facilitate IT skill courses (Klecun, 2008:273).

The presence of a literate environment is ineluctable (Easton, 2014:3). The literacy environment designate the characteristics of a setting, or of society at large, that support the acquisition, use and retention of reading, numeracy, ICT and digital literacies. Provision of reading materials and opportunities to apply, master, maintain and increase e-literacy skill levels for personal or social benefits are important.

#### **2.3.4 Solutions for e-literacy training**

Colleges and universities have employed a wide range of strategies to accommodate their heterogeneous student populations. Some institutions allow incoming freshman to waive taking a required computer literacy course by successfully passing a skills assessment test. Other institutions provide quick-start workshops (Kalman & Ellis, 2007:25). Another effort made by (Beriswill, Bracey, Sherman-Morris, Huang, & Lee, 2016) concentrated on common core state standards and 21<sup>st</sup> century skills as core of their e-literacy training. Although several private institutions in South Africa offer expensive computer literacy courses, there are also numerous community projects (Gumbo, Ntsekhe, & Terzoli, 2014) that help to empower underprivileged youths in rural townships. (Roseborough, 2014) refer to these projects as "typeright enrichment projects". A discussion on existing e-literacy training solutions implemented in South Africa is presented in 2.5.3.

## 2.4 Digital divide

This section discusses the theme **digital divide** conceptualised from the inductive analysis with Atlas.ti™. Themes associated with the construct are discussed using four headings: (i) digital divide revolution; (ii) digital divide conceptualised; (iii) digital divides for Africa and South Africa, and (iv) digital divide hampers e-readiness.

The various themes associated with the digital divide are illustrated in Figure 2.3.

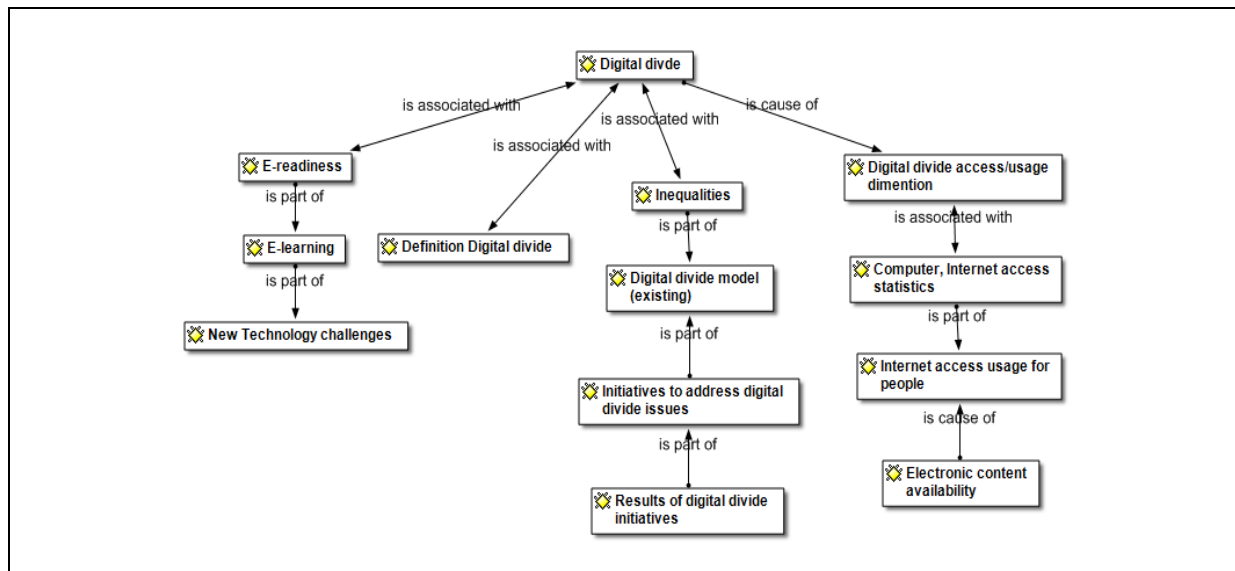


Figure 2.3: Digital divide themes from qualitative literature analysis

### 2.4.1 Digital divide revolution

In recent years, major advances in ICT, combined with the rapid growth (James, 2011:123) of global networks such as the Internet (Billon *et al.*, 2010:28; Larsen & Golden, 2006:114) have transformed businesses and markets, revolutionised learning and knowledge-sharing, generated global information flows, and empowered citizens and communities in new ways that redefine governance. McSorley (2003:80) asserts that these ICT advancements have created significant wealth and economic growth in many countries. The digital revolution evolved the dramatic power and versatility of technologies so much so that the explosion of varied technology services caused a gap in access opportunities as well as the variety of information and communication technology activities between individuals, households, businesses and geographical areas at different socio-economic levels (Billon *et al.*, 2010:41; Uzunboylyu & Tuncay, 2009:281).

Today, learning environments are designed to include web-based technologies, and thus it is essential that these technologies are easy to use. However, the South African scenario is such that a large number of HE students are introduced to computers and Internet technology for the first time when they enter these institutions, and thus grapple with basic computer skills (Naidoo & Raju, 2012:34).

Czerniewicz and Brown (2013:46) refer to these persons as digital strangers, those who have deficient ICT experience and opportunities compared to a digital native, a person from the millennial generation, one who has grown up with digital technology and who comes to university familiar with computers. Marsh (2000:13) states that it seems apparent that the technological competencies of the majority of students entering historically disadvantaged Technikons are inadequate. Asah (2013:507) adds that in SA, as in other developing countries, the integration of computers into health-care delivery units is taking place at a very slow pace, particularly in government health-care institutions, and the situation is even worse in rural areas.

#### **2.4.2 Digital divide conceptualised**

The digital divide debate is well known and much has been written about it. Conceptualising it, different streams of research define it differently. Moolman and Blignaut (2008:169) describe the digital divide as a divergence between individuals, communities, cultures and nations at socio-economic levels in terms of access to information and communication technologies as well as Internet usage. Billon *et al.* (2010:41) refer to the digital divide as “the gap between individuals, households, businesses and geographic areas at different socio-economic levels, with regard to their opportunities to access information and communication technologies and to their use for a wide variety of ICT activities.” Klecun (2008:268) maintains that the digital divide is not only disparities between people’s access to ICT but also to the inequality (Bruno, Esposito, Genovese, & Gwebu, 2011:27) between countries and within countries due to the respective countries’ acute strategic political and developmental issues. Besides, Stoiciu (2001:38) maintains that the digital divide is extensive and that there is a strong correlation between it and poverty. He claims that almost forty percent of the world population live in low income countries, and that about one billion people have no access to ICT. Other authors such as Warschauer (2003:6) highlight factors such as the availability of digital resources (relevant content in diverse languages), human resources (literacy and education), and social resources (institutional structures). De Haan and Huysmans (cited by Blignaut, 2009:582) state that the digital divide is not only a matter of possessing a household personal computer or having access to the Internet but that it is the use of ICT that determines who is ahead, who is catching up and who is left behind in the information society.

Norris (2001:339) categorises the digital divide in terms of a global divide, social divide and democratic divide, whilst Youssef (cited by Uzunboylu & Tuncay 2009:281) identifies four types of digital divides namely: access divide; uses divide; performance divide and dynamic divide. On the other hand, Blignaut (2009:586) claims that the digital divide has an access dimension as well as a usage dimension. Blignaut explains that the access dimension deals with having access to a computer and/or the Internet, either at school, work, home or a public place, whereas the usage dimension deals with users’ usage patterns and abilities to use computer equipment and the Internet (Bruno *et al.*, 2011:16) to participate in the global information society. For Wilson (cited by Fuchs & Horak, 2008:101), there are eight aspects of the digital divide: physical access (access to ICT devices); financial access (cost of ICT services relative to annual income); cognitive access (ICT skills); design access (usability); content access (availability of relevant

applications and information online); production access (capacity to produce one's own content); institutional access (availability of institutions that enable access); and political access (access to the governing institutions). Wilson relates these eight aspects to six demographic dimensions of the digital divide namely: gender; geography; income; education; occupation and ethnicity. Klecun (2008:269), on the contrary, summarises and presents the digital divide in four categories. The first category is the disparities between people's access to ICT. The second category is a developmental problem within and between countries. James (2008:121) made a classic argument for this view by stating that the digital divide is simply the ratio of information technology stock (Fuchs & Horak, 2008:100) in developed countries compared to the stock in developing countries. Thirdly, it is categorised as a political and social issue rather than a development problem and the last category contradicts the third, namely the digital divide should not be seen as a strategic political or a developmental issue.

Today, the digital divide comes in many forms. It has changed from digital divide to digital inclusivity. The speed of access to information is an important variable in user and community typologies. This inclusion encompasses service provision, access to data, creating a presence on the Internet as well as the shaping of ICTs. The issue of access has become more sophisticated in less than a decade (Modarres, 2011:5). In our effort to conceptualise the digital divide since the 1990s and early 2000s, the latter years have collapsed the traditional issue of differential access to differential patterns of usage. Studies of (Cullen & Cobb, 2011:30) demonstrate that, regardless of how many info-kiosks or telecentres there are installed in a low income or developing country, the probability of Internet use is ten times higher for a person in a developed or high income country than for a person in a developing country. This fact validates that education and changing mentalities are key factors in helping to bridge the digital divide. It is concerned with the implementation of a technology infrastructure (Amiel, 2006:238). Governments should develop and use e-government tools in order to enhance e-readiness, encourage and educate the usage of ICT, and support the development of ICT skills in a non-discriminative manner.

Although there is limited understanding of how non-use of ICT and e-illiteracy affect people in their daily lives, or of people's aspirations for use of these technologies, the ability to use ICT is predominantly seen as a pre-requisite to participate (living and working) in an e-society (Cushman & Klecun, 2006:348). This declaration warrants the discussion on the importance of computer literacy for HCD in §2.5.1.

So the question rises, how does the digital divide influence Africa and more specifically South Africa?

### **2.4.3 Digital divides for Africa and South Africa**

Concerning Africa, one can speak of a digital apartheid that has real world causes, such as the unequal global distribution of resources. Digital apartheid means that certain groups and regions of the world are systematically excluded from cyberspace and the benefits that it creates (Fuchs & Horak, 2008:104). It is an expression of the unequal geography of global capitalism where there are insufficient economic and technology resources. With very few exceptions, the best ICT is available in several urban areas in

contrast to scarce, primitive technology or a complete lack of ICT in rural areas and some peri-urban areas (Howie & Blignaut, 2009:350). Statistical data (Unesco, 2012:13, 19) show that almost all Sub-Saharan African countries with low Internet access are among the least developed countries in the world in terms of health, education, and income (Fuchs & Horak, 2008:105-106). This indicates that there seems to be a connection between global social gaps and the global digital divide. The so called network society has created parallel communications systems. The first and foremost is the one for those with income, education and fast but low cost connectivity. The second system is for the other without connections, blocked by barriers of time, cost and uncertainty, and dependent upon outdated information. For Africa this means that in the current form of the global network society, the continent has many fewer possibilities for participating in economy, society, culture, and technology i.e., economic wealth, global political decision making, worldviews and lifestyles that shape globalisation. Fuchs and Horak (2008:115) claim that it is not owing to corrupt African governments, and not an effect of bad governance, market protectionism or insufficient investment conditions for Western capital, but the effect of years of colonial and post-colonial exploitation, exclusion and dependency, on the Third World that have caused the conditions Africans have to face today. As most African countries have insufficient capital and are deprived of basic economic, social, educational and technological resources (Roycrofta & Anantho, 2003:67) that result in the absence of material access, one can assume that this also results in insufficient digital skills and meaningful Internet usage skills. Despite setbacks, there are some successes as well. According to Elletson (2015:17), the number of primary schools in Ethiopia has increased by over 5 000 between 2008 and 2013. Innovative new solutions, such as the use of mobile schools and the increasing availability of new technology for learning, are helping to extend the spread of education provision, particularly among disadvantaged groups and in rural areas. In a survey performed in Africa (Elletson & Burgess, 2015:51), women unambiguously said that ICTs provided them with increased employment opportunities and boosted their social and political participation. The majority stated that there are equal opportunities for women to gain digital skills and to be involved in the ICT sector, but that women cannot ignore the digital gender gap that is prominent across the African continent.

It seems that the digital divide can be categorised as discrepancies between information “haves” and “have-nots” and those who do not know how to use computers or the Internet. In other words, it is the gap that exists between those with ready access to information and communication technology and ICT tools, and those without such access or skills to enable access. Currently, the South African HEI students fall into both these categories. That is, there are some with no such access or skills while there are others who have access and are skilled in the use of, and have vast experience with, ICTs. On the other hand, the digital divide not only concerns material access, but also skills and usage patterns. Material access is necessary, but not a pre-condition for skills access and usage access. According to an intensive study by Abrahams and Goldstuck (2012:109) on e-development in SA, they pose the question: How well does SA wear the label of being an innovative developing country? The majority of South African firms (which are small or micro) and the majority of households (which are large and low income) experience numerous obstacles to digital access (Abrahams & Goldstuck, 2012:122). South Africans

have insufficient income and assets along with insufficient access to a communications infrastructure, as well as the unavailability of content in a local language required to take advantage of the digital revolution. Blignaut (2009:589) contends that the extent of the digital divide in SA is distressing if the difference between the wealthy and poor within the country is considered. This is supported by Howie and Blignaut (2009:346) who claim that SA faces both an intra and inter country digital divide with huge differences in access to ICT as well as a vast disparity in resources. Brown and Brown (2008:111), as well as Howie and Blignaut (2009:348), contend that young African children only receive primary education, the first three years of their early childhood education, in their home language. In addition, they mention that only thirteen per cent of schools have access to one or more computer. At present, the more productive local producers of Internet content are the media, financial, retail, tourism and entertainment sectors. The online educational content is just starting as computer access in schools is slowly becoming more widespread by the offering of limited creative and pre-packaged subject matter. Abrahams and Goldstuck (2012:134-135) point out that the Gauteng online schools project, which aims to utilise ICT to support learning, indicates that approximately 1 100 schools have limited access to educational content and that there is incredibly limited access to online textbooks and other learner supporting materials.

Although the notion of the digital divide has been deconstructed and exposed by a number of authors, the issue of digital inclusion and exclusion continues to play an important role in the rhetoric of HE. Among the many challenges facing HE in developing world contexts, the questions raised by the continued prominence of the digital divide need to be taken seriously, but also reflected on critically. Liebenberg, Chetty, and Prinsloo (2012:265) assert that constructs such as the digital divide are used to sustain an unwillingness to accept that technology is shaping HE and that the way we see and understand knowledge and knowledge creation and validation has changed forever.

#### **2.4.4 Digital divide hampers e-readiness**

e-Readiness is considered a main aspect for the development of any country. It represents the transformation of a society including the movement from traditional relations and methods to more modern ways of thinking or dealing with education, health and production. Currently both developed and developing economies have turned to ICTs as a toolbox (Bilbao-Osorio, Dutta, Geiger, & Lanvin, 2013:29) to potentially boost competitiveness, growth, and employment in this rapidly changing and uncertain environment.

Nonetheless, there is no single accurate definition for e-readiness, since different groups describe it differently. Drawing on studies, Lou (2010:949) and Setati (2012:13) indicate that e-readiness is the ability to pursue value creation opportunities facilitated by the use of the Internet. Alaraj and Ibrahim (2014:1) declare it as the state of play of a country's ICT infrastructure and the ability of its consumers, businesses and governments to use ICT to their benefit. Naidoo and Klopper (2005:135) defines e-readiness as the degree to which a society is prepared to participate in the networked world with the underlying concept that the Networked Economy can help to build a better society. From another

perspective literature mentions an e-readiness divide. The e-readiness divide is the gap between those who are e-literate, i.e. have the necessary e-skills and abilities, and those who are not. Moolman and Blignaut (2008:169) contend that the e-readiness divide is a lack of knowledge in e-applications related with technological skills and abilities. Uzunboyly and Tuncay (2009:282) mention three different types of e-readiness divides, such as: technology based e-divide; web-based e-divide and administrative e-divide. The variety of manifestations by researchers makes it difficult to find a specific definition to be used in the term of e-readiness, due to the multiplicity of its applications.

On its own, there are various reasons why there is an increased impetus among countries to assess their e-readiness statuses. Reasons that motivate developing countries to improve e-readiness and promote the adoption of ICT in their countries primarily are because ICT promises enormous benefits, as part of the solution to economic and social problems, and by empowering people to help themselves. Subsequently, it lessens the threat of being left further behind if they do not address the growing digital divides and finally, international leaders as well as foreign donors and lending agencies are increasingly requiring recipients to integrate ICT into their development and aid programmes. In the present day it is commonly stated that ICT (Cushman & Klecun, 2006:347) is transforming every aspect of society: the way people learn, work, conduct business, spend their leisure time as well as organise their social lives; therefore all countries are striving to become an inclusive global information society where all persons without exception are empowered to create, receive, share and utilise information for their economic, social, cultural and political development. The nonlinear relationship between the digital readiness of a country and its economic and social impacts suggests the existence of increasing returns to ICTs, skills, and innovation investments. In other words, the more countries invest in ICTs, skill development and innovation, the proportionally higher returns they will achieve (Bilbao-Orsorio *et al.*, 2013:29).

Different indices have been developed to assess e-readiness, and consequently to measure its component indicators. Such e-readiness assessment models provide information for decision makers in both private and public sectors to formulate suitable policies and to make proper investments with regard to their e-governance. One case in point is a self-assessment tool prepared by a non-profitable government organisation, NGOConnectAfrica (Van Belle, 2013:online) that helps to assess an organisation's level of maturity in the use of ICTs. Mutula and Van Brakel's (2006:217) e-readiness tool measures five major segments such as information readiness, enterprise readiness, human resources readiness and ICT (infrastructure) readiness. Several other approaches to measure e-readiness (Alaaraj & Ibrahim, 2014:3; Davids, 2011; Huang, Huang, Zhao, & Huang, 2004:367) were similarly observed from literature. For Moolman and Blignaut (2008:170), e-readiness assessment can be done by evaluating an individual's technical experience and competency to interact with computers.

Pertaining to SA's e-readiness ranking, the Minister of Communications, Dina Pule (Ngamdaza & Msweswe, 2013:online), argues that, although SA fall behind in the categories of affordability, skills, government usage as well as individual usage and social impacts, the country's global e-readiness ranking dropped from 47<sup>th</sup> position in 2007 to seventieth in 2013 (Bilbao-Orsorio *et al.*, 2013:11), and that

SA is equal with its peers in terms of the economic impact of e-skills development. The nature of the digital divide is complex and debatable; therefore an accurate diagnosis of its causes is imperative in order to discern and implement proper solutions. The cost and affordability of ICT is a big issue in many countries, but a bigger one is the insufficient knowledge and understanding of the technology (Stoiciu, 2001:38), a knowledge divide. Therefore information should be converted into knowledge and then that knowledge should be applied. Developing national e-literacy skills for ICT is the bedrock for the survival for any nation, because it is foreseen that in the near future 95% of jobs in the world will require ICT skills. However, in SA e-literacy skills must be seen in the wider educational and training context (South Africa, 2010:71) of providing everyone (young or old, male or female, able or disabled, rural or urban) with a core set of competences equipping them for the emerging South African information society and global knowledge economy. That is to say that e-literacy skills encompass a broad set of competences required in today's working environments, which range from the shop floor, the office, part-time or full-time home worker. To successfully use ICT, a person requires anything from basic computer, business, government and communication skills, to the use of specialist analytical tools, cross-disciplinary, cognitive and problem-solving skills and language competences.

Besides, e-readiness also touches the matter of employment readiness (South Africa, 2010:84). There are two aspects to employment readiness, and both are equally important. Firstly, the ability to get the job or to get an interview, and secondly to get the job. In today's workplace, without access to technology, you are unlikely to even be able to submit your CV (or even know the vacancy exists), and secondly you need skills to do the work. Having a basic skills foundation supports the up- and re-skilling for work of youth and women as well as the unemployed and disadvantaged. Crucial to all that has been discussed is the capacity of an individual to use new technologies in innovative ways and to be able to keep abreast of the new waves of technologies that are constantly developed (South Africa, 2010:58).

All of the above adds to the challenges on how entities, institutions, organisations, and nations can add value to people's knowledge, skills and abilities in the fast evolving environment.

## **2.5 Human capital development**

This section discusses the theme human capital development conceptualised from the inductive analysis with Atlas.ti™. Themes associated with HCD are discussed using three headings: (i) importance of computer literacy for human capital development; (ii) factors hindering the development of human capital development and (iii) HE involvement in human capital development. The various themes associated with HCD are illustrated in Figure 2.4.

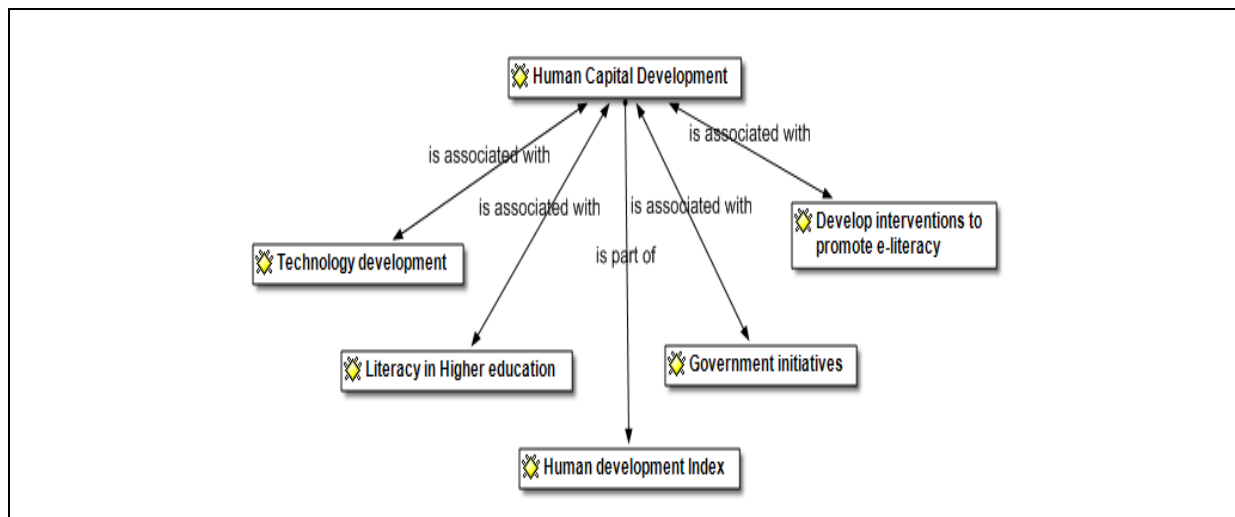


**Figure 2.4: Human capital development themes from qualitative literature analysis**

### 2.5.1 Importance of e-literacy skills for human capital development

Exclusion from computer technology affects, among other things, access to better career and educational opportunities, greater personal advancement, fuller access to social networks and the use of public provisions. Chang, Shieh, Liu, and Yu (2012:178) claim that if users own a computer, they are more likely to use it regularly, which changes their computer attitudes. Although the advantages of computers and the transformations they make in people's lives are widely accepted, these advantages are of no value if people do not have access to technology, or do not use it. Blignaut (2009:591) asserts that it is the use of technology that determines who is ahead, who is catching up and who is left behind in the information society. However, Liebenberg *et al.* (2012:262) claim that it is not necessarily true that an individual will use technology if the person has access to it. An individual will use it either because by doing so leaves the user with a sense of satisfaction, or because the individual is pressured to do so. Satisfaction refers to the fulfilment, pleasure or gratification of a need. If, for some or other reason, a user had an unsatisfactory experience while using a computer, chances are that this user will refrain from using a computer in the future unless he is once again pressurised to do so. Pressure can take various forms, from corporate and peer pressure to a feeling of being left behind. The danger exists that if people do not become actively involved, they will stay computer illiterate, and therefore will remain afraid of IT and lag further and further behind. Taylor *et al.* (2011:38) remark that apprehension over the use of a computer played a major role in achieving computer literacy skills in their case. The challenge, however, is not only to provide physical access but also to empower people to become proficient computer users, especially those with general literacy backlogs.

Skills development is sometimes used in a specific and general way. Specifically, it refers to occupational qualifications and workplace-based training. Generally, it refers to education at all levels which primarily focus on the preparation for the world of work. This includes professional, occupational and vocational education offered through colleges and universities, and programmes based at workplaces or levy grant institutions (South Africa, 2012:2). Although countless South Africans admit to the importance of ICTs

and that we need associated knowledge to build a more equitable (Gillwald, Esselaar, Burton, & Stavrou, 2005:151), prosperous and globally competitive economy, the shortage of skills and talents in Information Technology and Business is threatening its commercial and industrial growth. Telecommunication skills such as routing and switching networking skills are sought by employers in various business sectors. At the juncture of business models and IT a person is required to have a variety of digital skills, professional versatility, multi-discipline knowledge and technology understandings. In other words, the market needs a hybrid professional. Employees are to enhance their skills in order to meet the challenges of globalisation. The new workforce must be equipped with literacies that support them to possess more flexibility, since literacy involves a consciousness of technological forces that affect culture and human behaviour, and it is not just being literate at using a computer. Technological developments are continuing at a phenomenal rate, and are currently beginning to be used in an expansive range of ways to support learning. We are experiencing the emergence of technology enabled spaces and adaptive technologies that offer new and exciting opportunities in terms of contextual, ambient, augmented, distributed and social networked learning. Lecturers regard it as part of their professional responsibility to “design for learning”, using a variety of forms of digital technology. Learners have increased opportunities to take their learning from place to place, in the form of e-portfolios and learning records, and to make choices about how, when and where they want to participate in education. In order to maintain this coherence, technology has created infinite pathways for teaching and learning at HEIs in South Africa. At the Department of Higher Education and Training (South Africa, 2012) and more specifically at TUT (Swanepoel & Van Staden, 2009), learning with technology is preferred.

Even though the wide-spread agreement of the importance (Akoojee, 2012:675; Akoojee & Arends, 2009:191; Kambouri, Mellar, & Logan, 2013:online) of ICTs and associated knowledge production for building a more equitable prosperity and globally competitive economy, there is substantive evidence that SA is slipping down (Mitrovic, 2010:online) the international e-readiness rankings due to the serious shortage of e-skills (Lesame, 2013:74; Liangzhi Y., 2006:243; South Africa, 2010:4) to enable the effective use of contemporary ICTs. The country simply has substantially insufficient e-literacy skills, which not only dramatically limits its capacity to address its immediate needs, but - just as import - limits its capacity to prepare a future for a nation that will inevitably be dependent upon an adequately e-skilled workforce, service delivery capacity, educational provision sector and civil society (South Africa, 2010:58). An increasingly large portion of the population across all aspects of society requires effective e-literacy skills to ensure that those entering the labour market are qualified and competent to take up the employment and income- generating opportunities that exist, and will continue to exist as the economy grows and changes in the future (South Africa, 2012:viii). ICT is transforming every aspect of society, the way people learn, work, conduct business, spend leisure time and organise their social lives (Cushman & Klecun, 2006:347). As Asah (2013:500) asserts: “every aspect of our social and institutional world now relies on computers.” Skills are indispensable for sustainable socio-economic growth and development in order to enhance the productivity of government, business, education and society, and to provide equitable life chances, increasing self-reliance and deeply rooted social cohesion. The digital age is here, and it is evident that educators must embrace the 21<sup>st</sup> century learning paradigm shift to ensure that

students are adequately prepared for the global workforce. Educators require higher order skills, 21<sup>st</sup> century skills, to embrace pedagogies that require students to think outside the box, so that they are able to compete in a global society (Tucker, 2014:171; Voogt *et al.*, 2013:410).

But how difficult will it be to get people to use and continue using technology once they have gained access? What preconditions with respect to education, motivation, and cognitive abilities are necessary to enable people to learn how to use computers to their benefit?

In overcoming the resultant serious problems facing equity and prosperity, SA requires a substantial proactive effort. The National e-Skills Plan of Action (NeSPA) of 2010 (South Africa, 2010:i), is part of a project delivery process aimed at developing a platform to address the calamitous situation SA finds itself in with regard to developing suitable skills to sustain equitable prosperity and global competitiveness in the information society and knowledge economies. The government defines its e-skill concept as:

*“the ability to use and develop information and communication technology within the context of an emerging South African information society and global knowledge economy, and associated competencies that enable individuals to actively participate in a world in which it is a requirement for advancement in government, business, education and society in general” (South Africa, 2010:1).*

The key goal of e-literacy as defined in the Act is to “have an impact on employment readiness, particularly in relation to school leavers, university graduates, the unemployed, unskilled youth and those living in rural society” (South Africa, 2010:81). Therefore the e-skills Act refers to the ability of people to use and create all forms of information and communication technology to improve life opportunities in their personal lives, work environment, community interactions, educational spaces and in their participation in and contribution to governance processes.

As a result e-literacy skills for employment readiness, e-business, e-community as well as skills to e-participate in governance processes should be the focus point for HCD towards self-reliance and social cohesion.

## **2.5.2 Factors hindering the growth of human capital development**

Despite the many advances and gains made since 1994, there are still numerous challenges facing post-school education in SA (South Africa, 2012:5) since the system continues to produce and reproduce gender, class, racial and other inequalities with regard to access to educational opportunities and success. Howie and Blignaut (2009:348) benchmarked how far computers are implemented in Education in SA (South African Information Technology Report., 2012:25), and factors such as financial constraints, a lack of computer literacy amongst teachers, a lack of training regarding integration of computers into different learning areas, and the absence of a properly developed curriculum for teaching computer skills were some of the findings.

Socio-economic status, according to Brown and Brown (2008:120), is a key indicator for both access to, and usage of, information and communication. A great challenge is the large number of young people who face a very bleak future if major changes are not introduced. Not only do people with lower socio-economic statuses (SES) (Kavanaugh *et al.*, 2013:274) not have access to technology, they are also limited as far as usage is concerned, even if access has been established. Blignaut (2009:593) and Brown and Brown (2008:121) mention that the long term solution to solve the problem to uplift the social economic standard of communities through initiatives to take computers and the Internet to disadvantaged communities is a step in the right direction and commend it.

Another equally important factor is the post school system that is not meeting the needs of the economy and society as a whole. Abrahams (2011:147) contends that the technology gap is increasing between highly industrialised and less industrialised countries. Unfortunately, decades of under-investment cannot be undone at a stroke, and universities face problems with outmoded computing curricula (Bass & Heeks, 2011:2), where skills application and knowledge are not taught. Johnson, Smith, Levine, and Haywood (2010:12) contend that providing a more diversified mix of programmes to keep up with the pace will significantly benefit the poor, since it is largely poor learners who struggle to complete their schooling, who drop out of college, who do not achieve university entrance (Nwakanma, 2015:24) and whose poor skills base makes it difficult for them to obtain employment.

One more factor impeding the growth of HCD is the quality of education in universities, colleges and schools, as well as inadequately equipping educators with continuous capacity building skills. According to the e-learning Africa report survey (Manji, Jal, Badisang, & Opoku-Mensah, 2015b:55), 56% teachers rate their e-skills as good despite the fact that 74% indicate that there is not enough support in their country or region to increase their digital literacy. Bass and Heeks (2011:27) support this by asserting that insufficient e-literacy skills in educators are a grave concern. Special attention should be given to educators' base of knowledge on curriculum changes, knowledge on guidance documents as well as processes and structures. Howie and Blignaut (2009:350) refer to this occurrence as the knowledge divide prevalent within SA.

### **2.5.3 Higher Education involvement in human capital development**

The South African government has committed itself to a major effort in e-literacy skills enhancement, including a broad process of raising the level of awareness about an inclusive knowledge society in SA. Moreover, e-skills are a critical feature mentioned in the context of the current developmental trajectory. Given that the DHET, along with other responsible institutions, is located at the nexus between the formal education system and the workplace, the Minister of DHET, dr Blade Mzimande (South Africa, 2012:x) announced that by 2030 SA ought to have a post-school system that should provide a range of accessible alternatives for young people, and that DHET must build, resource and support this expanded system. At the same time, it is important to strengthen centres of excellence and transform them to serve all South Africans, especially those from poor backgrounds. At the very centre of these e-skill training

centres are universities, UoTs, FET Colleges (Akoojee & Arends, 2009:199), and private training institutions (South Africa, 2010:5). Current frameworks for the implementation of e-education in SA (Howie & Blignaut, 2009:349) provide a roll-out plan aimed for 2010 – 2013, whereby information and communication technology is to be integrated at all levels of the education system. Project Isizwe, providing WiFi for the city of Tshwane, was seen as a huge uptake in 2014, especially in educational centres. The Breadline Africa project provided digital centres with tablets carrying the latest Via Africa e-learning materials (Manji, Jal, Badisang, & Opoku-Mensah, 2015a:120).

Adding on to this, the Information Systems, Electronics and Telecommunications Technologies Sector Education and Training Authority (ISETT SETA) regulate approximately 86% of accredited small training providers (Akoojee, 2012:675; Isett Seta, 2011:online) which develops strategic quality human capital in relation to the needs of the South African ICT sector. Moreover, the National Skills Development Strategy 3 (NSDSIII) (South Africa, 2012:80-83) provides strategic guidelines for skills planning and implementation to these SETAs. The South African Government, in association with HE, established nine (one per province) collaborative e-skills knowledge production hubs. In addition, there are contracts between the Information Society Institute (ISI) and the e-Skills Institute (e-SI) in the Department of Communications to deliver eight integrated e-skills projects by the end of 2011. During an e-skills summit, a projected timeline for the expected outputs and performance metrics with regard to the bridging of the e-skills gap in SA was established (South Africa, 2010:77). The project focuses effort on five priority (South Africa, 2010:iv) areas to guide the coordination of existing and new projects in e-skilling SA, such as: (i) establishment of a high-level consultative process across government, education and civil society to inform the national budget process and be engaged with the human resource development council; (ii) establishment of a research network for e-skills across all sectors to develop research, evaluation, policy and international benchmarking; (iii) establishing nine collaborative e-skills knowledge production hubs in association with HEIs to coordinate existing and new efforts in e-skills; (iv) developing a proposal to examine a national transfer pricing model to provide a level of free cell phone and Internet access, electricity and water (South Africa, 2010:77); (v) assisting in the development of a high level advisory, implementation and evaluation process for all business sectors in SA.

It is recognised, though, that any rejuvenation of HE will not just require an increase in resourcing, but also the development of new curricula (Opoku-Mensah, 2015:7), especially in the area of science and technology (Bass & Heeks, 2011:3; South Africa, 2012:viii). Beetham *et al.* (2009:8) suggest that curricula should place greater emphasis on digital literacies whereby students are to develop literacies by engaging, monitoring, supporting and assessing digital competences across their learning experiences by using rich learner related data. One case in point was a compulsory e-based computer literacy course introduced at the North-West University in 2007. Another case was the Siyakhula Living Lab (SLL) e-literacy training course (Gumbo *et al.*, 2014:145) that enabled basic exposure to, and a foundation to ICT, in a deep rural setting in the Eastern Cape Province of SA.

In view of the review above regarding HE's involvement in the development of HCD, of which my line of work is part, as well as to verify if successful implementation of e-literacy training, in the past and at present is sustained, I deemed it necessary to determine the e-literacy skills abilities of a small group of school leavers as they entered a HEI. Hence, the significance of this research study refers to an attempt to bridge the e-skills gap in SA by contributing to the third e-skilling SA project: *The establishment of a national system of physical network hubs to coordinate existing and new efforts in e-skills located at HEIs in SA* (South Africa, 2010:5).

## **2.6 Chapter summary**

During my theory investigation, I created a theoretical gap that formed the basis of this research project (Bettany-Saltikov, 2010:48; Okoli & Schabram, 2010:2; Rew, 2010:64) and clarified my theory development.

The core of the gap resided in:

- Creating a base for e-literacy and concepts of digital divide as indicated in secondary research objective one.
- Building an understanding of e-readiness and prevailing e-readiness curricula strategies as indicated in secondary research objective two.
- Comprehending the role of HE in HCD.

I identified elements in relevant literature about the importance as well as main constraints of e-literacy in HE. In addition, I came across prevailing frameworks and programmes that address the disproportion of essential e-literacy skills. The proposed South African National e-skills action plan gave me clear insight of what the SA government intentions are to uplift the e-skills of its workforce in future. This discovery gave me a thorough understanding on e-literacy skills and the influence of these on the development of human capital. I attempted to better understand the concept of digital divide and its impact on e-readiness in SA.

Apart from the review of my body of scholarship, it assisted me to establish the importance of the study as well as to make recommendations for future research (Webster & Watson, 2002:xiii; Whetten, 1989:490). I brought the chapter to a close by stating the reason why this study was undertaken.

In Chapter Three, I present the e-readiness toolkit used as intervention and offered in the first year induction programme.

### **CHAPTER 3: E-READINESS TOOLKIT**

- 3.1 Introduction
  - 3.2 Existing e-readiness resources
  - 3.3 Structure and compilation of e-readiness toolkit
  - 3.4 e-Readiness toolkit
  - 3.5 Chapter summary
-

# CHAPTER 3

## E-READINESS TOOLKIT

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### 3.1 Introduction

In Chapter Two I provided a qualitative systematic literature review where I conceptualised notions of literacy and e-readiness that involved e-literacy skills along with categories of the digital divide. In addition, it contributed to an understanding of e-readiness and prevailing e-readiness curricula strategies as well as to identifying elements in relevant literature about the main constraints of ICT development in HE. Many recent studies (Duffelmeyer, 2000:304; Klecun, 2008:268; Taylor *et al.*, 2011:36) indicate designs of e-literacy curricula and programmes that were based on e-literacy. Other authors (Bass & Heeks, 2011:6; Blignaut & Els, 2010:106; Hoffman & Blake, 2003:231; Naidoo & Raju, 2012:41) compiled and reported several models, frameworks and guidelines for teaching e-literacy skills at HEIs. The effective use of new technology requires a step change in local e-literacy skills levels, including a step change in ICT related university education. At present developing countries are challenged to develop curricula and courses which are closely related to the effective utilisation of ICT.

This chapter addresses secondary research objective four (§1.4), and is devoted to the e-readiness toolkit suggested as training module for undergraduate students as part of the first year induction programme in the department Office Management and Technology of TUT.

### 3.2 Existing e-readiness resources

Several e-readiness resources to address the shortage of e-literacy skills are currently available. In the computer skills placement test of the Dallas County Community College (Wilson, Scalise, & Gochyyev, 2015:68) researchers uses topics that focus tightly on specific ICT concepts and skills such as: file management, information and communication, spreadsheets, presentations, word processing and e-mail. Another resource (Meethongjan & Tachpetpaiboon, 2015:2521) aims to increase the computer skills of the elderly who are outside the school system by focussing on basic computer skills usage and computer maintenance. (Bourbia, Gouasmi, Hadjeris, & Seridi, 2014:99) created a game based simulation where learners are confronted to configure a PC using specific characteristics and skills. (Samat & Chaijaroen, 2012) designed and developed a constructivist multimedia learning environment to enhance computer skills that are based on a specific framework and components. Similar e-literacy skill development courses created by principal software developer companies are available on the Internet. Taken the above developments to enhance e-literacy skills for e-readiness into consideration, the researcher could

not fully utilise existing resources since these resources were not appropriate for the OMT and CCM courses as well as the context of this study.

### **3.3 Structure and compilation of e-readiness toolkit**

The pre-test test, the e-readiness questionnaire (Addendum 4.4), consisted of two sections: (i) self-appraisal (§4.5.5.1, Table 4.9) section for participants to judge their own e-literacy skills capabilities; and (ii) a situational test (§4.5.5.1, Table 4.6) to assess tangible e-literacy skill capabilities (actual capability) of participants utilising assessment rubrics (§4.5.5.1, Table 4.7). The analyses of respondents' outcomes as well as the graded assessment rubrics accumulated nine constructs such as: (i) Getting started; (ii) File Management; (iii) Web browsing capabilities; (iv) Software usage; (v) Word processing skills; (vi) Spreadsheet manipulation skills; (vii) Presentation skills and (viii) PDF skills as subject matter for the e-readiness toolkit.

For every construct a learning unit was prepared that is in line with a set of learning objectives. Learning objectives addressed the e-literacy skills deficiency identified in the e-readiness questionnaire and situational test. Specific outcomes as well as instructions to tutors were indicated in first and second columns of the manual whilst, hands-on practical exercises were indicated in column three. Activities in hands-on exercises had to be applied in accompanied practice files. Practice files were distributed to e-readiness library folders on individual computers using Netop™ classroom management software. Accompanying practice files are available in Addendum 3.1, e-Readiness intervention practice files. Each learning unit ended with a narrative of the particular learning outcomes achieved.

### **3.4 e-Readiness toolkit**

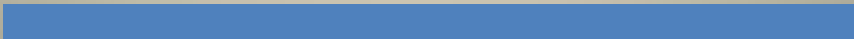
The e-readiness intervention manual is not bound to software versions and can be depleted in different software types and versions. The development of e-literacy skills were important, not specific software applications. The e-readiness toolkit manual is presented on the next page.

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# e-Readiness toolkit

DM v Vuuren Marais



## Getting started

### Learning objectives:

At the end of this section the learner will be able to:

- Switch on a desktop computer
- Familiarise him/herself with the Recycle bin, Documents and Computer icons on the desktop
- Familiarise him/herself with the mouse functions and identify three different mouse pointers
- Apply single and double-click mouse actions
- Drag and drop an icon
- Familiarise him/herself with the right mouse button and shortcuts
- Navigate using horizontal and vertical scroll bars as well as minimise, maximise, restore and close active windows
- Utilise the Start button to open applications
- Open more than one application
- Switch between applications using the taskbar
- Minimise, maximise, restore and close active windows
- Understand what Tooltips are
- Familiarise him/herself with Windows Help and Support.

| Specific outcomes                                                                                                  | Tutor                                                                                                                         | Learner hands-on                                                                                                                                                                                                                                                                                               |
|--------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Switch on a desktop computer                                                                                       | <i>Show learner where to switch on a desktop computer</i>                                                                     | Switch on your desktop computer using the power button                                                                                                                                                                                                                                                         |
| Familiarise him/herself with Recycle bin, Documents and Computer icons on the desktop                              | <i>Explain and familiarise the candidate theoretically with the Recycle bin, Documents and Computer icons on the Desktop</i>  |                                                                                                                                                                                                                                                                                                                |
| Familiarise him/herself with the mouse functions. Identify three mouse pointers                                    | <i>Explain pointing device (mouse). Explain three different mouse pointers</i>                                                | From the Desktop, place the mouse pointer over an object. Differentiate between the cursor, arrow and hand pointers                                                                                                                                                                                            |
| Apply single and double-click mouse actions                                                                        | <i>Apply single and double mouse actions</i>                                                                                  | From the Desktop, click once on an icon to highlight/select an icon. Double click an icon to open an object from the desktop                                                                                                                                                                                   |
| Drag and drop an icon                                                                                              | <i>Explain how to drag and drop icons</i>                                                                                     | From the Desktop, left click on an icon. Hold the left mouse button and drag and drop the selected icon elsewhere on the Desktop                                                                                                                                                                               |
| Familiarise him/herself with the right mouse button and shortcuts                                                  | <i>Apply right mouse button and shortcuts</i>                                                                                 | From the Desktop, click your right mouse button. Find the delete, copy, cut and rename shortcut keys on the menu                                                                                                                                                                                               |
| Utilise the Start button to open applications<br>Open more than one application                                    | <i>Show how to utilise the Start button to open applications</i>                                                              | Select the Start button to see list of software applications. Select all programs. Select Microsoft Office. Select to open Microsoft Word as well as Microsoft PowerPoint                                                                                                                                      |
| Navigate using horizontal and vertical scroll bars as well as minimise, maximise, restore and close active windows | <i>Demonstrate horizontal and vertical scroll bars as well as how to minimise, maximise, restore and close active windows</i> | On the desktop. Double click to open the Documents Library icon. Double click Exercise 1 within the Documents Library. Use vertical scroll bar and scroll to bottom of page. Use horizontal scroll bar to scroll to right hand corner of page. Minimise the file. Maximise the file. Close the Exercise 1 file |

|                                                       |                                                                  |                                                                                                                                                                                                                          |
|-------------------------------------------------------|------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Switch between applications using the taskbar         | <i>Practise to switch between applications using the taskbar</i> | Use mouse pointer to switch between applications using the taskbar                                                                                                                                                       |
| Understand what Tooltips are                          | Explain Tooltips to learner                                      | Place cursor over an icon. The Tooltip explanation box appears                                                                                                                                                           |
| Familiarise him/herself with Windows Help and Support | <i>Demonstrate Windows Help and Support</i>                      | On the Desktop, select the Document Library folder. Click on ? Windows Help and Support. Enter the keywords "download software" in the search box. Hit the search button. See information and solutions on the help menu |

### Learning outcomes:

At the end of this section, the learner will have reliably demonstrated the ability to have switched on a desktop computer; identified three mouse pointers; applied single and double-click left and right mouse actions; used the right mouse button as shortcut key; utilised the Start button to open applications; switched between applications using the taskbar; navigated between horizontal and vertical scroll bars; minimised, maximised, restored and closed active windows; familiarised Help and Support; and understood Tooltips.

## File Management

### Learning objectives:

At the end of this unit the learner will be able to:

- Open the Documents Library
- Successfully rename files and folders
- Create new folders
- Open files from an existing folder
- Able to save files to an existing folder
- Save files on different drives
- Save files on external devices
- Understand how to back-up data.

| Specific outcomes                                                        | Tutor                                                                  | Learner hands-on                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------------------------------------------------------|------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Open Documents Library. Successfully rename files and folders            | <i>Demonstrate how to open the Documents Library and Rename a file</i> | From the Desktop, double click on the Documents Library icon. Right-click your mouse. Select Rename. Change the name of the Exercise 1 file to Exercise 10                                                                                                                                                                                                                                                                                  |
| Create new folders. Open files from an existing folder                   | <i>Indicate to learner how to create new folder</i>                    | From the Desktop, double click to open the Documents Library. Select Create new and empty Folder from the Menu bar. Name it January 2015                                                                                                                                                                                                                                                                                                    |
| Able to save files to an existing folder. Save files on different drives | <i>Demonstrate how to copy, paste and open files in folders</i>        | Open the Documents Library from your Desktop. Point your mouse on the Exercise 10 file. Right-click your mouse. Select Copy. Open the January 2015 folder by double clicking it. Place your mouse pointer anywhere in the folder. Right-click your mouse. Select Paste. From the January 2015 folder, double click the Exercise 10 to open it. Select File. Select Save As. Double click the January 2015 folder. Name the file Exercise 11 |

|                                |                                                                               |                                                                                                                                                                                                             |
|--------------------------------|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Save files on external devices | <i>Indicate how to save files on external devices like CD or Flash drive</i>  | Open the Documents Library from your Desktop. Double click the January 2015 folder. Double click the Exercise 10 file in order to open. Select File. Select Save As. Save Exercise 10 on an external device |
| Understand to back-up data     | <i>Demonstrate how to back-up data by showing back-up facility of Windows</i> | Click Start button. Select Control Panel. Select back-up and restore. Customise settings                                                                                                                    |

### Learning outcomes:

At the end of this section, the learner will have reliably demonstrated the ability to have opened the Documents library; successfully created, opened, renamed and saved files in new and existing folders; saved files on external devices; and backed-up data.

### Web browsing capabilities

### Learning objectives:

At the end of this unit the learner will be able to:

- Utilise Internet Explorer
- Enter URLs of search engines
- Perform web searches using keywords
- Copy and paste text from a web page
- Copy and paste an image from web page
- Set browser application to a default home page
- Use Boolean operators to perform searches
- Customise Internet preference settings.

| Specific outcomes                   | Tutor                                                   | Learner hands-on                                                                                                                                                                                                                                                                                                                                                                            |
|-------------------------------------|---------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Utilise Internet Explorer           | <i>Show how to open Internet Explorer</i>               | Select Internet Explorer from the task bar. Enter the URL <a href="http://www.google.com">www.google.com</a> Run the web page by pressing enter                                                                                                                                                                                                                                             |
| Enter URLs of search engines        | <i>Show how to use different search engines</i>         | Select New tab. Enter the URL <a href="http://www.bing.com">www.bing.com</a> Run the web page. Close the webpage                                                                                                                                                                                                                                                                            |
| Perform web searches using keywords | <i>Indicate how to perform a search using keywords.</i> | Select Internet Explorer from the task bar. Enter the URL <a href="http://www.google.com">www.google.com</a> Run the web page by pressing enter. Enter the keywords "Business Administration" and run a search. Keep the website open                                                                                                                                                       |
| Copy and paste text from a web page | <i>Show how to copy and paste text from a webpage</i>   | Open Exercise 10 from the January 2015 folder. Switch back to Internet Explorer. Select and highlight the definition of Business Administration from the Wikipedia hit. Right click your mouse. Select copy. Place your cursor at the top of the document. Right click your mouse. Select paste in order to paste the search content into the Exercise 10 document. Close Internet Explorer |

|                                                |                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|------------------------------------------------|------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Copy and paste an image from web page          | <i>Show how to copy and paste an image from a webpage</i>                                      | Return to Internet Explorer and enter URL <a href="http://www.google.com">www.google.com</a> Select Images Tab. Enter keyword "Lady Gaga" in the search box of the Google website. Select one picture. Right click your mouse. Select Cop from the shortcut menu. Return to the Exercise 10 file. Place your cursor at the top of the document. Right click your mouse. Select paste in order to paste the picture into the Exercise 10 document |
| Set browser application to a default home page | <i>Demonstrate how to set browser application to a default home page</i>                       | Switch back to Internet Explorer with <a href="http://www.google.com">www.google.com</a> You will now position the <a href="http://www.google.com">www.google.com</a> website as your browser's default home page. Select Tools within the Internet Explorer application. Select Internet Options. Select Home page. Select Use New tab. Enter <a href="http://www.google.com">www.google.com</a> Click Apply                                    |
| Use Boolean operators to perform searches      | <i>Demonstrate four Boolean operators. Use Boolean operators to perform an internet search</i> | Open a new tab in Internet Explorer. Go to <a href="http://www.google.com">www.google.com</a> Search for websites that contains information about "dogs" as well as "cats". Use the "and" Boolean operator whilst entering the keywords for example: "dogs and cats". Run the search                                                                                                                                                             |
| Customise Internet preference settings         | <i>Demonstrate how to customise your Internet preference settings</i>                          | Look at how to change your Internet Privacy, General and Feeds preferences. Select Internet Explorer from the task bar. Click Tools in the Internet Explorer application. Select Internet options. Customise your settings such as privacy according to your own needs                                                                                                                                                                           |

### Learning outcomes:

At the end of this section, the learner will have reliably demonstrated the ability to have opened and used Internet Explorer; entered URLs; executed web searches using keywords and Boolean operators; exhibited the ability to have copied and pasted text and images from web pages; set up a default home page; and tailored Internet preference settings.

## Software Usage

### Learning objectives:

At the end of this unit the learner will be able to:

- Differentiate between an operating system and application software
- Customise the look and feel of his/her computer
- Download software
- Know how to install software
- Understand a plug-in.

| Specific outcomes                                                  | Tutor                                                                                        | Learner hands-on                                                                                                 |
|--------------------------------------------------------------------|----------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| Differentiate between an operating system and application software | <i>Theoretically explain difference between operating system versus application software</i> | Listen to explanation on the difference between an operating system and application software                     |
| Customise the look and feel of the computer                        | <i>Demonstrate how to customise the look and feel of the desktop computer</i>                | Select Start button. Choose control panel. Select Display. Change the settings according to personal preferences |

|                              |                                                                                          |                                                                                                                                                                                                                                                          |
|------------------------------|------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Download software            | <i>Demonstrate how to go about to download software</i>                                  | Select Internet Explorer from the task bar. Enter the URL <a href="http://www.google.com">www.google.com</a> Enter the keywords "Windows 10". Press enter. Choose the Windows download hit option. Click on Download Link in order for download to start |
| Know how to install software | <i>Demonstrate how to install software</i>                                               | Insert original software CD or DVD. Click on Start button. Enter "Run" in search box. Choose the appropriate setting. Enter the licence key code when requested                                                                                          |
| Understand a plug-in         | <i>Explain and show plug-ins such as: Adobe Flash Player, Adobe Reader and QuickTime</i> |                                                                                                                                                                                                                                                          |

### Learning outcomes:

At the end of this section, the learner will have reliably demonstrated the ability to distinguish between operating system and application software; customised a desktop computer's look and feel; understood how to download; and install software, as well as recognised a plug-in.

## Word Processing skills

### Learning objectives:

At the end of this unit the learner will be able to:

- Create and save a word processing document
- Print a word processing document
- Change the font size of written text in a document
- Underline and bold text in a document
- Change the page orientation of a document
- Insert both a table and text box in a document
- Move text between word processing documents.

| Specific outcomes                                                                    | Tutor                                                                                                             | Learner hands-on                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Create and save a word processing document.<br>Underline and bold text in a document | <i>Illustrate how to create and save a word processing document using MSWord.<br/>Bold text within a document</i> | Click the Start button at the bottom of your taskbar. Select Microsoft Office Suite. Select Microsoft Word. Type your name and student number at the top of the page. Left click your mouse button in order to perform a selection. Highlight your name and student number by dragging the mouse. Select Home from Menu Bar. Select the Bold icon. Save your file by clicking on File. Select Save As. Double click the January 2015 folder in the Documents Library on your Desktop. Name the file Exercise 5 |
| Print a document                                                                     | <i>Demonstrate how to print a document</i>                                                                        | Exercise 5 is still open. Select File. Select Print. Send Exercise 5 to the printer                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Change the page orientation of a document                                            | <i>Illustrate how to change the page orientation</i>                                                              | Exercise 1 is still open. Select Page Layout from the Menu Bar. Change the page orientation from Landscape to Portrait. Save your file by clicking on the Save icon                                                                                                                                                                                                                                                                                                                                            |

|                                                    |                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------------------------------|---------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Change the font size of written text in a document | <i>Illustrate how to underline and change font size in a word processing document</i> | Open Exercise 1 from the Documents Library. Use your left mouse button to select and highlight the all the text of paragraph 1. Select Home from the Menu Bar. Select the Underline icon. Use your left mouse button to select and highlight the text in paragraph 2. Select Home from the Menu Bar. Change the font size from 11 to 14. Save your file by clicking on the Save icon |
| Insert a table in a document                       | <i>Illustrate how to insert a table</i>                                               | Exercise 1 is still open. Place your cursor below the current text in your exercise. Select Insert from the Menu bar. Select Table. Insert a 2 x 2 column table                                                                                                                                                                                                                      |
| Insert a text box in a document                    | <i>Illustrate how to insert a text box</i>                                            | Exercise 1 is still open. Place your cursor at the top of the document. Select Insert from the Menu bar. Select Shapes. Click on Text box. Drag and draw a square. Enter your name in the text box. Save your file by clicking on the Save icon. Close your file                                                                                                                     |
| Move text between word processing documents        | <i>Demonstrate how to move text between word processing documents</i>                 | Open an existing MSWord file. Click on File. Click on Open. Select Exercise 7 from the Documents Library. Select and highlight paragraph 1 in the Exercise 7 document. Right-click the mouse. Select Copy. Open a new MSWord document. Click on File. Select New. Select Blank document. Place your cursor at the top of the document. Right-click the mouse. Select Paste           |

### Learning outcomes:

At the end of this section, the learner will have reliably demonstrated the ability to have created, saved and printed a word processing document; underlined and bolded text; successfully changed text font sizes; changed portrait and landscaped page orientations; inserted tables and inserted text boxes; and moved text between different word processing documents and files.

### Spreadsheet manipulation skills

#### Learning objectives:

At the end of this section the learner will be able to:

- Create a spreadsheet document
- Successfully save a spreadsheet document
- Print a spreadsheet document
- Utilise more than one sheet in the same workbook
- Perform a basic calculation such as sum and average
- Perform an advanced calculation such as CountA.

| Specific outcomes                                                          | Tutor                                                                                                   | Learner hands-on                                                                                                                                                                                                                                                                                                                           |
|----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Create a spreadsheet document.<br>Successfully save a spreadsheet document | <i>Illustrate how to create and save a Microsoft Excel spreadsheet. Explain cells, columns and rows</i> | Click the Start button at the bottom of your taskbar. Select Microsoft Office Suite. Select Microsoft Excel. Take note of cells, columns and rows. Enter your name in Cell A1. Enter your student number in Cell A2. Save your file by selecting File. Select Save As. Double click Documents Library. Save file as Excel 1 in this folder |

|                                                     |                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-----------------------------------------------------|---------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Print a document                                    | <i>Demonstrate how to print the spreadsheet</i>                           | Excel 1 file is still open. Select File. Select Print. Send Excel 1 to the printer                                                                                                                                                                                                                                                                                                                                   |
| Utilise more than one sheet in the same workbook    | <i>Illustrate how to utilise more than one sheet in the same workbook</i> | Excel 1 file is still open. Click on Sheet 2 in the same workbook. Enter your cellphone number in Cell A1 on Sheet 2. Right-click on the words Sheet 2. Rename Sheet 2 to Cellphone                                                                                                                                                                                                                                  |
| Perform a basic calculation such as sum and average | <i>Show how to enter basic calculations such as Sum and Average</i>       | Double click Documents Library from your Desktop. Double click to open Excel 5 file. Select Sheet 1. Determine the Total for Expenses in Cell A5. Place cursor in Cell A5. Enter the formula =SUM(A2:A4). Press enter. The answer should be R1650.00.<br>Determine the Average of all the Expenses in Cell A6. Place cursor on Cell A6. Enter the formula =AVERAGE(A2:A4). Press enter. The answer should be R550.00 |
| Perform an advanced calculation such as CountA      | <i>Illustrate to perform an advanced calculation such as CountA</i>       | Excel 5 file is still open. Move to Cellphone sheet in Excel 5 file. You would like to determine how many cellphone users are learners are situated in Mamelodi. Place your cursor in Cell A11. Enter the formula =COUNTA(A2:A10). Press enter. The answer should be 9                                                                                                                                               |

### Learning outcomes:

At the end of this section, the learner will have reliably demonstrated the ability to have created, saved and printed a spreadsheet document; utilised multiple sheets in the same workbook; performed basic =SUM and =AVERAGE calculations; and performed advanced =COUNTA calculation.

### Presentation skills

#### Learning objectives:

At the end of this section the learner will be able to:

- Open, create and save a presentation
- Print a presentation
- Insert graphics on a slide
- Add a theme style to a slide
- Enhance a slide show using animations, slide transitions and time intervals between slides.

| Specific outcomes                    | Tutor                                                                                           | Learner hands-on                                                                                                                                                                                                                                    |
|--------------------------------------|-------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Open, create and save a presentation | <i>Illustrate how to open Microsoft PowerPoint. How to create and save a basic presentation</i> | Double click Documents Library. Double click Presentation 1 file. Type your name and surname in the Title section on Slide 1. Move to Slide 2. Type your cellphone number in the Subtitle section. Save the changes by clicking on File. Click Save |
| Print a presentation                 | <i>Demonstrate how to print the presentation</i>                                                | Presentation 1 file is still open. Select File. Select Print. Send Presentation 1 to the printer                                                                                                                                                    |
| Insert graphics on a slide           | <i>Illustrate how to insert graphics on a slide</i>                                             | Presentation 1 file is still open. Place cursor on Slide 2. Select Insert from the Menu bar. Select Clip art. Choose any picture. Save current the changes by clicking on File then Save                                                            |

|                                                          |                                                                 |                                                                                                                                                                                                                                                                                                             |
|----------------------------------------------------------|-----------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Add a theme style to a slide                             | <i>Show how to add a theme style to a slide</i>                 | Presentation 1 file is still open. Place cursor on Slide 1. Select Design from the Menu bar. Select any theme from the Theme menu. Save the changes by clicking on File then Save                                                                                                                           |
| Enhance a slide show using animations, slide transitions | <i>Demonstrate how to add an animation and slide transition</i> | Presentation 1 file is still open. Place cursor on Slide 2. Select the clipart picture you inserted. Select Animation. Select Wheel. Select Preview. Place cursor on Slide 1. Select Transitions. Select Push. Save the changes by clicking on File then Save                                               |
| Enhance a slide show using time intervals between slides | <i>Apply time intervals between slides</i>                      | Presentation 1 file is still open. Place cursor on Slide 1. Select Slide show. Click Record slide show. Click Start recording. Allow 3 seconds for recording and then click twice. Present your slide show by clicking on Slide Show. Select From Beginning. Save the changes by clicking on File then Save |

### Learning Outcomes:

At the end of this section, the learner will have reliably demonstrated the ability to have created, saved and printed a presentation document; inserted graphics on a slide; added a theme style to a slide; enhanced a slide show using animations and slide transitions; and enhanced a slide show using time intervals between slides.

## PDF files

### Learning objectives:

At the end of this section the learner will be able to:

- Know what PDF files are
- View and can create PDF files
- Understand how to add password protection.

| Specific outcomes                         | Tutor                                                              | Learner hands-on                                                                                                                                                                                                                   |
|-------------------------------------------|--------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Know what PDF files are                   | <i>Illustrate the look and feel of a .pdf file</i>                 | Click the Start button at the bottom of your taskbar. Select Acrobat Reader. Select File Open. Double click Documents Library. Select the Digital Divide.pdf file to open it                                                       |
| Understand how to add password protection | <i>Demonstrate how to add password protection on .pdf document</i> | Double click on the Documents Library from your Desktop. Double click Exercise 1 to open it. Select File. Select Save As. Select PDF in Save as type menu box. Select Tools. Select General Options. Enter password. Click on Save |
| View and can create PDF files             | <i>Illustrate to learner how to create a .pdf file</i>             | From your Desktop, double click the Documents Library folder. Double click on Exercise 1 to open it. Select Save As. Select PDF in the Save as type menu box. The file is saved in PDF format                                      |

### Learning outcomes:

At the end of this section, the learner will have reliably demonstrated the ability to understand what PDF files are; viewed and created PDF files; and added password protection to files.

## Electronic mail

### Learning objectives:

At the end of this section the learner will be able to:

- Open and read a received e-mail message
- Reply to, or delete a received e-mail message
- Attach a file to a message
- Subscribe to and unsubscribe from mailing lists
- Understand how to set up return receipts.
- Find contacts in my address book
- Edit my contacts in the address book
- Create a mailing list

| Specific outcomes                                                                                                                                            | Tutor                                                                                      | Learner hands-on                                                                                                                                                                                         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Open and read a received e-mail message.<br>Reply to, or delete a received e-mail message.<br>Attach a file to a message.<br>Find contact in my address book | <i>Learners are to open their own e-mail account and mail Exel 5 file to the recipient</i> | Open own e-mail account. Enter the topic "Research" in the subject heading. Attach your Excel 5 file to the mail. Send this e-mail to <a href="mailto:vanvuurenmdm@tut.ac.za">vanvuurenmdm@tut.ac.za</a> |

### Learning outcomes:

At the end of this section the learner will have reliably demonstrated the ability to have opened and read a received e-mail message; replied to and deleted a received e-mail message; attached a file to a message; and found an e-mail contact in the address book.

### **3.5 Chapter summary**

Chapter Three presented the e-readiness toolkit exploited as learning material during the first year induction programme of the department OMT in TUT. A short description of prevailing e-readiness resources were presented firstly followed by the compilation and structure of the e-readiness toolkit. The compilation section was followed up by a complete e-readiness toolkit manual consisting of learning objectives, specific outcomes, tutorial instructions and hands-on excersises. Each unit was accompanied by practice files and ended with a narrative of achieved learning outcomes.

Chapter Four will provide my reseach philosophy and a conceptual framework that enfolds the boundaries of the project followed by the research design, data collection instruments and mixed methodology approach.

## **CHAPTER 4: RESEARCH DESIGN AND METHODOLOGY**

- 4.1 Introduction
- 4.2 Research philosophy
- 4.3 Conceptual framework embracing the research problem
- 4.4 Research design
- 4.5 Research methodology
  - 4.5.1 Selection of a research approach
  - 4.5.2 Population
  - 4.5.3 Sampling
  - 4.5.4 Measuring instruments
    - 4.5.4.1 Questionnaire
    - 4.5.4.2 Focus group interview
  - 4.5.5 Data collection
    - 4.5.5.1 Quantitative data collection strategy
    - 4.5.5.2 Qualitative data collection
  - 4.5.6 Data analysis
    - 4.5.6.1 Quantitative data
    - 4.5.6.2 Qualitative data
- 4.6 Field workers
- 4.7 Ethical aspects of the research
- 4.8 Strategies for enhancing the validity and reliability of quantitative data
  - 4.8.1 Validity
  - 4.8.2 Reliability
- 4.9 Methodological limitations
- 4.10 Chapter summary

# CHAPTER 4

## RESEARCH DESIGN AND METHODOLOGY

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### 4.1 Introduction

Chapter Three modelled the e-readiness toolkit developed for undergraduate students in the department OMT with the purpose to reduce the e-literacy skills gap school leavers experience when they enter a HEI after high school.

This chapter presents the research philosophy, design and methodology for this study. The research philosophy is presented first in order to clarify the researcher's epistemological viewpoint. Thereafter a conceptual framework, by means of how and why the study was conducted, is presented. The research design and methodology are described in terms of the requirements of the design, participant selection and sampling technique. Moreover, data collection instruments, the utilisation of field workers, the data collection process as well as a distinct quantitative and qualitative data analysis are presented. Issues of validity, reliability, ethical considerations and methodological limitations are also addressed.

### 4.2 Research philosophy

Growth of knowledge is a cumulative process and by decomposing the nature of social sciences, the researcher wished to gain new insights and broaden her existing knowledge inequalities. Burrell and Morgan (1979:3) describe how the nature of social sciences is conceptualised by a set of assumptions. The first assumption, ontology, is the individual's assumption about the nature of the social world, and the way in which it may be investigated. They recommend that a researcher should ask himself two questions: Is reality external to me as researcher or, is reality a given in the world? By addressing this basic question a researcher determines his ontology (Potgieter, 2013:16) as either a nominalist or a realist (Burrell & Morgan, 1979:4). Nominalists believe that there is no real structure to the world whilst realists postulate that the world is made up of hard, tangible and immutable structures.

The second assumption, epistemology, is about how an individual acquires his knowledge (Mouton, 1996:28; Tashakkori & Teddlie, 2010:101, 105). It can either be a conviction that knowledge is gained spiritually, by experience and insight in a subjective way, a post-positivist, or that knowledge is acquired objectively in a tangible form, a positivist (Burrell & Morgan, 1979:5, 7). Positivists follow a nomothetic approach because he bases his research upon systematic protocol and techniques whilst post-positivists follow an ideographic approach. Consequently a researchers' ontological, epistemological and human nature impact his methodology and strategic approach, therefore, the researcher should have an

understanding of the way in which to create, modify and interpret the world in which his study takes place. Hence, I present a brief orientation of my philosophical postulation.

With the reconciliation of different sociological issues in the late 1970s, paradigms were redefined in order to utilise the analysis of social theories. The four paradigms according to Burrell and Morgan (1979:24) outline separate views of the social world which are based upon different meta-theoretical assumptions with regard to the nature of science and of society. It provides a map for negotiating the subject area for locating one's own personal frame of reference pertaining to social theory. Each one defines a range of intellectual territory (Burrell & Morgan, 1979:24). Figure 4.1 portrays the four paradigms of Burrell and Morgan (1979:22) for the analysis of social theories.

| THE SOCIOLOGY OF RADICAL CHANGE |                  |                       |           |
|---------------------------------|------------------|-----------------------|-----------|
| SUBJECTIVE                      | Radical humanist | Radical structuralist | OBJECTIVE |
|                                 | Interpretive     | Functionalist         |           |
| THE SOCIOLOGY OF REGULATION     |                  |                       |           |

(Burrell & Morgan, 1979:22)

**Figure 4.1: Four paradigms of social research**

Functionalists have a problem solving orientation which leads to rational explanations. Interpretivists question whether organisations exist in any real sense beyond the conceptions of social actors, so their understanding is based on the experience of those who work within it. Radical humanists see organisations as a social arrangement from which individuals need to be emancipated and see research as guided by the need for change. A radical structuralist views an organisation as a product of structural power relationships which results in conflict (Bryman *et al.*, 2014:20).

After carefully scrutinising the four paradigms, I position myself and this research study in the functionalist paradigm (Burrell & Morgan, 1979:24). Functionalists are concerned in providing explanations on the status quo as well as social order and integration of society (Burrell & Morgan, 1979:26). Functionalist researchers tend to be involved in the satisfaction of needs of real life situations. From this paradigm they operate from a standpoint which tends to be that of a realist, positivist, determinist and nomothetic. For pragmatists, knowledge claims arise out of actions, situations and consequences, and knowledge is acquired through the combination of actions and reflections where researchers have a concern with the consequence and wish to find a solution to a problem (Tashakkori & Teddlie, 2010:120). "Actions" according to Tolman, Allport, Kluckhohn, Murray, Sears, Sheldon, and Stouffer (1962:6) is that it is important to understand how an individual views a situation. This generality is required for the purposes of a dynamic theory of action which would attempt to explain why one alternative rather than another is selected. The range of the alternatives of action orientation is determinate, it is inherent in the relation of the actor to the situation, and derives ultimately from certain general properties of the organism and the nature of objects in their relation to such organisms.

Creswell (2003:136) emphasises that before a researcher can create a plan of action or research method, he has to assess his own knowledge claim and consider his strategy of inquiry; only then he will be able to identify a specific research method. Knowledge claims connotes that a researcher approaches his research with certain assumptions. He separates these knowledge claims into four levels and these are presented in Table 4.1.

**Table 4.1: Knowledge claim positions**

|                                                                                                                    |                                                                                                                                    |
|--------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| <b>Positivism</b><br>Determination<br>Reductionism<br>Empirical observation and measurement<br>Theory verification | <b>Constructivism</b><br>Understanding<br>Multiple participant meanings<br>Social and historical construction<br>Theory generation |
| <b>Advocacy/Participatory</b><br>Political<br>Empowerment issue-oriented<br>Collaborative<br>Change-oriented       | <b>Pragmatism</b><br>Consequences of actions<br>Problem-centred<br>Pluralistic<br>Real-world practice oriented                     |

(Creswell, 2003:6)

With my conception of science and my understanding of these paradigms I was capable to provide true explanations and prognostic knowledge of my reality. Being a pragmatist and a functionalist as clarified in my conceptualisation of the research paradigms by Cohen *et al.* (2011:7) and Burrell and Morgan (1979:107), I empirically determined the e-literacy skills of novice undergraduate students and described these objectively. I similarly explored the perceptions of participants' experiences, therefore the interpretivist (Burrell & Morgan, 1979:22; De Vos *et al.*, 2012:309) paradigm of social theory is also relevant. I related the statistical analysis with important elements from the social content, as well as gave explanations on the prevailing situation. An advantage of methodological pluralism (Cohen *et al.*, 2011:23) enables errors in single approaches to be identified and rectified. It also enables meanings in data to be probed, corroboration and triangulation to be practised, richer data to be gathered and new modes of thinking to emerge where paradoxes between two individual data sources are found.

Since I attempted to improve the socio-economic life of students and the reality to which my work is addressed, and to attain my epistemic ideal of the truth, these paradigms were based upon the underlying norm of purposive rationality and were the dominant framework to conduct this research. The philosophical viewpoint, together with the conceptual framework of the study, guided me on how to approach the phenomenon under investigation (Creswell, 2007:15; Du Plooy, 2009:20). Having this ontological (Bryman *et al.*, 2014:16) viewpoint, my phenomenon was assessed objectively and proved by empirical evidence.

### 4.3 Conceptual framework embracing the research problem

During the conceptualisation of a research project, researchers plan their study in phases like: (i) the reasons why to conduct the study; (ii) to generate a theoretical knowledge; (iii) to state objectives; (iv) to formulate research questions; (v) to choose a research design; (vi) to collect and analyse data, and (vii) to get to conclusions and make recommendations (Teddlie & Tashakkori, 2009:110). It leads to the implementation of the research and ultimately towards the body of scholarship. Leshem and Trafford (2007:98) claim that conceptualisation assists researchers not only to contribute to knowledge, but also to indicate the knowledge gap whilst the researcher matches other concepts, assumptions, expectations, beliefs and theories that inform their research.

In SA, the 21<sup>st</sup> century workforce does not have the expanded skill set (competencies) required for adapting, innovating, and functioning optimally according to 21<sup>st</sup> century requirements. As a result, it ascribes education as the central role in almost every facet of life. Education should be restructured for this global culture of high technology interaction and use (Folley, 2010:99; Jefferies & Hyde, 2010:133; Tapscott & Williams, 2010:21). Ubiquitous technologies are futuristic tools, therefore educators are compelled to assist 21<sup>st</sup> century students to prepare for the ever widening global marketplace. Larsen and Golden (2006:114) assess that it is the task of educators to develop the skills, confidence and competencies of their students in order for them to become flexible and adaptable in the fast evolving world of technology. Bruce and McDonald (2006:20) claim that employees of the future should be able to respond to new competencies and be technologically astute. Karim (2007:online) argues that with the information and communication technology revolution, a highly skilled and internationally recognised workforce is needed, therefore the upcoming South African labour force should be equipped to meet the changing technological needs and inevitably emergent technology in order to meet the requirements of the workplace.

Currently the technological revolution has a collective and individual impact on students, as well as on HE. Time is of the essence and the use of ICT must be considered to enhance teaching and learning. The recent past has shown the growth, influence, and impact of Web 2.0 technologies on HE, especially on the younger generation. Ubiquitous learning environments inspire beyond the traditional model of teachers, students, classrooms and laboratories (Bement, 2007:online; Jefferies & Hyde, 2010:138; Uzunboyly & Tuncay, 2009:281). In the endeavour to prepare students to explore and utilise ubiquitous technologies, as well as to prepare them for the digital workplace, educators should ensure that diverse and differentiated teaching and learning (French, 1999:79) is possible and effective. A paradigmatic learning shift is possible through the utilisation of e-learning where learners actively engage in their own learning process. Learners are required to interact with e-learning tools, as well as with other IT components. In SA, different affiliated training institutions are essential in developing the e-skills of their students. TUT has for a long time utilised supportive e-learning tools. e-Learning tools compel students to engage with new means for communication like search engines, electronic libraries, computer networks, multimedia, content portals, distance, as well as web-supported learning.

TUT battles with the mismatch between the expected and actual ICT competencies of its undergraduate students. There is a gap between those who are e-literate (those who have the necessary e-literacy skills and competencies) and those who are not. Insufficient knowledge and skills, as well as inadequate infrastructural components are some of the main causes of the e-literacy divide of TUT students.

I, for one worked to achieve the stated research objectives (§1.4) of the study and hinged on the final formulation of the research question namely: *Is e-literacy skills training required for e-readiness of novice TUT students?* Teddlie and Tashakkori (2009:129) regard the research question as a dual focal point in the research process whilst Trafford and Leshem (2002:31) assert that everything flows through and from research questions. It liaises between what was known about the topic before the study and what was learned about the topic during the study. Therefore, I deliberately selected a user centred approach so that I could achieve a thorough understanding on e-readiness ranks in two vocations such as Office Management and Technology (OMT) and Contact Centre Management (CCM). Learners in the aforementioned occupations come from different surroundings as well as socio-economic backgrounds. If one hopes to design and implement eminence education that will meet the needs of a specific user group, it is advisable to involve the specific group concerned.

This research project contains notions of digital divide, e-literacy skills, digital divide discrepancies, e-literacy skill requirements for HE in SA and human capital development. The researcher indicates the locus and boundaries of this research project by means of an illustrated concept map in Figure 4.2 on the next page.

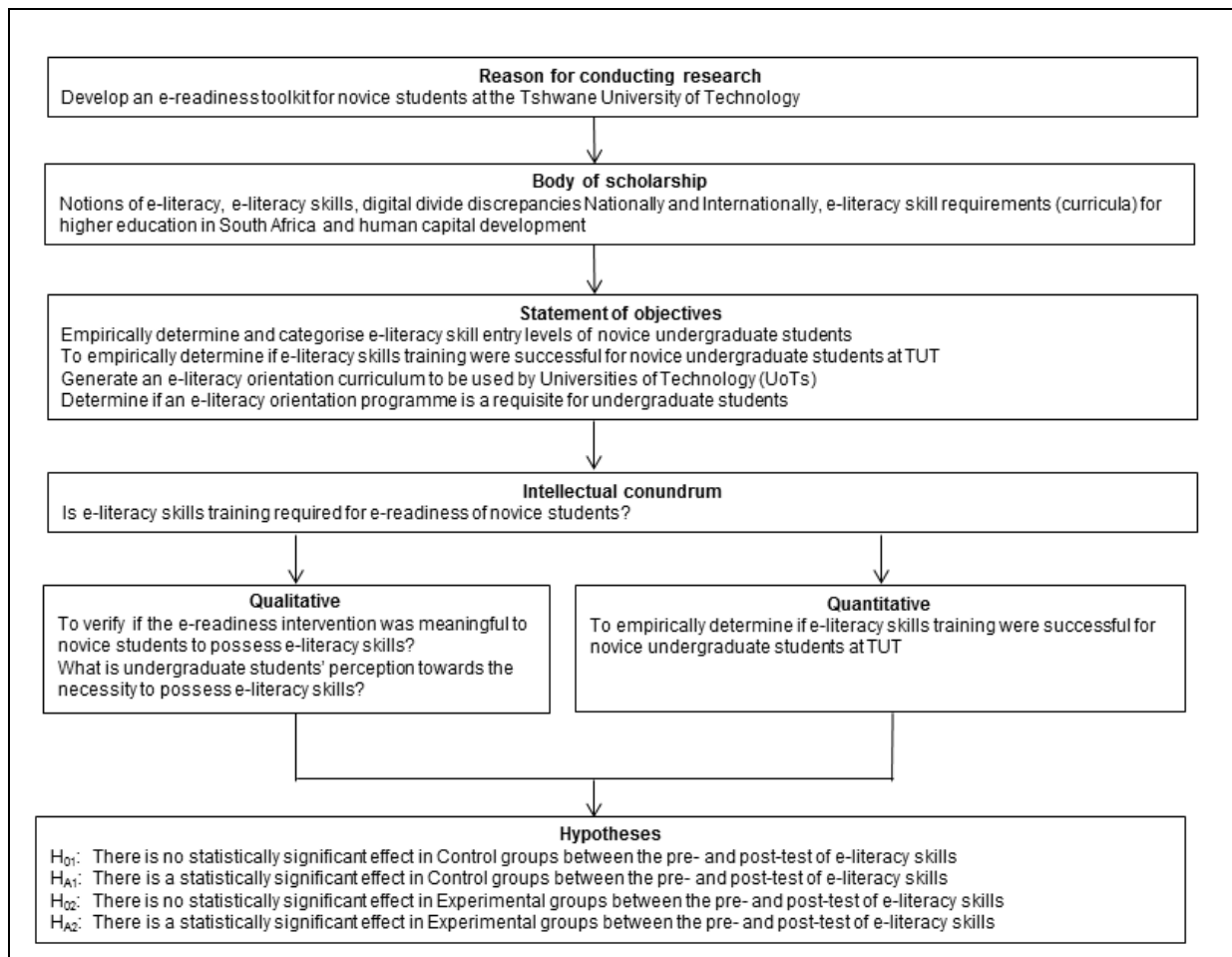


**Figure 4.2: Boundaries of research project**

Figure 4.2 summarises the boundaries of the research project. The research design is now discussed.

#### 4.4 Research design

This section presents the research design for the study, followed by the research methodology in section 4.5. A research design is ultimately the blueprint and logical sequence of a study (De Vos & Fouche, 1998:93; Yin, 1984:28) and connects empirical data to the research questions, as well as to the findings and conclusions. In this research project the e-literacy entrance skill levels of undergraduate students coming from different socio-economic backgrounds, surroundings as well as distinctive occupation fields were significant in obtaining results and findings. A descriptive single (Cohen *et al.*, 2011:291) bounded case study design (Cohen, Manion, & Morrison, 2000:183; Creswell, 2007:62; Du Plooy, 2009:34,181; Tellis, 1997:online; Yin, 1984:42) was selected as design due to the unique case and unit of analysis. De Vos *et al.*, (2012:165) mention that a single system design involves a planned comparison of observations in a pre-intervention period (in this case the pre-test) with observations during and after the intervention period (the post-test).

Three different case study approaches can be followed, either within a single or a multiple case design (Cohen *et al.*, 2000:183; Cresswell, 2012:465; Tellis, 1997:online). In an exploratory case study, fieldwork and data collection may be undertaken prior to the definition of research questions and hypotheses. Explanatory case studies (Cohen *et al.*, 2011:312), the second approach, are suitable where theories and hypotheses are tested on a larger scale. The third approach is descriptive cases which require that the investigator should give a narrative or descriptive account of the study. The aim of case studies is to probe deeply, to analyse intensively and to give feedback on the findings. Case studies allow a researcher to reveal a multiplicity of factors. Such factors should be integrated to produce a unique character of the entity, which is the subject of a study (Haigh, s.a.:online). This statement is echoed by Tellis (1997:online) when he states that “a case study is a valuable method of research, with distinctive characteristics that make it ideal for many types of investigations, so that it can be used in combination with other methods.” Case studies have several claimed strengths and weaknesses (Cohen *et al.*, 2000:184). Some of the strengths are: (i) case studies are down-to-earth and attention holding, in harmony with the reader’s own experience, thus providing a natural basis for generalisation; (ii) the results are more easily understood by a wide audience, including non-academics, since they are frequently written in everyday, non-professional language; (iii) case studies are strong on reality; (iv) they give insight into other, similar situations and cases, thereby assisting the interpretation of other similar cases, and can be undertaken by a single researcher.

I assessed a unit of analysis (Cresswell, 2012:141; Rule & John, 2011:7, 11; Yin, 1984:23), namely the e-literacy skill levels of first time entering undergraduate students in two vocational qualifications such as the National Diploma: Office Management and Technology (NDOM03) and the National Diploma: Contact Centre Management (NDCC01). These programmes required e-readiness and computer literacy skills. e-Readiness is regarded as the ability to use ICT in your everyday life. Since it forms such an integral part of your daily routine it was important for learners to obtain basic e-readiness skills and knowledge to survive the current technological era.

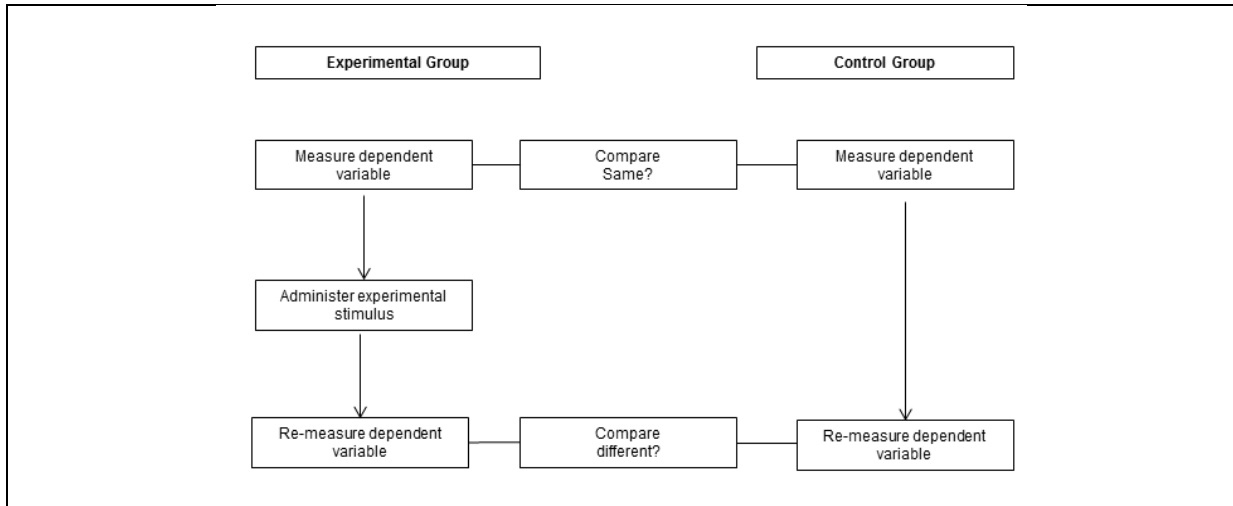
A descriptive single bounded case study design was utilised to test whether the researcher’s hypotheses (§1.5.2.1) propositions were correct or whether some alternative set of explanations might have been relevant.

## **4.5 Research methodology**

### **4.5.1 Selection of a research approach**

Evaluation research is not a method itself, but rather one application of social research. Experimentation (Babbie, 2013:285), a practice of evaluation research, is more appropriate for certain topics and research purposes than others and has been successful in studies with small group interactions. According to Babbie (2013:272), experiments are especially well suited to research projects that involve relatively

limited and well defined concepts and propositions. The major components of a classical experiment (Babbie, 2013:272; Bryman *et al.*, 2014:101) are: (i) dependent and independent variables; (ii) pre- and post-testing; (iii) experimental and control groups and (iv) equal randomness. Essentially, an experiment examines the effect of a dependent variable (pre-test), exposed to an independent variable, and then re-measured in terms of the dependent variable (post-test). Within a laboratory experiment (Babbie, 2013:273), researchers observe the Experimental group to which a stimulus has been administered. In addition, the researcher also observes a Control group which did not receive any stimulus. Figure 4.3 demonstrates a diagram of Babbie's Classic Experimental Design.



(Babbie, 2013:273)

**Figure 4.3: Classic Experimental Design**

The classical experimental design also in (Bryman *et al.*, 2014:101) was picked as an approach to successfully reach my aims and to collect my data. Independent variables such as: e-readiness intervention; the preparedness of students; socio-economic status differences; urban and rural settings; connectivity; occupation fields and e-skill perceptions; and e-readiness training needs were factors that influenced the dependent variable, namely e-literacy skills (§1.5.2.2). In most experiments, the observed effect is described in terms of the changes or differences in the mean value of a certain criterion variable (Miller *et al.*, 1998:136), in this case the dependent variable. The major purpose of this experiment was to describe the effect of a certain experimental treatment upon some characteristic of a particular population, in this case undergraduate students and to test the research hypotheses. Cohen *et al.* (2011:315) claim that a true experiment is conducted in a specially contrived, artificial environment so that variables can be isolated, controlled and manipulated. The execution of the true experiment was done according to the ten step, conduct an experiment, model of Cohen *et al.* (2011:326).

Non-parametric tests (Cohen *et al.*, 2011:478) compared to criterion-references tests have the advantage of being tailored to particular institutional, departmental and individual circumstances. It offers researchers the valuable opportunity to obtain quick, relevant and focused feedback on student performance (Babbie, 2013:364) since they can be designed for a specific population.

Criterion-referenced tests (Cohen *et al.*, 2011:478) on the other hand can be used to indicate whether students achieved a set of given criteria, to indicate what a student has learned along with what he can do. The pre-test ( $O_1$ ), a criterion-referenced test, was the initial measuring instrument in this study, because it measured the detailed starting points, knowledge, abilities and e-literacy skills of undergraduate students. It was utilised to measure the value-added component of teaching and learning from where a student started off, his abilities and his achievements, and is therefore referred to as a diagnostic test. Diagnostic tests (Cohen *et al.*, 2011:481; Miller *et al.*, 1998:30) measure students' understanding of a subject area or skills base, and gauge their prior knowledge they bring to class. It requires that several items about the same feature are included so that several types of difficulties in a student's understanding are exposed, therefore it needs to contain test items that will focus on a range of very specific difficulties that students might experience. Hence, it identified the exact problems from a range of possible problems that undergraduates might have had. Ultimately, it was designed to expose specific areas of weakness or strengths.

To investigate the influence of the independent variables on the dependent variable, as well as to verify the hypotheses (§1.5.2.1), pre- and post-tests were executed in Control and Experimental groups. A randomised pre-test ( $O_1$ ) and post-test ( $O_2$ ) control group (Cohen *et al.*, 2011:317) or two-group (Welman, Kruger, & Mitchell, 2005:80) design formed the basis for my experiment. De Vos *et al.*, (2012:152) illustrate this design as:

|                        |       |   |       |
|------------------------|-------|---|-------|
| Experimental group (E) | $O_1$ | x | $O_2$ |
| Control group (C)      | $O_1$ | x | $O_2$ |

Both groups wrote a pre-test ( $O_1$ ) at one go. The independent variable (X), in this case the e-readiness toolkit (the intervention), was offered only to the Experimental groups and not to the Control groups. After that, both groups wrote the post-test ( $O_2$ ). The pre-test collected quantitative data and met secondary research objective three (§1.4). Correspondingly, it directed the formulation and design of the e-readiness curriculum toolkit and intervention (secondary research objective four, §1.4). The subsequent post-test ( $O_2$ ) collected quantitative and qualitative data. Adequate qualitative data for the accomplishment of the inductive reasoning process as explained by Merriam (2009:205), were necessary to attain secondary research objective five (§1.4). As the research experiment developed, however, insufficient qualitative data were collected from the post-test and necessitated a focus group interview. Babbie (2013:349) points to five advantages of focus groups: (i) the technique is a socially oriented research method capturing real-life data in a social environment; (ii) it has flexibility; (iii) has high face validity and (iv) has speedy results and finally it is low in cost.

In view of the above, the mixed methods typology (MMT) well-matched the execution of this research project. Teddlie and Tashakkori (2009:138, 153-155) as well as Creswell (2003:18) describe the mixed methods research methodology as be a design that combines elements of both the quantitative and qualitative orientations across chronological phases in a study. To support my decision I looked at the

“criteria for using a mixed methods design” according to the Teddlie and Tashakkori (2009:141) guidelines and summarised its values in Table 4.2.

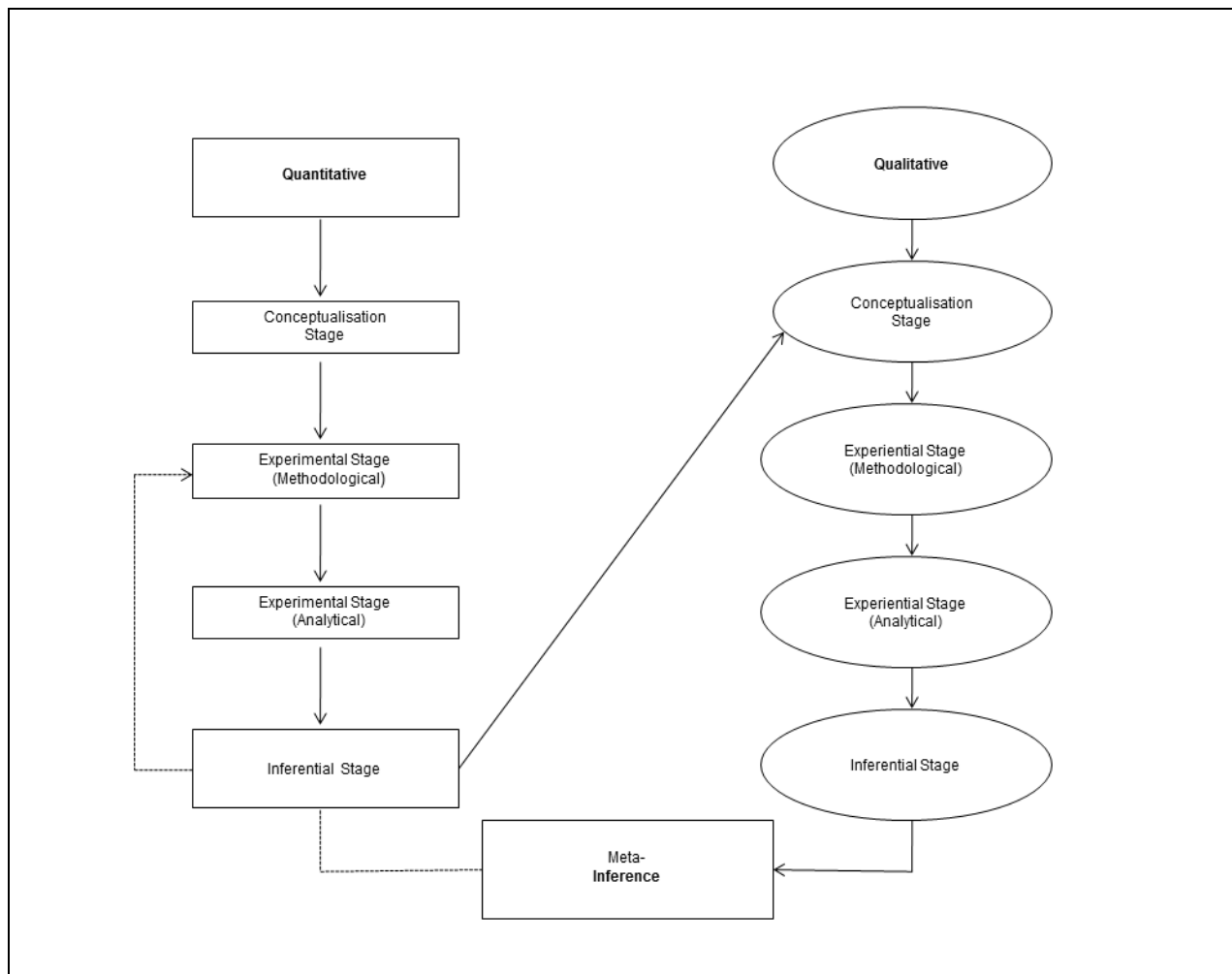
**Table 4.2: Summary of MMT values**

|                                  |                                                                                                                                            |
|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| <b>What values does MMT own?</b> | It uses a number of methodological approaches such as: QUAN + QUAL or QUAL + QUAN or QUAN → QUAL or QUAL → QUAN                            |
|                                  | MMT is functional all the way through the conceptualisation, methodological, analytical and inferential multi-phases in a research project |
|                                  | Quantitative and qualitative data are collected and analysed across all phases                                                             |
|                                  | It carries initiation, exploratory, confirmatory, development, expansion and inference qualities                                           |
|                                  | MMT can be implemented using four designs (parallel, sequential, conversion and multilevel)                                                |

(Teddlie & Tashakkori, 2009:141)

An advantage of the mixed method typology is that it uses an inductive-deductive reasoning cycle. According to Teddlie and Tashakkori (2009:26) inductive inferences are drawn from general inferences, grounded results, as well as the researchers' observations and facts. Jointly the researcher's theory and conceptual framework, together with deductive inferences and predictions, facilitated the verification of the conundrum. De Vos and Fouche (1998:91) claim that induction is the investigation of a case in addition to its characteristics, and that the conclusions are tentative generalisations. With the induction process new thoughts can be added that might not be contained within the hypothesis.

I adopted Teddlie and Tashakkori (2009:152) parallel mixed method (QUAN + QUAL) design as presented in Figure 4.4. This method embraced two independent strands. The first strand had QUAN questions, data collection and analysis techniques, whilst the second had QUAL questions, data collection and analysis techniques. The QUAN strand included a Likert-type scale measuring self-assessment and an achievement test in relation to e-literacy skills. The QUAL strand consisted of open-ended questions and a focus group interview with a sample of six participants. Inferences based on the results from each strand were integrated to form meta-inferences at the end of the study. By using this method, I simultaneously addressed a range of confirmatory and exploratory questions of both the quantitative and qualitative research approaches that generated theory and provided great inferences.



(Teddle & Tashakkori, 2009:152)

**Figure 4.4: Graphic illustration of parallel mixed method design**

The main reason for applying this method was to test my intellectual conundrum in more than one way, and to increase the reliability and validity of my observations, analyses and findings. The mixed method design preserves the integrity of findings of different types of studies by using the appropriate type of analysis that is specific to each type of finding. Leech and Onwuegbuzie (2009:271) extend the mixed methodology approach by referring to a “fully mixed concurrent dominant status design.” In this design, the quantitative and qualitative phases are mixed concurrently at one or more stages or across stages, with the understanding that either the quantitative or the qualitative phase is given more weight. In this research project however, mixing occurred at the research objectives as well as the data analysis and interpretation phases, with the intent that the qualitative analysis ought to confirm empirical findings.

With this much said, the researcher pursued a single bounded case study research design with an explanatory (De Vos *et al.*, 2012:321) concurrent or parallel mixed method approach (Cresswell, 2012:543) where deductive as well as inductive reasoning structured the quantitative and qualitative methods in a parallel manner (Teddle & Tashakkori, 2009:151) but the empirical findings were primary (Leech & Onwuegbuzie, 2009:271) to the qualitative confirmatory analysis. Inferences from both the

quantitative and qualitative data as well as the qualitative systematic literature review provided the substantiation of findings and evidence.

#### **4.5.2 Population**

A researcher has to decide what kind of population (Babbie, 2013:365) is best suited to investigate his research topic. The population (Welman *et al.*, 2005:52) for this study was first time undergraduate students (grade twelve learners) registered at TUT, a public HEI. Students studying towards a National Diploma are referred to as “undergraduates.” They were taught in the traditional way and had at their disposal a management learning system *myTUTor* for their basic educational needs. The participants had to possess the following attributes, predetermined by the researcher, to be included in the research:

- Possess a National Senior Certificate
- Should not have had any formal qualification at any HEI in SA
- Should have been in matric in the year prior to this first year study at TUT.

This accessible population (Cresswell, 2012:142) was derived from one department, but two different academic qualifications. They were regarded as a homogeneous population. They shared similar sampling elements and common characteristics because they met the same admission requirements. The identified department was the department of Office Management and Technology. The two academic qualifications were NDOM03 and the NDCC01 (§4.4). The first year student intake for the first qualification was 200 and 20 for the latter. The target population was  $N=220$  of which a sample size of 140 was required to obtain a 95% confidence level with a 5 confidence interval. The researcher provided a list of admitted students as on 19 January 2015. (Addendum 4.1, Admission list OMT and Addendum 4.2, Admission list CCM).

#### **4.5.3 Sampling**

Tashakkori and Teddlie (2010:356) define sampling as the “process of selecting a subset from a larger group or population of interest with the purpose to address a study’s research question.” Other authors (Bryman *et al.*, 2014:170) claim that a sample is a segment of a population that is selected for an investigation. The selection of a sampling method is based on a researcher’s choice to keep his sampling error to a minimum, to eliminate sampling bias (Bryman *et al.*, 2014:170) as well as to use tests of statistical significance. The probability sampling method empowers researchers to control the probability that an element or a member of the population has a known chance of being selected in a sample. Simultaneously, the systematic sampling method (Bryman *et al.*, 2014:173; De Vos *et al.*, 2012:230; Welman *et al.*, 2005:64) provides a more representative sample and is a more convenient method, especially when the researcher wants to generalise findings that were derived from a sample, to a population from which that sample was selected.

In this mixed-method study, systematic random sampling (Vermeulen, 1998:54) was used to allocate participants into either a Control or an Experimental group (Babbie, 2013:364) §4.5.1. Admitted undergraduate students reported for orientation on 19 January 2015. During the first assembly the research project was explained and an Information leaflet and Informed consent letter (Addendum 4.12, Information leaflet and Informed consent) was distributed to everybody present. All students present at that stage were invited to participate in the study. Voluntary participants,  $n=108$ , were systematically allocated into either a control or an experimental group. Since there were two qualifications, I had to get two experimental and two control groups. For qualification one, forty two ( $n_1 = 42$ ) participants were divided into the experimental group and forty one ( $n_2 = 41$ ) in the control group. For qualification two, thirteen ( $n_3 = 13$ ) and twelve ( $n_4 = 12$ ) participants were divided apiece. Sample sizes for experimental groups were  $n_5 = 55$  and control groups  $n_6 = 53$ . I summarised the division of the Experimental (E) and Control (C) groups sample sizes in Table 4.3.

**Table 4.3: Sample sizes for Experimental and Control groups**

| Type of group          | Group name  | Sample sizes | Qualification | Group sample sizes |
|------------------------|-------------|--------------|---------------|--------------------|
| Experimental group (E) | Group A (E) | 42 ( $n_1$ ) | OMT           | $n_5 = 55$ (E)     |
|                        | Group C (E) | 13 ( $n_3$ ) | CCM           |                    |
| Control group (C)      | Group B (C) | 41 ( $n_2$ ) | OMT           | $n_6 = 53$ (C)     |
|                        | Group D (C) | 12 ( $n_4$ ) | CCM           |                    |

The reason for dividing participants into smaller groups was due to the capacity of the computer laboratories. Systematic allocation of voluntary participants into the various groups started with the first record on the admission list followed by a sampling interval of two (Du Plooy, 2009:119). Although this method had strengths as well as weaknesses (Du Plooy, 2009:120), I regarded it an appropriate method to execute the intended classical experiment, to formulate representative claims and to make generalisations to the population (Cresswell, 2012:143).

After the systematic separation of participants into four groups, as per two qualifications, a unique assessment number was allocated to each participant. The assessment numbers were allocated in the following fashion. For the qualification Office Management and Technology the identification code “OMT” and for the qualification Contact Centre Management, “CCM” was allocated. A “C” at the end of the participant number represented the Control group whilst an “E” represented the Experimental group. Therefore a number such as OMT\_\_E represented the qualification OMT in the Experimental group whilst assessment number OMT\_\_C represented the Control group of the same qualification. Forty two numbers were allocated to participants in the OMT Experimental group, and the numbers ranged from OMT01E to OMT53E. Another forty one numbers were allocated to participants in the OMT Control group and the numbers ranged from OMT140C until OMT192C. The number CCM\_\_E represented the Experimental group in the CCM qualification. Assessment number CCM\_\_C represented the same qualification but the Control group. Thirteen numbers were allocated to participants in the CCM Experimental group, and ranged from CCM101E to CCM115E whilst twelve allocated numbers in the Control group ranged from CCM201C until CCM212C respectively. Table 4.4 provides an extract of the

allocated assessment numbers. A comprehensive list is available in Addendum 4.3, Sampled participants E and C groups.

**Table 4.4: Sampled participants divided into E and C groups**

| OMT<br>Experimental |           | OMT<br>Control |           | CCM<br>Experimental |           | CCM<br>Control |           |
|---------------------|-----------|----------------|-----------|---------------------|-----------|----------------|-----------|
| 213456083           | OMT03E    | 213105728      | OMT178C   | 215440656           | CCM101E   | 215536327      | CCM201C   |
| 214009102           | OMT27E    | 213395424      | OMT165C   | 215518876           | CCM102E   | 215545814      | CCM202C   |
| 214156164           | OMT23E    | 214241447      | OMT172C   | 215198740           | CCM103E   | 215556077      | CCM203C   |
| 214479850           | OMT12E    | 214420643      | OMT153C   | 215461106           | CCM104E   | 214819350      | CCM204C   |
| 214652340           | OMT07E    | 214467909      | OMT173C   | 214796473           | CCM105E   | 215498824      | CCM205C   |
| 214695715           | OMT53E    | 214514451      | OMT142C   | 215029042           | CCM106E   | 215127761      | CCM206C   |
| 214710595           | OMT24E    | 214520494      | OMT179C   | 215390950           | CCM107E   | 215547752      | CCM207C   |
| 214756749           | OMT25E    | 214542102      | OMT155C   | 214737140           | CCM108E   | 215300030      | CCM208C   |
| 214772299           | OMT06E    | 214547780      | OMT168C   | 215033570           | CCM109E   | 215393151      | CCM209C   |
| 214801035           | OMT49E    | 214581531      | OMT161C   | 214070049           | CCM110E   | 214085003      | CCM210C   |
| 214815419           | OMT48E    | 214622807      | OMT152C   | 215400212           | CCM111E   | 214331845      | CCM214C   |
| 215012743           | OMT02E    | 214658615      | OMT158C   | 214807610           | CCM112E   | 214758946      | CCM215C   |
| 215018865           | OMT45E    | 214684845      | OMT144C   | 215556948           | CCM113E   |                |           |
| 215047318           | OMT40E    | 214712393      | OMT157C   | <b>Total</b>        | <b>13</b> | <b>Total</b>   | <b>12</b> |
| 215122301           | OMT13E    | 214746220      | OMT177C   |                     |           |                |           |
| 215133303           | OMT20E    | 214805642      | OMT170C   |                     |           |                |           |
| 215557677           | OMT44E    | 215546284      | OMT176C   |                     |           |                |           |
| 215557707           | OMT39E    | 215551164      | OMT180C   |                     |           |                |           |
| 215557847           | OMT38E    | 215555461      | OMT163C   |                     |           |                |           |
| 215558134           | OMT22E    | 215556816      | OMT171C   |                     |           |                |           |
| 215558240           | OMT46E    | 215557278      | OMT170C   |                     |           |                |           |
| 215558622           | OMT18E    | 215558045      | OMT175C   |                     |           |                |           |
| 215559238           | OMT193    | 215558100      | OMT160C   |                     |           |                |           |
| 215563065           | OMT41E    | 215558614      | OMT147C   |                     |           |                |           |
| 215563197           | OMT36E    |                |           |                     |           |                |           |
| <b>Total</b>        | <b>42</b> | <b>Total</b>   | <b>41</b> |                     |           |                |           |

The unique assessment number was required as connection point to combine the pre- and post-test as well as the situational test with a participant. I based my sampling decision on the advantages and disadvantages of the systematic random sampling technique to garner successful responses to my research problem. Using this method there was no space for human biases, moreover it enhanced the internal validity (§4.8) of this study.

#### 4.5.4 Measuring instruments

##### 4.5.4.1 Questionnaire

I took the recommendations for preparing a questionnaire from Brancato, Macchia, Murgia, Signore, Simeoni, Blanke, Korner, Nimmergut, Lima, Paulino, and Hoffmeyer-Zlotnik (2006:50-51) as well as Cohen *et al.* (2011:481) into consideration when I compiled the measuring instrument. Throughout the compilation (Cresswell, 2012:158) and amendment processes I considered the foundations of preparing a

test namely the Classical test theory (CTT) and Item Response Theory (IRT) (Cohen *et al.*, 2011:480).

The e-readiness questionnaire (Addendum 4.4, e-Readiness questionnaire) used in this study consisted of a biographical section as well as a self-appraisal section where participants detected their own basic computer literacy in: (i) Getting started; (ii) Navigation capabilities; (iii) File management; (iv) Web browsing; (v) E-mail; (vi) Software; (vii) Hardware capabilities; (viii) Word processing; (ix) Spreadsheet; (x) Presentation manipulation as well as (xi) Portable document format (PDF) by means of closed and open-ended questions (Cresswell, 2012:220). Open-ended questions (Cohen *et al.*, 2011:392) were constructed by using a single text box for the respondents' answers or comments (§4.5.5.2). A supplementary objective situational test (hands-on test) was crafted to confirm whether participants possessed skills in some of the categories. The situational test comprehended three categorisations such as basic skills, functional skills and proficient skills.

Brancato *et al.* (2006:13-14), recommend that before the construction of a questionnaire can start the researcher should review relevant literature as well as analyse available data from similar studies. What is more, the researcher should specify the questionnaire objectives and concepts in a questionnaire design also referred to as conceptualisation. Subsequently, these concepts should be translated into measureable indicators for operationalisation and must be indicated in a questionnaire matrix. To meet the precondition for the concept formation, I compiled a conceptional e-readiness questionnaire design which mainly focuses on the self-appraisal section of the questionnaire. It indicated module learning outcomes as well as the research questions associated with the outcomes (Addendum 4.5, Conceptional e-readiness questionnaire design). An extract of merely two modules in the questionnaire design, Addendum 4.5, is presented in Table 4.5 on the next page.

**Table 4.5: Conceptual e-readiness questionnaire design**

| <b>Getting started and Navigation</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Outcomes</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Questions per category</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <ul style="list-style-type: none"> <li>• Switch on a desktop computer</li> <li>• Familiarise with the Recycle bin, Documents and Computer icons on the desktop</li> <li>• Familiarise with the mouse functions and identify three different mouse pointers</li> <li>• Apply single and double-click mouse actions</li> <li>• Drag and drop an icon</li> <li>• Familiarise with the right mouse button and shortcuts</li> <li>• Navigate using horizontal and vertical scroll bars as well as minimise, maximise, restore and close active windows</li> <li>• Utilise the Start button to open applications</li> <li>• Open more than one application</li> <li>• Switch between applications using the taskbar</li> <li>• Minimise, maximise, restore and close active windows</li> <li>• Understand what Tooltips are</li> <li>• Familiarise with Windows Help and Support</li> </ul> | <p><b>Basic skills:</b><br/>           I can switch on a Desktop computer<br/>           I can choose applications with the Start button on the task bar<br/>           I know what a pointing device is<br/>           I can adjust the view in a window up and down<br/>           I can adjust the view in a window left and right</p> <p><b>Functional skills:</b><br/>           I can identify Desktop components such as Recycle Bin, Documents and Computer<br/>           I am able to minimise, maximise, restore and close active windows<br/>           I can use the appropriate mouse button to select, highlight, copy and paste or drag text</p> <p><b>Proficient skills:</b><br/>           I know what Tooltips are<br/>           I can use the Windows Help and Support system<br/>           I use the appropriate mouse button for shortcuts</p> |
| <b>Electronic mail</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <ul style="list-style-type: none"> <li>• Open and read a received e-mail message</li> <li>• Reply to, or delete a received e-mail message</li> <li>• Attach a file to a message</li> <li>• Find contacts in an address book</li> <li>• Edit my contacts in the address book</li> <li>• Create a mailing list</li> <li>• Subscribe to and unsubscribe from mailing lists</li> <li>• Understand how to set up return receipts</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                | <p><b>Basic skills:</b><br/>           I can open and read a received e-mail message<br/>           I can reply to, or delete a received e-mail message</p> <p><b>Functional skills:</b><br/>           I can attach files to messages<br/>           I can find contacts in my address book<br/>           I can edit my contacts in the address book</p> <p><b>Proficient skills:</b><br/>           I can create a mailing list<br/>           I can subscribe to and unsubscribe from mailing lists<br/>           I can use an advanced e-mail feature such as return receipts</p>                                                                                                                                                                                                                                                                                |

After conceptualisation the researcher progressed to operationalisation when she translated the objectives, outcomes and concepts into measureable indicators. By doing this, the supplementary objective situational test (Addendum 4.6, Situational test design matrix) originated. This was a measurement yardstick to test whether students did indeed possess some of the required skills as they indicated and judged themselves in the self-evaluation section of the questionnaire. In this test students had to perform hands-on instructions on a computer using different applications and navigation techniques. The situational test design matrix indicated the basic instructions students had to carry out as well as the possible skill category a student might possess. An extract of Addendum 4.6, Situational test design matrix, is presented in Table 4.6 on page 67.

**Table 4.6: Situational test design matrix**

| The situational test matrix indicates the skill category of outcomes measured in the situational test. Acronyms used to indicate skills categories are: Basic skills (BS), Functional skills (FS) and Proficient skills (PS) |           |           |           |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------|-----------|
| <b>Web browsing skills</b>                                                                                                                                                                                                   | <b>BS</b> | <b>FS</b> | <b>PS</b> |
| Select Internet Explorer™ browser from the task bar on the desktop                                                                                                                                                           | ✓         |           |           |
| Enter a search engine's URL like www.Google.com in the tab section                                                                                                                                                           |           | ✓         |           |
| Execute a search that will include hits with both Michael Jackson and Elizabeth Taylor                                                                                                                                       |           | ✓         |           |
| Minimise the Internet Explorer™ program                                                                                                                                                                                      | ✓         |           |           |
| <b>Presentation manipulation skills</b>                                                                                                                                                                                      |           |           |           |
| Select the Microsoft PowerPoint™ application from the Microsoft Office Suite using the Start button on the task bar                                                                                                          | ✓         |           |           |
| Select and open the file Slides.pptx from the Documents library                                                                                                                                                              | ✓         |           |           |
| Edit the slide show by entering a subtitle "Academic aids"                                                                                                                                                                   |           | ✓         |           |
| Apply any background colour to the existing slide                                                                                                                                                                            |           |           | ✓         |
| Save your file in PDF format with the file name "Final Slide".pdf in the Documents library                                                                                                                                   |           |           | ✓         |

An assessment rubric (Addendum 4.7, Situational test assessment rubric), a further measurement tool was used to record whether the student could execute the instructions in the situational test. The execution of the situational tests was done under close supervision of fieldworkers (§4.6). They assessed participants and indicated on the rubric with which basic, functional or proficient level could the participant execute the instructions with ease. Rubrics were associated with participants by using the unique assessment number written on it (§4.5.3). Table 4.7 provides an extract of the situational test assessment rubric.

**Table 4.7: Situational test assessment rubric**

|                |
|----------------|
| Assessment no: |
|----------------|

**Assessment Rubric: Situational test**

| <b>Instruction 1: File Management</b>                                                          | <b>Basic literacy</b> | <b>Functional literacy</b> | <b>Proficient literacy</b> |      |
|------------------------------------------------------------------------------------------------|-----------------------|----------------------------|----------------------------|------|
| Computer switched on                                                                           |                       |                            |                            | V117 |
| Used left mouse button to open Documents library on the desktop                                |                       |                            |                            | V118 |
| Used left mouse button and double clicked to open the Research folder within Documents library |                       |                            |                            | V119 |
| Renamed the file "Research 1.docx" to "Research 5.docx"                                        |                       |                            |                            | V120 |
| Closed the file management application                                                         |                       |                            |                            | V121 |
| <b>Instruction 2: Web browsing</b>                                                             | <b>Basic literacy</b> | <b>Functional literacy</b> | <b>Proficient literacy</b> |      |
| Selected Internet Explorer™ browser from the task bar                                          |                       |                            |                            | V122 |
| Entered www.Google.com in the tab section                                                      |                       |                            |                            | V123 |
| Executed search with hits containing "Michael Jackson" and "Elizabeth Taylor" only             |                       |                            |                            | V124 |
| Minimised the Internet Explorer™ program                                                       |                       |                            |                            | V125 |

Before I decided on the need for contriving an e-readiness skills assessment, I scrutinised whether or not suitable tests already existed (Cohen *et al.*, 2011:479) that could be wholly or partially used (Cresswell, 2012:157), or that some of the required information are available from other sources. During this venture I located several e-readiness surveys and assessments. SmarterMeasure™ (2014:online) is a learning readiness indicator that assesses learning styles, individual attributes, life factors and on-screen reading and recall rate. It is designed to inform students of their strengths and opportunities for growth in areas

related to online, hybrid and technology rich courses. The iSkills assessment from ETS Higher Education Solutions (2014:online) tests mainly digital and information skills. Equally important, it considers participants' study habits and selfdiscipline, lifestyle and their goals and training experiences. Feedback and permission to use ETS Higher Education Solution's tests are provided in Addendum 4.8, ETS Higher Education skills feedback. The student Online Readiness Tool from the University of Georgia, USA (Board of Regents University of Georgia., 2003:online) is an online e-readiness assessment tool that measure students' readiness to learn online. In addition Huang *et al.* (2004:370) created an e-readiness assessment tool that is regularly used by the Asia Pacific Economic Operation.

Van Antwerpen (2013:169) indicated that administrative employees skills were assessed using a performance-based assessment. Its focus was to determine a true reflection of administrative employees' basic computer skills. Even though the focus and academic intention of the recorded tests were slightly different from my envisioned skills assessments, I adopted and adapted content from two existing tests. The performance-based assessment of Van Antwerpen was adapted into the e-readiness situational skills assessment. Section one from the e-readiness skill section of the SmarterMeasure™ learning readiness indicator was adapted into the e-literacy skills literacy self-appraisal section of the e-readiness questionnaire. Permission from SmarterMeasure™ to use their basic questionnaire is available in Addendum 4.9, SmarterMeasure™ permission.

Both the e-readiness questionnaire and the situational skills assessments were piloted (Brancato *et al.*, 2006:xi; Cohen *et al.*, 2011:492) using a small group of experts (Brancato *et al.*, 2006:87). They examined the items in the test for its suitability, relevance, possible cultural biases and potential sources of invalidity (§4.8).

In order to collect analogous data and to improve the validity of collected data, the e-readiness questionnaire was utilised in both the pre- and post-test for both the control and experimental groups.

This section contained a description of the conceptualisation and operationalisation of the questionnaire and situational test. It furthermore justified the adoption and adaption of an existing measuring instrument. The focus group interview and data collection strategies are discussed in the subsequent sections.

#### **4.5.4.2 Focus group interview**

Group dynamics in focus groups (Babbie, 2013:349) bring out better understandings of assessment of problems, concerns, new products, programmes or ideas by interviewing a purposefully sampled group of people rather than each person individually. McMillan and Schumacher (2001:455) claim that “by creating a social environment in which group members are stimulated by the perceptions and ideas of each other, one can increase the quality and richness of data through a more efficient strategy than one-on-one interviewing.”

Taking the advantages and disadvantages (Babbie, 2013:349-350; Bryman *et al.*, 2014:238) of focus groups into consideration, I selected it as a confirmatory procedure. There are different approaches to moderating focus group (Bryman *et al.*, 2014:234) sessions. Most strategies lie between an open-ended approach with just one of two very general questions to stimulate discussion and a more structured approach. I followed a more structured approach and organised a private, comfortable environment to engage participants in a guided discussion. The subject of discussion was steered by secondary research objective five (§1.4), the relevance of the e-readiness intervention. A topic Agenda (Bryman *et al.*, 2014:235) was created (Addendum 4.13, focus group Agenda) to guide the focus group session and to allow latitude for discussion and embraced:

- Relevance of e-literacy skills today.
- What did the e-literacy training bestow upon you?
- Did the experimental group experience a difference in basic computer skills between the pre-test (day one) and the post-test (day three)?
- Did the control group experience a difference in basic computer skills between the pre-test (day one) and the post-test (day four)?
- What is your feeling about the necessity of e-skills training at school level?
- Can you suggest/identify a topic to improve the current e-readiness intervention?

Furthermore, the interview was managed against the ethical checklist of Merriam (2009:233). Informed consent forms explaining risk assessment, confidentiality, data access and ownership were signed by participants. After the interview had been recorded live and transcribed, the correctness of the transcribed interview was peer reviewed (Merriam, 2009:220) by an external mediator.

#### **4.5.5 Data collection**

##### **4.5.5.1 Quantitative data collection strategy**

Data collection (De Vos & Fouche, 1998:90; White, 2005:127) is a series of interrelated activities aimed to gather information and to answer research questions. A two group pre- and post-test design (Cresswell, 2012:311; De Vos & Fouche, 1998:131) was implemented for data collection (§4.5.1). Voluntary participants from the population were assigned into either a Control or Experimental group using systematic random sampling (§4.5.3). Participants in the Experimental group endured the e-readiness intervention whilst participants in the Control group were not subjected to the intervention. Table 4.8, on the next page, reports the pre- and post-test design including the intervention opportunities for the Control and Experimental groups.

**Table 4.8: Intervention pre- and post-test design for Control and Experimental groups**

| Group                  | Qualification | Pre-test    | Intervention | Post-test   |
|------------------------|---------------|-------------|--------------|-------------|
| Experimental group (E) | A             | Group 1 (E) | X            | Group 1 (E) |
|                        | B             | Group 3 (E) | X            | Group 3 (E) |
| Control group (C)      | A             | Group 2 (C) |              | Group 2 (C) |
|                        | B             | Group 4 (C) |              | Group 4 (C) |

To meet the primary and secondary research objectives of this study (§1.4) and to answer the fundamental research question (§1.1), I performed a baseline evaluation of the research problem. De Vos and Fouche (1998:141) assert that a baseline evaluation is similar to a single system design and denotes the study of a single subject. By doing so I enhanced the internal validity (Vermeulen, 1998:44) of the collected data. All participants in both the Control and Experimental groups completed the baseline evaluation of their e-literacy skills by means of the pre-test (De Vos & Fouche, 1998:141). This criterion referenced test (Cresswell, 2012:152) referred to as the e-readiness questionnaire (§4.5.4.1) assembled quantitative and qualitative data. Nominal data measurement scale (Cohen *et al.*, 2011:605) was applied to cluster participants' biographical data into categories such as province (items V1- V6), area (items V7- V9), gender (items V10-V11), and age (items V12–V16). Items V17–V18 determined whether participants had done the subject Computer Applications Technology (CAT) in high school, whilst V19– V34 collected data about the availability of electronic devices, Internet connectivity and social networking practices. These types of data were necessary to draw correlations between participants' different surroundings, occupation levels and digital divide concerns.

In the self-appraisal section (items V35–V116), participants judged their own e-literacy skills in eleven construct elements as presented in Table 4.9. A 4-point Likert (Du Plooy, 2009:142) ordinal measurement scale (Cohen *et al.*, 2011:605), ranking from 1=fully agree, 2=somewhat agree, 3=somewhat disagree to 4=totally disagree, pinpointed respondents inputs.

**Table 4.9: Self-appraisal (V35-V116) constructs**

| Constructs                   | Variable items |
|------------------------------|----------------|
| Getting started              | V35-V40        |
| Navigation capabilities      | V42-V47        |
| File management capabilities | V48-V54        |
| Web browsing capabilities    | V56-V61        |
| E-mail                       | V63-V70        |
| Software capabilities        | V72-V78        |
| Hardware operations          | V80-V83        |
| Word processing skills       | V85-V94        |
| Spreadsheet capabilities     | V96-V102       |
| Presentation capabilities    | V104-V111      |
| PDF files                    | V113-V115      |

The declared constructs corresponded with the learning units listed in the e-readiness toolkit (§3.2), and will be discussed according to this classification during data analyses (§4.5.6.1) and empirical findings in Chapter 5 (§5.2, §5.3 and §5.4).

A supplementary objective situational hands-on test confirmed whether participants retained the listed skills in: (i) File management skills (items V117-V121; (ii) Web browsing capabilities (items V122-V125);

(iii) Word processing skills (items V126-V131); (iv) Spreadsheet skills (items V132-V136) and (v) Presentation skills (items V137-V141) using a 3-point ratio scale (Cohen *et al.*, 2011:605; Field, 2009:9) where 1=basic skills, 2=functional skills and 3=proficient skills. Retained e-literacy skills were scripted (items V117–V141) on an accompanying assessment rubric (§4.5.4.1).

The completion of the pre- and post-tests were executed in computer laboratories situated on the Pretoria West campus of the TUT. The laboratories were rooms 30-135 and 30-3105 on the TUT campus. Since each laboratory could accommodate fifty students only, the data collection process had to be repeated twice due to the four group scenario as explained in §4.5.3. It was essential that the researcher plan the timing of the tests appropriately. Experimental procedures are prone to problems of timing: too soon and the effect may not be noticed, too late and the effect might have gone or been submerged by other matters. The pre-test must be conducted as close to the start of the intervention as possible, to avoid the influence of confounding effects between the pre-test and the start of the intervention. Cohen *et al.* (2011:328) claim that the post-test should be as close as possible to the end of the intervention. Table 4.10 represents the time schedule for completing the data collection and intervention of four groups.

**Table 4.10: Time schedule for data collection and intervention**

| Date                         | Times         | Activity                                                                                                      | Venues                |
|------------------------------|---------------|---------------------------------------------------------------------------------------------------------------|-----------------------|
| 20 January 2015<br>Tuesday   | 09:00 – 14:00 | Split of OMT students into control and experimental groups<br>OMT Control group to write pre-test immediately | 31 - 114<br>30 - 3105 |
| 20 January 2015<br>Tuesday   | 11:00 – 14:00 | Split of CCM students into control and experimental groups<br>CCM Control group to write pre-test immediately | 31 - 114<br>30 - 135  |
| 21 January 2015<br>Wednesday | 09:00 – 14:00 | OMT Experimental group write pre-test<br>Start training immediately                                           | 30 - 135              |
| 21 January 2015<br>Wednesday | 09:00 – 14:00 | CCM Experimental group write pre-test<br>Start training immediately                                           | 30 - 3105             |
| 22 January 2015<br>Thursday  | 09:00 – 14:00 | OMT Experimental group training<br>OMT Experimental group write post-test                                     | 30 - 135              |
| 22 January 2015<br>Thursday  | 09:00 – 14:00 | CCM Experimental group training<br>CCM Experimental group write post-test                                     | 30 - 3105             |
| 23 January 2015<br>Friday    | 09:00 – 14:00 | OMT Control group write post-test<br>OMT Control group training                                               | 30 - 135              |
| 23 January 2015<br>Friday    | 09:00 – 14:00 | CCM Control group write post-test<br>CCM Control group training                                               | 30 - 3105             |
| 26 January 2015<br>Monday    | 09:00 – 14:00 | OMT Control group training                                                                                    | 30 - 135              |
| 26 January 2015<br>Monday    | 09:00 – 14:00 | CCM Control group training                                                                                    | 30 - 3105             |

Immediately after all participants in the Experimental groups for both qualifications wrote the pre-test the e-readiness intervention started. The moment the e-readiness intervention was completed, the post-test namely the e-readiness questionnaire and situational test, was completed by the same participants in the Experimental groups in both qualifications. Three days lapsed between the pre- and post-test for the Control group. Tracking of participants, to determine whether they wrote both the pre- and post-test, was regulated by the unique assessment number issued to them (§4.5.3). The Control group were not subjected to the intervention but received the same training after the experimental procedure.

#### 4.5.5.2 Qualitative data collection

As a consequence of secondary research objective five (§1.4), the question: Was the e-readiness toolkit meaningful to novice TUT students? was addressed by collecting qualitative data by means of a focus group interview and open-ended (Bryman *et al.*, 2014:199) questions. Open-ended questions at the end of each construct in both the pre- and post-test (V's 41, 45, 55, 62, 71, 79, 84, 95, 103, 112 and 116 collected data on e-literacy skills requirements whilst the focus group interview collected data around the necessity of the e-readiness intervention. Bryman *et al.* (2014:233) mention that through focus groups, a researcher can study how participants collectively make sense of a phenomenon and construct meanings around it. Merriam (2009:94) contends that the aim of a focus group interview should be to get the perspectives of those being studied, so the approach should not be intrusive and overly structured. This is consistent with the key perspective of symbolic interactionism that: understanding social phenomena occurs in interaction and discussion with others.

Cohen *et al.* (2011:437) mention that sampling is a major key to the success of focus groups and suggest that a researcher should take extreme care so that every participant is the bearer of the particular characteristic required, or that the group has homogeneity of background in the required area, otherwise the discussion will lose focus or become unrepresentative. Although focus groups interviews usually require a wide range of different participants, I used purposeful sampling (McMillan & Schumacher, 2001:433; Merriam, 2009:94) for the reason that participants were organised into separate groups in terms of stratifying criteria such as the Control and Experimental groups and such as CCM and OMT qualifications. It was important to get a balance of participants from the Control and Experimental groups, and to get each one's account of what they perceived to be important of the e-readiness intervention. I interviewed six participants. To ensure anonymity, each person in the focus group interview received a number, for instance C1, C2 or E1, E2. The analysis of qualitative data is ultimately discussed in §4.5.6.2.

#### 4.5.6 Data analysis

##### 4.5.6.1 Quantitative data

There are two basic methods to express the results of quantitative analysis that is numerical and graphical. Using the numerical approach, you compute statistics such as the mean and standard deviation, whilst when using the graphical approach you create a stem and leaf display, graphs or box plots (Bryman *et al.*, 2014:320). Cresswell (2012:183) states that descriptive statistics help to summarise trends and tendencies, and also provide an understanding of how varied scores might be. In addition they give insight into where one score stands in comparison with others. Descriptive statistics (§5.2) such as frequency distribution were conducted to describe the numerical data analysed and interpreted from the demographical and self-appraisal sections, as well as the situational test of the e-readiness questionnaire. It included frequencies, measures of central tendencies (means, modes, medians)

standard deviations (Brase & Brase, 2010:37, 84) and dependent t-tests (Cohen *et al.*, 2011:642). Bar graphs (Cresswell, 2012:197) were used to substantiate interpreted data.

In addition to the descriptive statistics, techniques, such as two-way analysis of variance (ANOVA) and two-way analysis of covariance (ANCOVA) techniques based on the distribution of the descriptive statistics were used to perform inferential analysis (§5.4). The two-way ANOVA not only assessed whether the means of two groups (Experimental and Control) were statistically different from each other, but also examined the interaction effects of different qualifications and group on each other (Cohen *et al.*, 2011:649). In order to test the hypotheses about the resemblance of the groups, a two-way ANCOVA was used to account for pre-test scores as covariates. Field (2009:396) mentions that there may be some variables in an experiment that can confound its results; therefore, if any variables are known to influence the dependent variable being measured, ANCOVA is the ideal test to remove bias of variables.

In this study hypotheses testing was done to determine whether the null or the alternative hypothesis (§1.5.2.1) is correct. The null hypothesis is always used for testing. It is important to note that the null hypotheses:  $H_{01}$ : there is no statistically significant effect in Control groups between the pre- and post-test of e-literacy skills;  $H_{02}$ : there is no statistically significant effect in Experimental groups between the pre- and post-test of e-literacy skills, and alternative hypotheses of this study indicates:  $H_{A1}$ : there is a statistically significant effect in Control groups between the pre- and post-test of e-literacy skills;  $H_{A2}$ : there is a statistically significant effect in Experimental groups between the pre- and post-test of e-literacy skills. The significance level (Berenson *et al.*, 2012:359; Cresswell, 2012:188; Field, 2009:52) is a critical probability in choosing between the null hypothesis and the alternative hypothesis. The 5% level of significance  $p < 0.05$ , type I error, is the probability of rejecting the null hypothesis when it is true (Berenson *et al.*, 2012:381).

In addition, Berenson *et al.* (2012:385) claim that a researcher needs to make a distinction between the existence of a statistically significant result and its practical significance (Cresswell, 2012:188) in a field of application. I determined the practical significance of the experimental manipulation by way of determining effect sizes. A natural way to comment on practical significance is to use the standardised difference between the means of two populations, i.e. the difference between the two means divided by the estimate for standard deviation. Practical significance can be understood as a large enough difference to have an effect in practice. Field (2009:56) contends that effect sizes are a way of quantifying the differences between two groups. In this study Experimental groups were subjected to treatment, whilst the Control groups did not get any treatment; therefore it was important to know whether the relationship between two variables was practically significant. Cohen *et al.* (2011:616-617) state that effect size measure the effectiveness of treatments and proposed scales for the interpretation of effect sizes measured as: (i) small effect  $= d \leq 0.4$ ; (ii) medium effect  $= 0.4 \leq d \leq 0.8$  and (iii) large effect  $= d \geq 0.8$ . I considered data with  $d \geq 0.8$  as practically significant. This result indicated differences that had a large effect.

Data reduction and analysis started by editing raw data. According to Cohen *et al.* (2011:407), editing of questionnaires is intended to identify and eliminate errors made by respondents and serves to inspect questionnaires for completeness, accuracy and uniformity. Forty two (42) questionnaires in the Experimental group were suitable for analysis §5.1 whilst in the Control group forty four (44) questionnaires were usable. A unique assessment number was allocated per participant as connection point to combine the pre- and post-tests. Twenty two questionnaires could not be used due to unmatched pre- and post-tests. The next step was to score the data, to create a codebook (Cresswell, 2012:175) and to enter the raw data contained in the questionnaires into a Microsoft Excel™ spreadsheet (Addendum 5.1, Raw data set). The coding process is dictated by the way a variable was measured (measuring scale) in the research instrument, and the way the findings about variables are to be communicated. In this study different measuring scales (Cresswell, 2012:176) were used to measure participants' perceptions and participants' e-literacy skills application. The different measurements and the application thereof were applied as follows:

- Perceptions were measured using ordinal measurement scale where the 4-point Likert scale indicated 1=totally agree (good) and 4=totally disagree (bad). Interpreted and analysed data are observed in §5.4.1.
- Tangible e-literacy skill applications were measured using ratio data measurement scale where the 3-point Likert scale indicated 1=basic skills (bad) and 3=proficient skills (good). Analysed data for this comparison are described in §5.4.3.
- With reference to the comparison between perceptions and e-literacy skills application, the 3-point Likert scale 1=bad and 3=good consumed to measure application, was transformed and reversed score so that 1=good and 4=bad for comparison purposes with perception. Analysed data relevant to this breakdown are described in §5.4.2.

At the empirical findings, I first described the perceptions of students on their e-literacy skill abilities before and after the intervention; thereafter explanations on the application of e-literacy skills before and after the intervention. The associations were done considering two factors:

- Factor One: Control/Experimental groups
  - Factor Two: OMT/CCM courses
- Control/Experimental groups \* OMT/CCM courses (four-group interaction).

#### **4.5.6.2 Qualitative data**

A general strategy of qualitative data analysis refers to the framework that guides the data analysis process embracing the analytic induction, grounded theory and thematic analysis processes. Teddlie and Tashakkori (2009:25) describe the inductive thematic analyses as “the process that involves the discovering of patterns, themes and categories in a researcher’s data,” a bottom-up method, while Bryman *et al.* (2014:351) and (McMillan & Schumacher, 2001:462) describe the deductive thematic method as “a top-down method and is informed by the researcher’s theoretical framework.”

In this analysis, I applied the thematic qualitative data analysis technique, and compared my analysis against the checklist of Braun and Clarke (cited by Bryman *et al.*, 2014:351):

- I summarised open-ended records probed at the end of each unit in both the pre- and post-test, in an Excel spreadsheet (Addendum 6.1, Atlas PhD qualitative data).
- I recorded the focus group interview live, transcribed it (Addendum 6.1, Atlas PhD qualitative data) and it was peer reviewed (Merriam, 2009:220).
- I integrated the open-ended questions and the transcribed focus group interview as primary documents in a Hermeneutic unit in Atlas.ti<sup>TM</sup> (Addendum 6.1, Atlas PhD qualitative data).
- I searched and categorised themes for organising and conceptualising data. Dey (1993:117) declares that categorising is a crucial element in the process of analysis. Developing codes usually involves looking forwards towards the overall results of the analysis as well as looking backwards towards the data.
- I coded interesting features of the data in a systematic fashion across the data set by marking data relevant to each code. Qualitative data are unstructured, and in categorising unstructured data, inconsistencies and overlaps are unavoidable. Codes are legal statutes arranged to avoid inconsistency and overlapping during analyses, and are symbols used for brevity in the place of ordinary language. Dey (1993:60) affirms coding as a term for replacing full category names by brief symbols.
- I reviewed themes and codes.
- I produced a qualitative data analysis findings report in Chapter Six (§6.2 - §6.6).

Open-ended quiz data from 86 participants and comments from six focus group interviewees generated twelve codes. These codes were grouped into three categories and ultimately six families. This process helped me to map out needs, thoughts, perceptions and experiences of participants.

Figure 4.5 on the next page indicates how families, categories and codes that informed the basis for organising and conceptualising (Dey, 1993:3) the qualitative data analyses, developed.

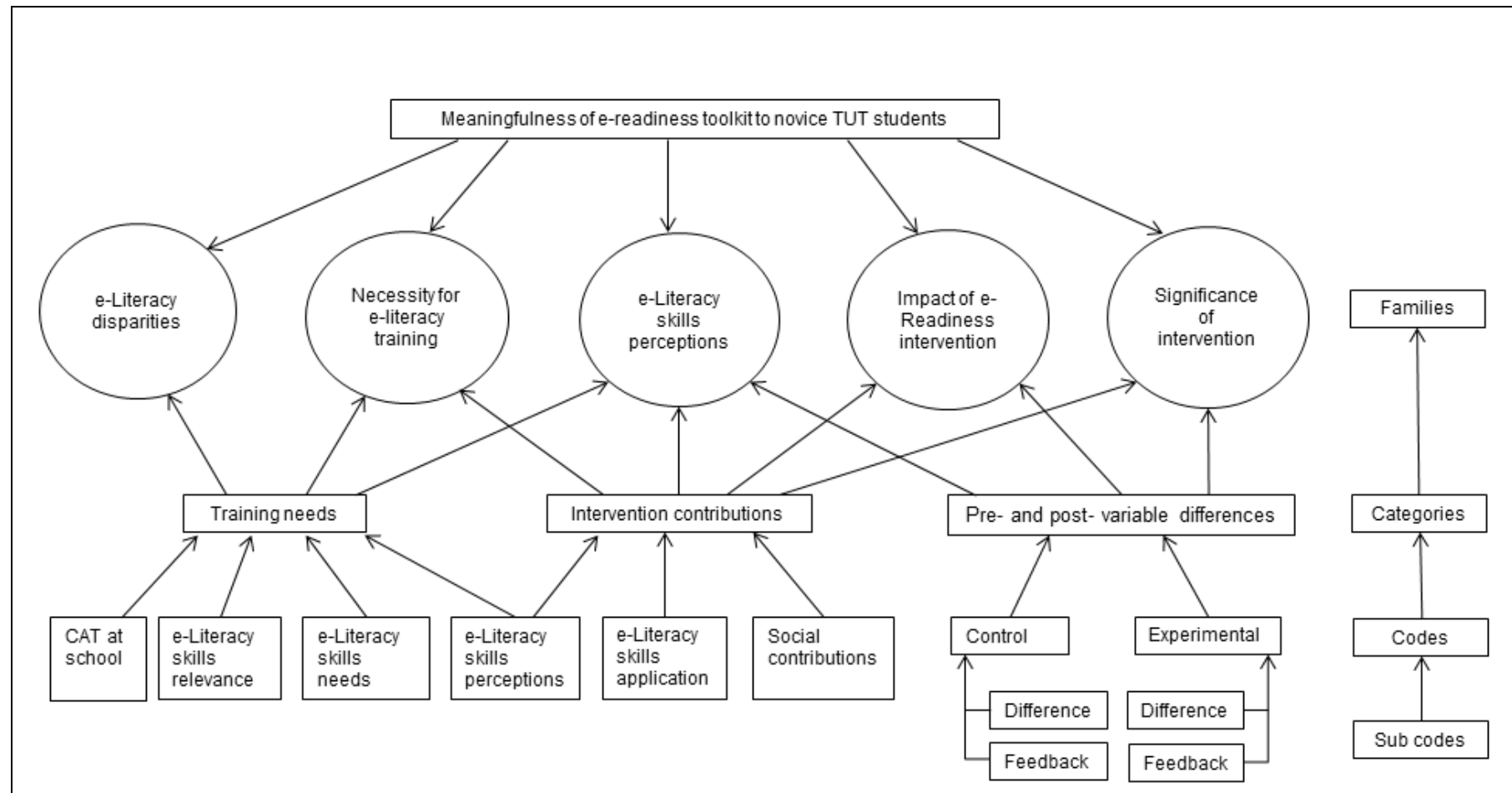


**Figure 4.5:** Families, categories and codes depicted in qualitative data analysis

#### **4.6 Field workers**

Three field workers were appointed to assist the researcher with data collection. The academic qualifications of two of the fieldworkers were a BTech in Office Management and Technology, and the third worker had a BTech in Business Administration. Both qualifications pitch at NQF Level 7. Subjects such as Research Methodology, Computer Operating III as well as Information Administration IV provided sufficient credentials for them to operate as field workers mainly because they had the necessary e-learning, e-literacy, computer and software application skills.

Responsibilities of field workers during data collection were that they had to:

- Assist with systematic random selection of voluntary participants into Experimental and Control groups
- Assign a unique assessment numbers to each participant
- Distribute Information leaflet and Informed consent letter
- Distribute data collection instruments
- Execute the situational test for both pre- and post-tests
- Complete the situational test assessment rubrics.

Not only did the utilisation of field workers prevent researcher bias but helped me to complete the data collection tasks in time especially the situational tests' assessments, since these required individual attention. A confidentiality agreement (Addendum 4.10, Confidentiality agreement fieldworkers) was signed between the researcher and fieldworkers. Issues like the anonymity of participants, disclosure of collected data and their trustworthiness were itemised in the agreement. Important matters such as their availability and duties during the data collection practice were stipulated too. Ethical clearance to employ the field workers was granted to the researcher by the Central Ethics Committee of TUT (Addendum 4.11, Field worker ethical clearance).

#### **4.7 Ethical aspects of the research**

Anyone involved in social science research needs to be aware of the general agreements shared by researchers about what is proper and improper in the conduct of scientific inquiry. Research ethics are important as there have been many cases of abuse of people's rights in the quest of social research. While researchers have the privilege to search for truth and knowledge, it should never be at the expense of individuals (Cresswell, 2012:148, 169) in society. Hoffmann (2012) and Babbie (2013:43) assert that Research Ethics emphasise on the humane and sensitive treatment of research participants. Although an ethical code is recognised throughout the world, a South African ethical research code is suggested by The Human Sciences Research Council (HSRC) (Human Sciences Research Council, s.a.:online). This code advocates researchers to uphold and respect the principles of: transparency; respect and protection; scientific and academic professionalism as well as accountability. At TUT, the Central Research and Innovation Committee (CRIC) mandates Faculty Research Ethics Committees (FREC) to review research projects proposed by students and staff according to standard operating procedures and

guidelines (Tshwane University of Technology, 2009:online). The purpose of such ethics reviews and monitoring is to protect the dignity, rights, safety, well-being and advancement of all human research participants in their functional environments.

McMillan and Schumacher (2001:422) claim that it is the researcher's responsibility to ensure that his research is conducted ethically. To adhere to standard procedures both, the e-readiness questionnaire and situational test were submitted for ethical clearance to both the North-West University (Addendum 1.2, NWU ethical approval) as well as the Tshwane University of Technology's Ethical Committees (Addendum 1.1, TUT ethical approval). Permission was granted for the deployment of the following documents: Information leaflet and Informed consent (Addendum 4.12, Information leaflet and Informed consent); e-readiness questionnaire and situational test (Addendum 4.4, e-Readiness questionnaire); assessment rubric (Addendum 4.7, Situational test assessment rubric) as well as the use of field workers (Addendum 4.11, Field worker ethical clearance). The information leaflet explained issues like: what was the study about; what was required from you as participant; exclusion conditions; the rights of participants; the division of either being separated into a Control or Experimental group; anonymity as well as the confidentiality of collected information.

The following measures guided the planning and conduction of the study to ensure that the rights and welfare of each participant was protected, and that nobody was harmed or hurt in any way during the research:

- The study adhered to the ethical considerations from the North-West University's Ethical Committee.
- Measuring instruments and permission to use undergraduate students in the department OMT were submitted to and approved by the Central Research Ethics forum of TUT.
- Participants were informed, in conversation and by means of an information letter, about the nature and intention of the study, and what their involvement would be.
- In all cases participants agreed, participated voluntarily and were willing to be divided into either a Control or an Experimental group.
- Informed consent forms were completed in duplicate, and the participant as well as the researcher each kept a copy.
- I ensured students of their anonymity (Cohen *et al.*, 2011:92), that they were free to speak their minds, and that their participation in the study would in no way be used to victimise anybody because he or she refused to participate in the study.
- All participants were treated with respect and maintained the right to withdraw from the research at any given point.
- I was transparent during the entire research process and was cautious not to influence the data from my own point of view.
- Sensitive or controversial issues were treated with the necessary discretion and without sacrificing the validity or reliability of the data obtained during data collection.

## 4.8 Strategies for enhancing the validity and reliability of quantitative data

One way to ensure that measurement error is kept to a minimum is to determine the properties of the measure that assure a researcher that his inquiry findings are accurate and meticulous. The first property is validity: Did the instrument actually measure what it was set out to measure? The second property is reliability: Can the instrument be interpreted consistently across different situations? I applied innumerable validity and reliability strategies to enhance the fidelity of this study, and they are recorded below.

### 4.8.1 Validity

Henning, Van Rensburg, and Smit (2004:148) state that “validation depends on good craftsmanship in an investigation, which includes continuous checking, continuous questioning as well as the precise theoretical interpretation the research findings.” For White (2005:193), validity signifies that the researcher’s conclusions, true or correct, should correspond to the actual state in reality. Cresswell (2012:303) classifies four threats to validity. These are *statistical conclusion* validity that means the appropriate use of statistics is vital. Secondly, *construct* validity, the degree to which it measures the intended construct rather than irrelevant constructs. *Internal* validity refers to the inferences drawn about the cause and effect relationship between the independent and dependent variables. Lastly, *external* validity concerns the cause-and-effect relationship being generalised to other settings, treatment variables, persons and measures.

Bryman *et al.* (2014:102), De Vos *et al.* (2012:153) and Babbie (2013:279) claim that the internal validity of a study can be maximised as soon as a researcher makes use of experiments. According to Babbie (2013:282) problems of internal validity are avoided through the careful administration of a controlled experimental design with a clear specification of independent and dependent variables. In this study the classical experimental design was selected to evaluate how well my methodology choice met the primary objective, answered the research question and validated the hypotheses of this study. For the successful execution of the experiment I applied systematic random sampling. Cohen *et al.* (2011:317) state that randomisation ensures a greater likelihood of equivalence, i.e. the apportioning out of any other factors or characteristics of subjects which might conceivably affect the experimental variables between the Experimental and Control groups. In addition, this prevented researcher bias and gave participants an equal opportunity of being selected. Greater control was achieved in the experiment by way of having a control and an experimental group (De Vos *et al.*, 2012:155). I minimised instrumentation (Cresswell, 2012:309) threats by using the same measuring instrument in the pre- and post-test, and proclaiming the same standard procedures during the experiment. Moreover, to attain face validity (Dey, 1993:263), I rooted annotated concepts and connections from the qualitative data analysis to the empirical base.

#### 4.8.2 Reliability

Bryman *et al.* (2014:36) maintain that reliability refers to the consistency of a measure of a concept and three factors such as stability, internal reliability and inter-observer consistency contributes to measure reliability. Babbie (2013:145) defines stability as “that quality of a measurement method that suggests that the same data would have been collected each time in repeated observations of the same phenomenon.” Similarly, Welman *et al.* (2005:145) and White (2005:200) claim that reliability relates to the stability, consistency and repeatability of research.

It was useful to measure the reliability of my data collection instrument so that interpretations based on current and future use of the instrument can be made with confidence. Therefore assessing an indicator accurately was important because it revealed differences or variances between different groups or cases. Cronbach’s alpha is a more traditional measurement scale of the internal consistency of an instrument and is based on the average correlation among the items on a scale. Cohen *et al.* (2011:640) proposed guidelines to measure the reliability of items namely: >0.90 very high reliability; 0.80 – 0.90 high reliability; 0.70 – 0.79 reliable; 0.60 – 0.69 minimal reliability and <0.60 low reliability. Cohen’s kappa (Bryman *et al.*, 2014:260) gives researchers an indication of how well the different items complement each other in their measurement of different aspects of the same variable or quality. The reliability (Cresswell, 2012:159) of the e-readiness questionnaire was attested to by means of Cronbach alpha ( $\alpha$ ) and inter-item correlations (§5.3).

Further than what was mentioned above, I improved validity and reliability by means of:

- Explaining the researcher’s role (Bryman *et al.*, 2014:12; McMillan & Schumacher, 2001:415) by means of my epistemological position as researcher and by declaring my biases related to the data collection and analysis.
- Methodological triangulation (McMillan & Schumacher, 2001:409; Merriam, 2009:222; Welman *et al.*, 2005:143) which refers to the use of multiple methods and multiple sources of data to study a single problem. Data obtained from both the quantitative and qualitative methods regarding the e-literacy skill levels of novice students were manifested to provide a more comprehensive understanding of the phenomenon.
- Cohen *et al.* (2011:482) assert that to ensure validity in a test, it is essential that the objectives of the test are addressed and that it should represent the intended learning outcomes. The operationalisation of the independent variable into the situational test endorsed construct (Welman *et al.*, 2005:115; White, 2005:197) validity.
- The e-readiness questionnaire and situational test were piloted and judged by other experts confirming expert-jury validity (Du Plooy, 2009:136).
- The covariate (the pre-test) was statistically controlled by the researcher (Cresswell, 2012:309).
- Criterion related validity (Du Plooy, 2009:136) as well as parallel forms reliability (Welman *et al.*, 2005:146) came into play when pre-tests were measured against post-tests.

- The transcribed focus group interview was peer reviewed (Merriam, 2009:220) by an external mediator (§4.5.4.2).
- All Addenda applicable to this study are available in electronic format on CD-ROM. The CD-ROM is attached at the back of this dissertation.

#### **4.9 Methodological limitations**

Methodological limitations the researcher faced were:

- Permissible sample error
- Data contamination
- Participant factors
- Intervention factors
- Situational factors
- Nuisance variables.

As per first bullet point, the accuracy from which the sample was drawn, the level of confidence and the permissible sample error (Cresswell, 2012:146; Du Plooy, 2009:112) tolerated were concerns for the researcher, because not all voluntary participants returned for the post-test. Following bullet point two, contamination in the data might have occurred due to computer resource constraints. Computer laboratories accommodated a maximum of fifty persons per session, therefore the pre and post-tests were written over a period of two days in order to accommodate the four sessions. Extraneous variables such as participant, intervention and situational factors may well indicate experimental error (Cohen *et al.*, 2011:317), mainly because the important characteristics of participants between the Control and Experimental groups were different. In addition, the intervention might not have been exactly the same for all participants especially when it came to variations in sequences, the duration and content of the intervention, practices and the assistance provided by the fieldworkers. A matter of great concern was the fact that one fieldworker took longer tea breaks than was permissible. As per last bullet, the researcher determined the speculated effect of nuisance variables (Welman *et al.*, 2005:88) by doing a qualitative systematic literature review; therefore nuisance variables documented in earlier research findings were identified and controlled.

#### **4.10 Chapter summary**

In this chapter I clarified my research philosophy and identified the research design and methodology of this study. I described the conceptual framework and explained the research approach that was followed to execute the study.

The explanatory concurrent (Leech & Onwuegbuzie, 2009:271) and parallel mixed methods design (Cresswell, 2012:542) that combined elements of both quantitative and qualitative orientations across parallel and chronological phases in the study (Creswell, 2003:18; Teddlie & Tashakkori, 2009:138, 153-

155) was justified. The reason why I chose this approach was to test the intellectual conundrum in more than one way and to increase the reliability and validity of the literature review, data collections, observations and analyses.

Various steps in the research process were discussed, focusing on the population and systematic random sampling. I also described the process of questionnaire and testing developments. Amongst the procedures that were followed to collect the primary data and to capture and process the raw data, I correspondingly described how the data were analysed quantitatively and qualitatively.

This chapter concluded with the steps that were taken to ensure the validity of the research, incorporating the event of methodological limitations. Reliability of the e-readiness questionnaire was discussed. Steps and procedures that were followed to protect the ethical rights of the participants were declared.

Chapter Five presents the analysed statistics and interpreted findings of the empirical research.

## **CHAPTER 5: EMPIRICAL FINDINGS**

- 5.1 Introduction
  - 5.2 Descriptive statistics
    - 5.2.1 Provinces and dwelling areas
    - 5.2.2 Age and gender
    - 5.2.3 Computer Applications Technology subject
    - 5.2.4 Electronic devices
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    - 5.2.6 Descriptive statistics about participants' e-literacy skills application capabilities from the situational test at initiation
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    - 5.4.1 Group comparisons before the intervention
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      - 5.4.2.1 Participants perceptions about their e-literacy skill capabilities between the pre- and post-test in the Control group of CCM
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      - 5.4.2.3 Participants perceptions about their e-literacy skill capabilities between the pre- and post-test in the Control group of OMT
      - 5.4.2.4 Participants perceptions about their e-literacy skill capabilities between the pre- and post-test in the Experimental group of OMT
      - 5.4.2.5 Participants' tangible e-literacy skills application between the pre- and post-test for Control and Experimental groups of CCM
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## **CHAPTER 5: EMPIRICAL FINDINGS (CONTINUE)**

- 5.4.2.6 Participants' tangible e-literacy skills applications between the pre- and post-test in the Control and Experimental groups for OMT
  - 5.4.2.7 Participants' perceptions about their e-literacy skill capabilities compared with their tangible e-literacy skills application before the intervention within the Control and Experimental group for CCM and OMT
  - 5.4.2.8 Participants' perceptions about their e-skills capabilities before the intervention between the Control and Experimental controlling for their e-literacy skills capabilities after the intervention
  - 5.4.3 Group comparisons after the intervention
  - 5.4.3.1 Participants' perceptions about their e-literacy skills capabilities after the intervention
  - 5.4.3.2 Participants' application of their e-literacy skills after the intervention
  - 5.5 Chapter summary
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# CHAPTER 5

## EMPIRICAL FINDINGS

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### 5.1 Introduction

In the previous chapter I gave a notional explanation of the parallel mixed method approach used as basis to execute the study. Being consistent with the methodology of a positivist framework (Cohen *et al.*, 2011:604), this design complemented my pragmatist and naturalist epistemic philosophy in life and in social sciences. I explained the classical experiment and justified the construction of my data collection instruments. Amongst the various steps and procedures followed to employ systematic random sampling to the designated population, I described the data collection process as well as the capturing and processing of the raw data. I correspondingly described how quantitative and qualitative data were analysed and examined, together with population and sample sizes.

In this chapter the findings obtained from the quantitative collection (§4.5.4.1 and §4.5.5.1), as well as analysis (§4.5.6.1) of the data as generated from the e-readiness questionnaire and situational test, are presented and discussed. This discussion is concurrent with secondary research objectives three and four outlined in §1.4, and include descriptive and inferential statistics. Descriptive statistics are available in Addendum 5.2, Descriptive statistics. The reliability of the data collection instrument is discussed in §5.3.

The services of a North West University statistician were used to oversee the statistical methods and software requirements for appropriate capturing and processing of data. Quantitative data were analysed using SPSS<sup>TM</sup> (SPSS Inc., 2015), and included descriptive and inferential statistics. Corty (2007:27) asserts that descriptive statistics involve methods of reducing, organising, picturing and summarising data to a meaningful value in order to describe the characteristics of a sample or a population's observations. All descriptive data were reflected as frequencies (counts) and in proportions (percentages), and were rounded off in all tables (Bryman *et al.*, 2014:318) and graphs. The population  $N=220$  comprised first time entering students in the department OMT. The sample size  $n=108$  (§4.5.3) involved participants from two vocational diplomas (§4.4) namely OMT  $n=83$  and CCM  $n=25$ . Participants within the two qualifications were systematically (Brase & Brase, 2010:15) divided into either a Control or Experimental group (§4.5.3). Only eighty six questionnaires were usable, of which pre- and post-test questionnaires for Control groups were ( $n_6 = 53$ ) and Experimental groups were ( $n_5 = 55$ ). Realised sample sizes according to the diplomas were OMT ( $n_7 = 66$ ) and CCM ( $n_8 = 20$ ).

## 5.2 Descriptive statistics

Descriptive statistics (Cohen *et al.*, 2011:622) on the outcomes of each and every one of the participants' personal demographics, namely province and dwelling areas, gender and age, CAT subject involvement, possession of electronic devices together with their connectivity and social media practices, are presented in §5.2.1 - §5.2.4 as well as Table 5.1. Descriptive statistics are also provided on participants' perceptions about their initial e-literacy skills capabilities, §5.2.5 and Table 5.2, as well as their actual tangible e-literacy skills before the intervention (§5.2.6, Table 5.3). Thereafter, descriptive statistics are provided about participants' perceptions on their final e-skill capabilities (§5.2.7, Table 5.4), in addition to their ultimate application capabilities (§5.2.8, Table 5.5) after the intervention.

**Table 5.1: Descriptive statistics: frequencies and percentages of personal demographics**

| Items  | Topics                     |                        | Frequencies |    | Percentages |    |
|--------|----------------------------|------------------------|-------------|----|-------------|----|
| V1-6   | Province                   | Limpopo                | 29          |    | 34          |    |
|        |                            | North West             | 5           |    | 6           |    |
|        |                            | Kwa-Zulu Natal         | 4           |    | 5           |    |
|        |                            | Gauteng                | 28          |    | 33          |    |
|        |                            | Mpumalanga             | 16          |    | 19          |    |
|        |                            | Eastern Cape           | 3           |    | 4           |    |
|        |                            | Northern Cape          | 1           |    | 1           |    |
| V7-9   | Dwelling areas             | Urban                  | 13          |    | 15          |    |
|        |                            | Semi-urban             | 30          |    | 35          |    |
|        |                            | Rural                  | 43          |    | 50          |    |
| V10-11 | Gender                     | Male                   | 36          |    | 41          |    |
|        |                            | Female                 | 50          |    | 58          |    |
| V12-16 | Year born                  | 1997 (18 Years)        | 8           |    | 9           |    |
|        |                            | 1996 (19 Years)        | 34          |    | 40          |    |
|        |                            | 1995 (20 Years)        | 22          |    | 26          |    |
|        |                            | 1994 (21 Years)        | 15          |    | 17          |    |
|        |                            | Before 1994 (22 years) | 6           |    | 7           |    |
| V17-18 | CAT subject                | Yes                    | 7           |    | 8           |    |
|        |                            | No                     | 79          |    | 92          |    |
|        |                            |                        | Yes         | No | Yes         | No |
| V19-23 | Possess electronic devices | Computer               | 7           | 79 | 8           | 92 |
|        |                            | Laptop                 | 21          | 65 | 24          | 76 |
|        |                            | Cell phone             | 84          | 2  | 98          | 2  |
|        |                            | Tablet                 | 12          | 74 | 14          | 86 |
|        |                            | Kindle                 | 1           | 85 | 1           | 99 |
| V24-28 | Device primary connection  | Dial-up modem          | 13          | 73 | 15          | 85 |
|        |                            | ADSL                   | 1           | 85 | 1           | 99 |
|        |                            | 3G                     | 36          | 50 | 42          | 58 |
|        |                            | Wi-Fi                  | 29          | 57 | 33          | 67 |
|        |                            | Other: Data bundles    | 5           | 81 | 5           | 95 |
| V29-34 | Social networking          | Facebook©              | 77          | 9  | 89          | 11 |
|        |                            | Twitter©               | 17          | 69 | 20          | 80 |
|        |                            | Google+                | 33          | 53 | 38          | 62 |
|        |                            | Flickr                 | 0           | 0  | 0           | 0  |
|        |                            | Linkedin®              | 0           | 0  | 0           | 0  |
|        |                            | Other: Instagram       | 1           | 85 | 1           | 99 |

### 5.2.1 Provinces and dwelling areas

Participants were requested to indicate from which of the nine provinces they originated. Outcomes indicated that the majority of undergraduates (34%) came from Limpopo. Seventy six per cent (76%) of

these pupils<sup>2</sup> were from rural areas, (17%) from semi-urban and (7%) from urban parts of the province. Thirty three per cent (33%) came from Gauteng and (19%) from Mpumalanga. In Gauteng (7%) were from rural areas, (57%) from semi-urban and (36%) from urban areas. For Mpumalanga, (6%) came from an urban area, (25%) from semi-urban and (69%) from rural areas. Six per cent (6%) emanated from North West, (5%) from Kwa-Zulu Natal and (4%) from the Eastern Cape. The majority of the North West participants lived in rural areas. All participants from Kwa-Zulu Natal and the Eastern Cape were located in rural areas. One student came from the Northern Cape. TUT, a University of Technology, is located in Pretoria, Gauteng, and offers higher education for people from neighbouring provinces such as Limpopo, Mpumalanga and North West. Other UoTs such as Durban University of Technology, Nelson Mandela Metropolitan University of Technology and Cape Town University of Technology provide Higher Education for students from the KwaZulu Natal, Eastern and Northern Cape provinces, which is the reason for not finding students from neighbouring provinces.

### **5.2.2 Age and gender**

Two gender groups were represented in the completion of the questionnaire. More females (58%) than males (41%) completed the questionnaire. Forty per cent (40%) of all participants were nineteen years old and nine percent (9%) were eighteen years old. Twenty six per cent (26%) of the participants were twenty years of age whilst (17%) were twenty one and (7%) twenty two years old.

### **5.2.3 Computer Applications Technology subject**

Computers in school programmes are an important segment in our current education system. When participants were asked to indicate how many studied the subject Computer Applications Technology at high school, the result was alarming. Outcomes indicated that only (8%) had taken the subject at school. The high negative figure is a clear indication that basic education in SA is far from what it should be concerning the implementation of technology and technology based subjects. This is in line with a study conducted by Leendertz (2013:126), which indicated that only (13%) of Mathematics teachers had access to computers for teaching and learning. The SA Government sees ICT as an important component to raise standards in schools, especially the e-schools programme, where the use of mobile computer labs at schools with no infrastructure, is important. The government is looking for various ways to achieve its 2014 goal. Although the white paper on education, published in 2003, had as goal making all South African schools ICT capable by 2013, the Minister of Education at that stage, Naledi Pandor, said there was still a long way to go before South Africa's 26 000 public schools would have the necessary infrastructure to give pupils<sup>3</sup> access to computer-based education (South African Information Technology Report., 2012:30). By 2012 merely 25% of schools across SA had computers available for teaching and learning.

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<sup>2</sup> Undergraduate participant

<sup>3</sup> Schoolboy/girl

#### 5.2.4 Electronic devices

Although SA is classified as a middle-income country, it is characterised by a wide range of developmental levels. As a result, the country is one of the world's most inequitable societies with extensive disparities between rich and poverty-stricken people. Table 5.1 provides an indication on the type of electronic devices participants owned, and their everyday connectivity routines. Ninety eight per cent (98%) of the participants had cell phones with popular social networking applications such as WhatsApp. Twenty four per cent (24%) indicated that they had laptops, and eight per cent (8%) owned a desktop computer. Fourteen per cent (14%) owned tablets and nobody possessed a kindle. This means that 76% did not own a laptop and 92% of pupils did not own a desktop computer. Forty two per cent (42%) used 3G connectivity and 33% made use of Wireless broadband. The majority of participants drew on Facebook<sup>®</sup> and Google+ social networking communication platforms.

#### 5.2.5 Descriptive statistics on participants' initial perceptions about their individual e-literacy skills capabilities from the self-appraisal section of the e-readiness questionnaire at initiation

Participants were asked to judge their e-skill capabilities over a spectrum of topics such as: (i) Getting started on a PC, (ii) Basic navigation capabilities, (iii) File management manipulation, (iv) Web browsing capabilities, (v) E-mail skills, (vi) Software and (vii) Hardware operations, as well as (viii) Word processing, (ix) Spreadsheet, (x) Presentation and (xi) PDF capabilities (§4.5.4.1). Refer to §4.5.6.1 for the measurement scale applied in the analyses of perceptions. The outcomes of participants' judgements, as reflected in Table 5.2, indicated that 54% (mean = 3.16) of participants did not know what Tooltips were and 38% (mean = 2.74) did not know Windows Help and Support System. Twenty nine per cent (29%) (mean = 2.35) understood what a pointing device is and could appropriately use the left and right mouse buttons. Even though an important factor of having a computer is to back-up data, and that it is a way to protect the investment you made in your data, 61% (mean = 3.39) of participants emphasised that they were unable to back-up data. At Web browsing capabilities, 67% (mean = 3.54) of participants could not use Boolean operators to perform Internet searches by means of search engines.

With E-mail capabilities, some 54% (mean = 3.28) participants' outcomes indicated that they struggled to create, subscribe and unsubscribe to and from mailing lists, and 59% (mean = 3.34) were unable to send e-mail return receipts. When participants were asked if they could trouble-shoot software problems, 63% (mean = 3.38) indicated that they were unable to do so. At the same time 64% (mean = 3.37) indicated that they could not upgrade hardware components of a computer. Against their Word processing, Spreadsheet and Presentation capabilities, 50% (mean = 3.07) struggled to insert text boxes, 61% (mean = 3.38) could not perform advanced calculations given that they do not know the appropriate formulas, and 62% (mean = 3.35) could not enhance slide shows by means of time intervals.

The cross platform use of PDF offers paramount document and digital signature options to businesses and individuals, especially in the 21<sup>st</sup> century where information is shared over networks, intranets and the Internet. While participants knew that PDF preserves files, fonts and layouts, and that they could open and read them with ease, 70% (mean = 3.56) indicated that could not set up document and file password protection.

Table 5.2, on the next page, presents the means and standard deviations (descriptive statistics) for each treatment group on the initial self-appraisal section of the e-readiness questionnaire before the intervention.

**Table 5.2: Descriptive statistics on self-appraisal section of e-readiness questionnaire at initiation**

| <b>Getting started</b><br>V35-40                | Fully agree |    | Somewhat agree |    | Somewhat disagree |    | Totally disagree |    | Mean | Standard deviation |
|-------------------------------------------------|-------------|----|----------------|----|-------------------|----|------------------|----|------|--------------------|
|                                                 | f           | %  | f              | %  | f                 | %  | f                | %  |      |                    |
| Switch on a desktop computer                    | 64          | 74 | 14             | 16 | 3                 | 4  | 5                | 6  | 1.41 | 0.82               |
| Select applications from Start button           | 44          | 51 | 26             | 30 | 6                 | 7  | 8                | 9  | 1.74 | 0.96               |
| Identify Desktop components                     | 64          | 74 | 13             | 15 | 3                 | 4  | 6                | 7  | 1.43 | 0.86               |
| Minimise/maximise/restore/close windows         | 43          | 50 | 15             | 17 | 10                | 12 | 18               | 21 | 2.04 | 1.21               |
| Tooltips                                        | 10          | 12 | 12             | 14 | 18                | 21 | 46               | 54 | 3.16 | 1.06               |
| Windows Help and Support system                 | 17          | 20 | 21             | 24 | 15                | 17 | 33               | 38 | 2.74 | 1.17               |
| <b>Navigation capabilities</b><br>V42-47        | Fully agree |    | Somewhat agree |    | Somewhat disagree |    | Totally disagree |    | Mean | Standard deviation |
|                                                 | f           | %  | f              | %  | f                 | %  | f                | %  |      |                    |
| Pointing device                                 | 32          | 37 | 16             | 19 | 12                | 14 | 25               | 29 | 2.35 | 1.26               |
| Mouse click to select/highlight/copy/paste/drag | 56          | 65 | 17             | 20 | 8                 | 9  | 5                | 6  | 1.56 | 0.89               |
| Mouse click for shortcuts                       | 33          | 38 | 25             | 29 | 14                | 16 | 14               | 16 | 2.11 | 1.10               |
| Vertical scrolling                              | 53          | 62 | 32             | 37 |                   |    |                  |    | 1.38 | 0.49               |
| Horizontal scrolling                            | 53          | 62 | 32             | 37 |                   |    |                  |    | 1.38 | 0.49               |
| <b>File management capabilities</b><br>V48-54   | Fully agree |    | Somewhat agree |    | Somewhat disagree |    | Totally disagree |    | Mean | Standard deviation |
|                                                 | f           | %  | f              | %  | f                 | %  | f                | %  |      |                    |
| Create new folder in Documents Library          | 39          | 45 | 21             | 24 | 6                 | 7  | 19               | 22 | 2.06 | 1.20               |
| Open files from existing folder                 | 56          | 65 | 18             | 21 | 2                 | 2  | 8                | 9  | 1.55 | 0.94               |
| Save files to existing folder                   | 41          | 48 | 20             | 23 | 8                 | 9  | 17               | 20 | 2.01 | 1.17               |
| Rename files and folders                        | 47          | 55 | 15             | 17 | 11                | 13 | 13               | 15 | 1.88 | 1.13               |
| Save files on different drives                  | 26          | 30 | 17             | 20 | 15                | 17 | 28               | 33 | 2.52 | 1.23               |
| Save files on external devices                  | 26          | 30 | 11             | 13 | 14                | 16 | 35               | 41 | 2.67 | 1.29               |
| Back-up data                                    | 1           | 1  | 17             | 20 | 15                | 17 | 52               | 61 | 3.39 | 0.85               |
| <b>Web browsing capabilities</b><br>V56-61      | Fully agree |    | Somewhat agree |    | Somewhat disagree |    | Totally disagree |    | Mean | Standard deviation |
|                                                 | f           | %  | f              | %  | f                 | %  | f                | %  |      |                    |
| Navigate Internet using search engines          | 29          | 34 | 23             | 27 | 10                | 12 | 24               | 28 | 2.34 | 1.21               |
| Copy/paste text from web site                   | 28          | 33 | 19             | 22 | 13                | 15 | 26               | 30 | 2.43 | 1.23               |
| Copy/paste graphics from a web page             | 15          | 17 | 14             | 16 | 20                | 23 | 37               | 43 | 2.92 | 1.14               |
| Set browser application to default home page    | 11          | 13 | 17             | 20 | 21                | 24 | 37               | 43 | 2.98 | 1.07               |
| Use Boolean operators to perform searches       | 2           | 2  | 7              | 8  | 19                | 22 | 58               | 67 | 3.54 | 0.75               |
| Customise Internet preference settings          | 6           | 7  | 15             | 17 | 12                | 14 | 52               | 61 | 3.29 | 1.00               |

| <b>E-mail</b><br>V63-70                       | Fully agree |    | Somewhat agree |    | Somewhat disagree |    | Totally disagree |    | Mean | Standard deviation |
|-----------------------------------------------|-------------|----|----------------|----|-------------------|----|------------------|----|------|--------------------|
|                                               | f           | %  | f              | %  | f                 | %  | f                | %  |      |                    |
| Open and read received e-mail messages        | 57          | 66 | 17             | 20 | 5                 | 6  | 7                | 8  | 1.56 | 0.93               |
| Reply to or delete received e-mail messages   | 54          | 63 | 17             | 20 | 7                 | 8  | 8                | 9  | 1.64 | 0.98               |
| Attach files to messages                      | 33          | 38 | 18             | 21 | 13                | 15 | 22               | 26 | 2.28 | 1.22               |
| Find contacts in address book                 | 34          | 40 | 16             | 19 | 11                | 13 | 25               | 29 | 2.31 | 1.27               |
| Edit contacts in address book                 | 24          | 28 | 23             | 27 | 15                | 17 | 24               | 28 | 2.45 | 1.17               |
| Create mailing list                           | 8           | 9  | 19             | 22 | 21                | 24 | 38               | 44 | 3.04 | 1.02               |
| Subscribe/unsubscribe from mailing lists      | 5           | 6  | 12             | 14 | 23                | 27 | 46               | 54 | 3.28 | 0.92               |
| Advanced e-mail features/return receipts      | 6           | 7  | 10             | 12 | 19                | 22 | 51               | 59 | 3.34 | 0.94               |
| <b>Software capabilities</b><br>V72-78        | Fully agree |    | Somewhat agree |    | Somewhat disagree |    | Totally disagree |    | Mean | Standard deviation |
|                                               | f           | %  | f              | %  | f                 | %  | f                | %  |      |                    |
| Operating system versus application software  | 4           | 5  | 12             | 14 | 26                | 30 | 44               | 51 | 3.28 | 0.88               |
| Open more than one window at same time        | 25          | 29 | 16             | 19 | 9                 | 11 | 36               | 42 | 2.65 | 1.29               |
| Customise look and feel of computer           | 25          | 29 | 9              | 11 | 16                | 19 | 36               | 42 | 2.73 | 1.28               |
| Trouble-shoot software problems               | 7           | 8  | 7              | 8  | 18                | 21 | 54               | 63 | 3.38 | 0.95               |
| Download software                             | 17          | 20 | 16             | 19 | 16                | 19 | 37               | 43 | 2.85 | 1.18               |
| Install software                              | 19          | 22 | 11             | 13 | 16                | 19 | 40               | 47 | 2.90 | 1.22               |
| Install a plug-in                             | 10          | 12 | 13             | 15 | 16                | 19 | 47               | 55 | 3.16 | 1.07               |
| <b>Hardware operations</b><br>V80-83          | Fully agree |    | Somewhat agree |    | Somewhat disagree |    | Totally disagree |    | Mean | Standard deviation |
|                                               | f           | %  | f              | %  | f                 | %  | f                | %  |      |                    |
| Request help when experiencing problems       | 60          | 70 | 14             | 16 | 5                 | 6  | 7                | 8  | 1.52 | 0.93               |
| Identify and correct simple computer problems | 22          | 26 | 14             | 16 | 16                | 19 | 34               | 40 | 2.72 | 1.23               |
| Set up new computer                           | 9           | 11 | 9              | 11 | 14                | 16 | 54               | 63 | 3.31 | 1.03               |
| Upgrade computer's hardware components        | 10          | 12 | 3              | 4  | 18                | 21 | 55               | 64 | 3.37 | 1.01               |
| <b>Word processing skills</b><br>V85-94       | Fully agree |    | Somewhat agree |    | Somewhat disagree |    | Totally disagree |    | Mean | Standard deviation |
|                                               | f           | %  | f              | %  | f                 | %  | f                | %  |      |                    |
| Create word processing document               | 23          | 27 | 20             | 23 | 12                | 14 | 31               | 36 | 2.59 | 1.23               |
| Save word processing document                 | 25          | 29 | 16             | 19 | 17                | 20 | 28               | 33 | 2.56 | 1.22               |
| Print word processing document                | 24          | 28 | 22             | 26 | 12                | 14 | 28               | 33 | 2.51 | 1.22               |
| Change font sizes                             | 39          | 45 | 18             | 21 | 12                | 14 | 17               | 20 | 2.08 | 1.18               |
| Underline text                                | 39          | 45 | 19             | 22 | 10                | 12 | 18               | 21 | 2.08 | 1.19               |
| Bold print text                               | 43          | 50 | 19             | 22 | 6                 | 7  | 17               | 20 | 1.97 | 1.18               |
| Change the page orientation                   | 19          | 22 | 15             | 17 | 17                | 20 | 35               | 41 | 2.79 | 1.20               |
| Insert a table                                | 22          | 26 | 14             | 16 | 14                | 16 | 36               | 42 | 2.74 | 1.25               |
| Insert a text box                             | 12          | 14 | 13             | 15 | 18                | 21 | 43               | 50 | 3.07 | 1.10               |
| Move text between documents                   | 14          | 16 | 13             | 15 | 19                | 22 | 40               | 47 | 2.99 | 1.13               |

| Spreadsheet capabilities<br>V96-V102        | Fully agree |    | Somewhat agree |    | Somewhat disagree |    | Totally disagree |    | Mean | Standard deviation |
|---------------------------------------------|-------------|----|----------------|----|-------------------|----|------------------|----|------|--------------------|
|                                             | f           | %  | f              | %  | f                 | %  | f                | %  |      |                    |
| Create spreadsheet document                 | 8           | 9  | 11             | 13 | 20                | 23 | 47               | 55 | 3.23 | 1.00               |
| Save spreadsheet document                   | 15          | 17 | 10             | 12 | 15                | 17 | 46               | 54 | 3.07 | 1.17               |
| Print spreadsheet document                  | 15          | 17 | 11             | 13 | 15                | 17 | 45               | 52 | 3.05 | 1.17               |
| Utilise more than one sheet in workbook     | 6           | 7  | 8              | 9  | 20                | 23 | 52               | 61 | 3.37 | 0.92               |
| Perform basic calculation such as Sum       | 21          | 24 | 13             | 15 | 16                | 19 | 36               | 42 | 2.78 | 1.23               |
| Perform basic calculation such as Average   | 21          | 24 | 11             | 13 | 16                | 19 | 38               | 44 | 2.83 | 1.24               |
| Perform advanced calculation such as CountA | 4           | 5  | 11             | 13 | 19                | 22 | 52               | 61 | 3.38 | 0.88               |
| Presentation capabilities<br>V104-V111      | Fully agree |    | Somewhat agree |    | Somewhat disagree |    | Totally disagree |    | Mean | Standard deviation |
|                                             | f           | %  | f              | %  | f                 | %  | f                | %  |      |                    |
| Create a presentation                       | 14          | 16 | 22             | 26 | 17                | 20 | 33               | 38 | 2.80 | 1.13               |
| Save a presentation                         | 18          | 21 | 19             | 22 | 17                | 20 | 32               | 37 | 2.73 | 1.17               |
| Print a presentation                        | 10          | 12 | 25             | 29 | 15                | 17 | 36               | 42 | 2.90 | 1.09               |
| Insert graphics on a slide                  | 13          | 15 | 10             | 12 | 21                | 24 | 42               | 49 | 3.07 | 1.10               |
| Add theme style to a slide                  | 15          | 17 | 7              | 8  | 21                | 24 | 43               | 50 | 3.07 | 1.14               |
| Enhance slide show using animations         | 8           | 9  | 10             | 12 | 18                | 21 | 50               | 58 | 3.28 | 1.00               |
| Enhance slide show using slide transitions  | 9           | 11 | 6              | 7  | 18                | 21 | 53               | 62 | 3.34 | 1.00               |
| Enhance slide show using time intervals     | 10          | 12 | 3              | 4  | 20                | 23 | 53               | 62 | 3.35 | 1.00               |
| PDF files<br>V113-115                       | Fully agree |    | Somewhat agree |    | Somewhat disagree |    | Totally disagree |    | Mean | Standard deviation |
|                                             | f           | %  | f              | %  | f                 | %  | f                | %  |      |                    |
| Know what PDF files are                     | 18          | 21 | 14             | 16 | 10                | 12 | 44               | 51 | 2.93 | 1.23               |
| Regularly view/create PDF files             | 8           | 9  | 7              | 8  | 12                | 14 | 59               | 69 | 3.42 | 0.99               |
| Apply password protection                   | 3           | 4  | 6              | 7  | 17                | 20 | 60               | 70 | 3.56 | 0.78               |

## 5.2.6 Descriptive statistics about participants' e-literacy skills application capabilities from the situational test at initiation

Table 5.3 indicates the tangible application of participants' e-literacy skills before the intervention in categories such as: (i) File management skills, (ii) Web browsing capabilities, (iii) Word processing, (iv) Spreadsheet and (v) Presentation skills. Refer to §4.5.6.1 for measurement scales applied in the analyses of tangible e-literacy skills application.

**Table 5.3: Descriptive statistics on application of e-literacy skills from situational test at initiation**

| File management skills<br>V117-121             | Basic skills |    | Functional skills |    | Proficient skills |    | Mean | Standard deviation |
|------------------------------------------------|--------------|----|-------------------|----|-------------------|----|------|--------------------|
|                                                | f            | %  | f                 | %  | f                 | %  |      |                    |
| Computer switched on                           | 4            | 5  | 3                 | 4  | 79                | 92 | 2.87 | 0.46               |
| Click left mouse button to open icons          | 7            | 8  | 11                | 13 | 68                | 79 | 2.71 | 0.61               |
| Double click left mouse button to open folders | 7            | 8  | 14                | 16 | 65                | 76 | 2.67 | 0.62               |
| Renamed files                                  | 21           | 24 | 17                | 20 | 48                | 56 | 2.31 | 0.84               |
| Closed file management application             | 11           | 13 | 10                | 12 | 65                | 76 | 2.63 | 0.70               |
| Web browsing capabilities<br>V122-125          | Basic skills |    | Functional skills |    | Proficient skills |    | Mean | Standard deviation |
|                                                | f            | %  | f                 | %  | f                 | %  |      |                    |
| Selected and opened Internet Explorer™         | 20           | 23 | 24                | 28 | 42                | 49 | 2.26 | 0.81               |
| Entered www.google.com in the tab section      | 17           | 20 | 34                | 40 | 35                | 41 | 2.21 | 0.75               |
| Executed Boolean operator keyword search       | 23           | 27 | 27                | 31 | 36                | 42 | 2.15 | 0.82               |
| Minimised Internet Explorer™                   | 21           | 24 | 20                | 23 | 45                | 52 | 2.28 | 0.84               |
| Word processing skills<br>V126-131             | Basic skills |    | Functional skills |    | Proficient skills |    | Mean | Standard deviation |
|                                                | f            | %  | f                 | %  | f                 | %  |      |                    |
| Selected and opened Microsoft Word™            | 39           | 45 | 23                | 27 | 24                | 28 | 1.83 | 0.84               |
| Selected and opened file from library          | 46           | 54 | 23                | 27 | 17                | 20 | 1.66 | 0.79               |
| Changed selected text to bold print            | 53           | 62 | 14                | 16 | 19                | 22 | 1.61 | 0.83               |
| Changed font sizes                             | 48           | 56 | 15                | 17 | 23                | 27 | 1.71 | 0.87               |
| Deleted second paragraph                       | 51           | 59 | 15                | 17 | 20                | 23 | 1.64 | 0.84               |
| Saved file in library                          | 55           | 64 | 14                | 16 | 17                | 20 | 1.56 | 0.81               |
| Spreadsheet skills<br>V132-136                 | Basic skills |    | Functional skills |    | Proficient skills |    | Mean | Standard deviation |
|                                                | f            | %  | f                 | %  | f                 | %  |      |                    |
| Selected Microsoft Excel™ application          | 43           | 50 | 19                | 22 | 24                | 26 | 1.78 | 0.86               |
| Selected and opened the file Budget.xlsx       | 54           | 63 | 13                | 15 | 19                | 22 | 1.59 | 0.83               |
| Entered formula for Total expenses             | 68           | 79 | 10                | 12 | 8                 | 9  | 1.30 | 0.63               |
| Entered formula for Spending money             | 69           | 80 | 10                | 12 | 7                 | 8  | 1.28 | 0.61               |
| Saved the file using same file name            | 57           | 66 | 12                | 1  | 17                | 20 | 1.54 | 0.81               |
| Presentation skills<br>V137-141                | Basic skills |    | Functional skills |    | Proficient skills |    | Mean | Standard deviation |
|                                                | f            | %  | f                 | %  | f                 | %  |      |                    |
| Selected the Microsoft PowerPoint™             | 40           | 47 | 14                | 16 | 32                | 37 | 1.91 | 0.92               |
| Selected and opened the file Slides.pptx       | 46           | 54 | 19                | 22 | 21                | 24 | 1.71 | 0.84               |
| Entered a subtitle Academic aids               | 49           | 57 | 16                | 19 | 21                | 24 | 1.67 | 0.85               |
| Added a background colour                      | 64           | 74 | 11                | 13 | 11                | 13 | 1.38 | 0.71               |
| Saved file in PDF format                       | 62           | 72 | 10                | 12 | 14                | 16 | 1.40 | 0.76               |

At the application of File management skills, the majority 92% (mean = 2.87) of participants indicated that they could switch on a desktop computer whilst 5% were unable to do so. Seventy nine per cent (79%) (mean = 2.71) could apply the left mouse button correctly to open icons and folders, whilst 8% had basic skills. Only 56% (mean = 2.31) of participants were able to successfully rename files, and 24% had

elementary skills. Seventy six per cent (76%) (mean = 2.63) were able to close Windows Explorer application and 13% were unable to.

Outcomes around Web browsing skilfulness indicated that only 49% (mean = 2.26) of the participants could select and open Internet Explorer™ whereas 23% were unable to. Forty one per cent (41%) (mean = 2.21) were able to enter the search engine [www.google.com](http://www.google.com) into the tab section and 20% did not know. Only 42% (mean = 2.15) could apply a Boolean operator keyword search successfully. Twenty seven per cent (27%) battled with this. Fifty two per cent (52%) (mean = 2.28) were able to minimise, maximise, restore and close active windows whilst 24% were unable to.

Office Administration and Contact Centre employees are expected to carry out word processing, spreadsheet and presentation chores utilising the popular Microsoft Office productivity suite (Angeles, 2014). In the quest to determine the Word processing capabilities of participants, analysed data indicated that 45% (mean = 1.83) possessed basic skills and 28% had proficient skills to open Microsoft Word™. Sixty two per cent (62%) (mean = 1.61) possessed the basic skill to bold print text, whilst 22% had proficient skills to do so. Fifty six per cent (56%) (mean = 1.71) had basic skills to change font sizes, and 27% had proficient skills. Merely 54% (mean = 1.66) had basic skills to search and open a file from a library, and 20% had proficient skills. Fifty nine per cent (59%) (mean = 1.64) had basic skills and 23% had proficient skills to delete a typed paragraph. Sixty four per cent (64%) (mean = 1.56) tested basic skills and 20% tested proficient skills to save a file in a library.

Established Spreadsheet skills indicated that 50% (mean = 1.78) had basic abilities to open Microsoft Excel™ application and 26% had proficient skills to do so. In the direction of selecting and opening a particular file from a library, 63% (mean = 1.59) had basic skills and 22% had proficient skills to execute the instruction. Seventy nine per cent (79%) (mean = 1.30) had basic skills to execute the =SUM formula and 9% had proficient skills. Eighty per cent (80%) (mean = 1.28) possessed basic skills to apply the =AVERAGE formula and 8% had proficient skills. Sixty six per cent (66%) (mean = 1.54) had basic abilities to save a file with the same name in a matching folder whilst 20% had proficient abilities to do so.

In the Presentation capabilities section, 47% (mean = 1.91) were unable to open Microsoft PowerPoint™ whilst 37% could easily do so. When participants were requested to open a specific file in a dedicated folder, 54% (mean = 1.71) had basic skills to do so and 24% were able to execute the instruction proficiently. Fifty seven per cent (57%) (mean = 1.67) could not insert a subtitle to a slide, whilst 24% could successfully enter a subtitle. In adding a background colour to a presentation, 74% (mean = 1.38) were unable to and 13% of the participants were able to insert the incline. At the instruction to save a file in PDF format, 72% (mean = 1.40) did not know what to do whilst 16% were able to convert a presentation file into PDF format.

Table 5.3 presents detailed data on tangible e-literacy skill capabilities of participants from the situational test at initiation.

### **5.2.7 Descriptive statistics about participants' final perceptions around their e-literacy skills capabilities from the self-appraisal section of e-readiness questionnaire**

Windows Help and Support System represents a significant resource for online help, support, tools, how to articles, and other resources. Participants were probed to respond if they were able to draw on the Windows Help and Support system. According to outcomes of results depicted in Table 5.4, 44% (mean = 2.13) indicated that they were able to use the Windows Help and Support system and 21% could not. Moreover, it seemed that 57% (mean = 1.68) were able to use the right mouse button for shortcuts. After the intervention, 31% (mean = 2.45) participants' outcomes indicated that they could not back-up data. Variable sixty (60) in the e-readiness questionnaire established whether participants could use Boolean operators to perform Internet searches. The replies to this question indicated that 34% (mean = 2.62) could not identify with Boolean operators. At the construct E-mail capabilities, 37% (mean = 2.81) participants specified that they could not use the advanced features of e-mail software such as return receipts. In computing, a plug-in is a software component that adds specific features to an existing software application. Participants were asked if they thought they could install a plug-in. Thirty eight per cent (38%) (mean = 2.77) indicated that they could not install a plug-in, neither could 49% (mean = 2.95) of participants upgrade a desktop computer's hardware.

Furthermore, participants assessed their Word processing, Spreadsheet and Presentation capabilities according to the Microsoft Office Suite. This widely recognised package is used for office productivity and was considered appropriate software for testing the e-literacy skills of office administration and contact centre managers (§ 4.5.2). Results for construct Word processing indicated that 37% (mean 2.29) of the partakers could move text between different documents, applications and windows. At the question if they could perform advanced calculations such as CountA, a split statistic portrayed that 40% (mean = 2.54) of the testees could perform advanced calculations and 40% (mean = 2.54) indicated that they could not. Besides the Word processing and Spreadsheet results, 40% per cent (mean = 2.37) indicated that they can enhance a slide show utilising time intervals. For PDF files, 43% (mean = 2.79) indicated that they could not apply password protection to secure documents and files.

The results associated with the above findings are depicted in Table 5.4 and are presented on the next page.

**Table 5.4: Descriptive statistics on self-appraisal section of e-readiness questionnaire at completion**

| <b>Getting started</b><br>V35-40                | Fully agree |    | Somewhat agree |    | Somewhat disagree |    | Totally disagree |    | Mean | Standard deviation |
|-------------------------------------------------|-------------|----|----------------|----|-------------------|----|------------------|----|------|--------------------|
|                                                 | <i>f</i>    | %  | <i>f</i>       | %  | <i>f</i>          | %  | <i>f</i>         | %  |      |                    |
| Switch on a desktop computer                    | 84          | 98 | 1              | 1  | 1                 | 1  | 0                | 0  | 1.04 | 0.24               |
| Select applications from Start button           | 76          | 88 | 3              | 4  | 6                 | 7  | 1                | 1  | 1.21 | 0.62               |
| Identify Desktop components                     | 77          | 90 | 4              | 5  | 2                 | 2  | 2                | 2  | 1.17 | 0.57               |
| Minimise/maximise/restore/close windows         | 62          | 72 | 14             | 16 | 5                 | 6  | 5                | 6  | 1.45 | 0.85               |
| Tooltips                                        | 45          | 52 | 9              | 11 | 13                | 15 | 19               | 22 | 2.07 | 1.25               |
| Windows Help and Support system                 | 38          | 44 | 17             | 20 | 13                | 15 | 18               | 21 | 2.13 | 1.20               |
| <b>Navigation capabilities</b><br>V42-47        | Fully agree |    | Somewhat agree |    | Somewhat disagree |    | Totally disagree |    | Mean | Standard deviation |
|                                                 | <i>f</i>    | %  | <i>f</i>       | %  | <i>f</i>          | %  | <i>f</i>         | %  |      |                    |
| Pointing device                                 | 56          | 65 | 13             | 15 | 10                | 12 | 7                | 8  | 1.63 | 0.98               |
| Mouse click to select/highlight/copy/paste/drag | 70          | 81 | 11             | 13 | 2                 | 2  | 3                | 4  | 1.28 | 0.68               |
| Mouse click for shortcuts                       | 49          | 57 | 18             | 21 | 14                | 16 | 4                | 5  | 1.68 | 0.92               |
| Vertical scrolling                              | 72          | 84 | 14             | 16 |                   |    |                  |    | 1.16 | 0.37               |
| Horizontal scrolling                            | 68          | 79 | 16             | 19 |                   |    |                  |    | 1.21 | 0.51               |
| <b>File management capabilities</b><br>V48-54   | Fully agree |    | Somewhat agree |    | Somewhat disagree |    | Totally disagree |    | Mean | Standard deviation |
|                                                 | <i>f</i>    | %  | <i>f</i>       | %  | <i>f</i>          | %  | <i>f</i>         | %  |      |                    |
| Create new folder in Documents Library          | 64          | 74 | 12             | 14 | 2                 | 2  | 8                | 9  | 1.47 | 0.93               |
| Open files from existing folder                 | 71          | 83 | 10             | 12 | 3                 | 4  | 2                | 2  | 1.26 | 0.64               |
| Save files to existing folder                   | 66          | 77 | 7              | 8  | 7                 | 8  | 6                | 7  | 1.45 | 0.92               |
| Rename files and folders                        | 69          | 80 | 10             | 12 | 4                 | 5  | 3                | 4  | 1.31 | 0.72               |
| Save files on different drives                  | 44          | 51 | 16             | 19 | 13                | 15 | 13               | 15 | 1.94 | 1.13               |
| Save files on external devices                  | 40          | 47 | 15             | 17 | 16                | 19 | 15               | 17 | 2.07 | 1.17               |
| Back-up data                                    | 29          | 34 | 16             | 19 | 14                | 16 | 27               | 31 | 2.45 | 1.25               |
| <b>Web browsing capabilities</b><br>V56-61      | Fully agree |    | Somewhat agree |    | Somewhat disagree |    | Totally disagree |    | Mean | Standard deviation |
|                                                 | <i>f</i>    | %  | <i>f</i>       | %  | <i>f</i>          | %  | <i>f</i>         | %  |      |                    |
| Navigate Internet using search engines          | 48          | 56 | 14             | 16 | 15                | 17 | 9                | 11 | 1.83 | 1.07               |
| Copy/paste text from web site                   | 47          | 55 | 14             | 16 | 11                | 13 | 14               | 16 | 1.91 | 1.15               |
| Copy/paste graphics from a web page             | 36          | 42 | 18             | 21 | 14                | 16 | 18               | 21 | 2.16 | 1.19               |
| Set browser application to default home page    | 27          | 31 | 17             | 20 | 14                | 16 | 28               | 33 | 2.50 | 1.24               |
| Use Boolean operators to perform searches       | 21          | 24 | 20             | 23 | 16                | 19 | 29               | 34 | 2.62 | 1.19               |
| Customise Internet preference settings          | 24          | 28 | 22             | 26 | 12                | 14 | 28               | 33 | 2.51 | 1.22               |

|                                               |             |    |                |    |                   |    |                  |    |      |                    |
|-----------------------------------------------|-------------|----|----------------|----|-------------------|----|------------------|----|------|--------------------|
| <b>E-mail</b><br>V63-70                       | Fully agree |    | Somewhat agree |    | Somewhat disagree |    | Totally disagree |    | Mean | Standard deviation |
|                                               | <i>f</i>    | %  | <i>f</i>       | %  | <i>f</i>          | %  | <i>f</i>         | %  |      |                    |
| Open and read received e-mail messages        | 58          | 67 | 16             | 19 | 6                 | 7  | 6                | 7  | 1.54 | 0.90               |
| Reply to, or delete received e-mail messages  | 59          | 69 | 15             | 17 | 5                 | 6  | 7                | 8  | 1.54 | 0.93               |
| Attach files to messages                      | 39          | 45 | 17             | 20 | 14                | 16 | 16               | 19 | 2.08 | 1.17               |
| Find contacts in address book                 | 40          | 47 | 21             | 24 | 10                | 12 | 14               | 16 | 1.98 | 1.12               |
| Edit contacts in address book                 | 32          | 37 | 17             | 20 | 19                | 22 | 17               | 20 | 2.25 | 1.16               |
| Create mailing list                           | 21          | 24 | 18             | 21 | 25                | 29 | 21               | 24 | 2.54 | 1.12               |
| Subscribe/unsubscribe from mailing lists      | 17          | 20 | 18             | 21 | 27                | 31 | 23               | 27 | 2.66 | 1.09               |
| Advanced e-mail features/return receipts      | 16          | 19 | 16             | 19 | 21                | 24 | 32               | 37 | 2.81 | 1.14               |
| <b>Software capabilities</b><br>V72-78        | Fully agree |    | Somewhat agree |    | Somewhat disagree |    | Totally disagree |    | Mean | Standard deviation |
|                                               | <i>f</i>    | %  | <i>f</i>       | %  | <i>f</i>          | %  | <i>f</i>         | %  |      |                    |
| Operating system versus application software  | 28          | 33 | 17             | 20 | 17                | 20 | 24               | 28 | 2.43 | 1.21               |
| Open more than one window at same time        | 39          | 45 | 16             | 19 | 13                | 15 | 18               | 21 | 2.12 | 1.20               |
| Customise look and feel of computer           | 40          | 47 | 8              | 9  | 15                | 17 | 23               | 27 | 2.24 | 1.29               |
| Trouble-shoot software problems               | 19          | 22 | 20             | 23 | 16                | 19 | 31               | 36 | 2.69 | 1.18               |
| Download software                             | 34          | 40 | 10             | 12 | 14                | 16 | 28               | 33 | 2.42 | 1.31               |
| Install software                              | 31          | 36 | 15             | 17 | 12                | 14 | 28               | 33 | 2.43 | 1.28               |
| Install a plug-in                             | 19          | 22 | 15             | 17 | 19                | 22 | 33               | 38 | 2.77 | 1.18               |
| <b>Hardware operations</b><br>V80-83          | Fully agree |    | Somewhat agree |    | Somewhat disagree |    | Totally disagree |    | Mean | Standard deviation |
|                                               | <i>f</i>    | %  | <i>f</i>       | %  | <i>f</i>          | %  | <i>f</i>         | %  |      |                    |
| Request help when experiencing problems       | 65          | 76 | 12             | 14 | 3                 | 4  | 6                | 7  | 1.42 | 0.86               |
| Identify and correct simple computer problems | 33          | 38 | 14             | 16 | 17                | 20 | 22               | 26 | 2.33 | 1.23               |
| Set up new computer                           | 13          | 15 | 22             | 26 | 13                | 15 | 38               | 44 | 2.88 | 1.14               |
| Upgrade computer's hardware components        | 13          | 15 | 20             | 23 | 11                | 13 | 42               | 49 | 2.95 | 1.16               |
| <b>Word processing skills</b><br>V85-94       | Fully agree |    | Somewhat agree |    | Somewhat disagree |    | Totally disagree |    | Mean | Standard deviation |
|                                               | <i>f</i>    | %  | <i>f</i>       | %  | <i>f</i>          | %  | <i>f</i>         | %  |      |                    |
| Create word processing document               | 47          | 55 | 14             | 16 | 9                 | 11 | 16               | 19 | 1.93 | 1.19               |
| Save word processing document                 | 50          | 58 | 11             | 13 | 6                 | 7  | 19               | 22 | 1.93 | 1.24               |
| Print word processing document                | 53          | 62 | 11             | 13 | 7                 | 8  | 15               | 17 | 1.81 | 1.17               |
| Change font sizes                             | 60          | 70 | 10             | 12 | 7                 | 8  | 9                | 11 | 1.59 | 1.02               |
| Underline text                                | 62          | 72 | 10             | 12 | 6                 | 7  | 8                | 9  | 1.54 | 0.98               |
| Bold print text                               | 61          | 71 | 8              | 9  | 6                 | 7  | 11               | 13 | 1.62 | 1.08               |
| Change the page orientation                   | 44          | 51 | 13             | 15 | 14                | 16 | 15               | 17 | 2.00 | 1.18               |
| Insert a table                                | 43          | 50 | 13             | 15 | 10                | 12 | 19               | 22 | 2.06 | 1.24               |
| Insert a text box                             | 39          | 45 | 16             | 19 | 8                 | 9  | 23               | 27 | 2.17 | 1.27               |
| Move text between documents                   | 32          | 37 | 21             | 24 | 9                 | 11 | 24               | 28 | 2.29 | 1.24               |

| Spreadsheet capabilities<br>V96-V102        | Fully agree |    | Somewhat agree |     | Somewhat disagree |    | Totally disagree |    | Mean | Standard deviation |
|---------------------------------------------|-------------|----|----------------|-----|-------------------|----|------------------|----|------|--------------------|
|                                             | f           | %  | f              | %   | f                 | %  | f                | %  |      |                    |
| Create spreadsheet document                 | 35          | 41 | 15             | 17  | 11                | 13 | 25               | 29 | 2.30 | 1.27               |
| Save spreadsheet document                   | 38          | 44 | 14             | 16  | 8                 | 9  | 26               | 30 | 2.26 | 1.30               |
| Print spreadsheet document                  | 41          | 48 | 9              | 11  | 8                 | 9  | 28               | 33 | 2.27 | 1.35               |
| Utilise more than one sheet in workbook     | 34          | 40 | 12             | 14  | 9                 | 11 | 31               | 36 | 2.43 | 1.33               |
| Perform basic calculation such as Sum       | 39          | 45 | 13             | 15  | 9                 | 11 | 25               | 29 | 2.23 | 1.30               |
| Perform basic calculation such as Average   | 38          | 44 | 9              | 11  | 10                | 12 | 29               | 34 | 2.35 | 1.34               |
| Perform advanced calculation such as CountA | 34          | 40 | 6              | 7.0 | 12                | 14 | 34               | 40 | 2.54 | 1.36               |
| Presentation capabilities<br>V104-V111      | Fully agree |    | Somewhat agree |     | Somewhat disagree |    | Totally disagree |    | Mean | Standard deviation |
|                                             | f           | %  | f              | %   | f                 | %  | f                | %  |      |                    |
| Create a presentation                       | 43          | 50 | 12             | 14  | 9                 | 11 | 22               | 26 | 2.12 | 1.28               |
| Save a presentation                         | 48          | 56 | 8              | 9   | 10                | 12 | 20               | 23 | 2.02 | 1.27               |
| Print a presentation                        | 44          | 51 | 12             | 14  | 9                 | 11 | 21               | 24 | 2.08 | 1.27               |
| Insert graphics on a slide                  | 46          | 54 | 7              | 8   | 8                 | 9  | 25               | 29 | 2.14 | 1.34               |
| Add theme style to a slide                  | 48          | 56 | 8              | 9   | 7                 | 8  | 23               | 27 | 2.06 | 1.31               |
| Enhance slide show using animations         | 46          | 54 | 6              | 7   | 7                 | 8  | 27               | 31 | 2.17 | 1.37               |
| Enhance slide show using slide transitions  | 39          | 45 | 12             | 14  | 8                 | 9  | 27               | 31 | 2.27 | 1.32               |
| Enhance slide show using time intervals     | 34          | 40 | 13             | 15  | 12                | 14 | 27               | 31 | 2.37 | 1.30               |
| PDF files<br>V113-115                       | Fully agree |    | Somewhat agree |     | Somewhat disagree |    | Totally disagree |    | Mean | Standard deviation |
|                                             | f           | %  | f              | %   | f                 | %  | f                | %  |      |                    |
| Know what PDF files are                     | 42          | 49 | 8              | 9   | 9                 | 11 | 27               | 31 | 2.24 | 1.35               |
| Regularly view/create PDF files             | 33          | 38 | 13             | 15  | 8                 | 9  | 32               | 37 | 2.45 | 1.33               |
| Apply password protection                   | 19          | 22 | 17             | 20  | 13                | 15 | 37               | 43 | 2.79 | 1.22               |

## 5.2.8 Descriptive statistics about participants' e-literacy skills application capabilities from the situational test at completion

Table 5.5 indicates a detailed analysis of the response means and standard deviations on the application of e-literacy skills after the intervention. Analysed data from the situational test on the application of File management skills at the rear of the intervention indicated that 94% (mean = 2.93) of participants could switch on a desktop computer and 1% were unable to. Eighty six per cent (86%) (mean = 2.86) could apply the left mouse button correctly to open icons and folders whilst 14% had functional skills. Nobody was unable to apply the left mouse button. Eighty eight per cent (88%) (mean = 2.88) were able to close Windows Explorer™ and 2% were unable. Seventy two per cent (72%) (mean = 2.65) of participants could successfully rename files, and 7% were unable to rename files.

Outcomes for Web browsing proficiency indicated that 81% (mean = 2.77) of the participants could select and open Internet Explorer™ whilst 4% were unable to open the application. Seventy two per cent (72%) (mean = 2.69) were now able to enter the search engine [www.google.com](http://www.google.com) into the tab section and 4% did not know how. At this point 64% (mean = 2.54) could apply a Boolean operator keyword search successfully. Eleven per cent (11%) still battled. Seventy three per cent (73%) (mean = 2.67) were able to minimise, maximise, restore and close active windows whilst 6% were unable to.

Data collected from the situational test on the Word processing capabilities of participants towards the end indicated that 66% (mean = 2.55) could proficiently open Microsoft Word™ whilst 12% had basic skills. Twenty two per cent (22%) owned a basic skill to bold print text whilst 51% (mean = 2.29) had proficient skills to do so. Twenty three per cent (23%) had basic skills to change font sizes and 55% (mean = 2.31) had proficient skills. Merely 16% had basic skills to search and open a file from a library and 52% (mean = 2.36) had proficient skills. Twenty six per cent (26%) had basic skills and 54% (mean = 2.28) had proficient skills in deleting a typed paragraph. Twenty seven per cent (27%) tested basic skills and 50% (mean = 2.23) tested proficient skills to save a file in a library.

In this portion the Spreadsheet capabilities of participants' outcomes indicated that 19% had basic abilities to open Microsoft Excel™ application and 61% (mean = 2.42) had proficient skills to do so. In the direction of selecting and opening a particular file from a library, 27% had basic skills and 54% (mean = 2.27) had proficient skills to execute the instruction. Thirty six per cent (36%) had basic skills to execute a =SUM formula and 41% (mean = 2.05) demonstrated proficient skills. Thirty six per cent (36%) possessed basic skills to apply the =AVERAGE formula and 24% (mean = 1.88) had proficient skills. Twenty six per cent (26%) had basic abilities to save a file with the same name in a matching folder whilst 49% (mean = 2.23) had proficient capabilities.

Data from the Presentation capabilities section indicated that 20% were unable to open Microsoft PowerPoint™ whilst 69% (mean = 2.49) could easily do so. In opening a specific file in a dedicated folder, 21% had basic skills to do so and 63% (mean = 2.42) were able to execute the instruction

proficiently. Twenty two per cent (22%) could not enter a subtitle to a slide whilst 54% (mean = 2.31) could successfully do so. In adding a background colour to a presentation, 35% were unable to and 40% (mean = 2.05) of the participants were able to achieve the instruction. At the instruction to save a file in PDF format, 42% did not know what to do whilst 44% (mean = 2.02) were able to do the conversion.

**Table 5.5: Descriptive statistics on application of e-literacy skills from situational test at completion**

| <b>File management skills</b><br>V117-121      | Basic skills |    | Functional skills |    | Proficient skills |    | Mean | Standard deviation |
|------------------------------------------------|--------------|----|-------------------|----|-------------------|----|------|--------------------|
|                                                | f            | %  | f                 | %  | f                 | %  |      |                    |
| Computer switched on                           | 1            | 1  | 4                 | 5  | 81                | 94 | 2.93 | 0.30               |
| Click left mouse button to open icons          | 0            | 0  | 12                | 14 | 74                | 86 | 2.86 | 0.35               |
| Double click left mouse button to open folders | 4            | 5  | 12                | 14 | 70                | 81 | 2.77 | 0.52               |
| Renamed files                                  | 6            | 7  | 18                | 21 | 62                | 72 | 2.65 | 0.61               |
| Closed file management application             | 2            | 2  | 7                 | 8  | 76                | 88 | 2.88 | 0.42               |
| <b>Web browsing capabilities</b><br>V122-125   | Basic skills |    | Functional skills |    | Proficient skills |    | Mean | Standard deviation |
|                                                | f            | %  | f                 | %  | f                 | %  |      |                    |
| Selected and opened Internet Explorer™         | 3            | 4  | 14                | 16 | 69                | 81 | 2.77 | 0.50               |
| Entered www.google.com in the tab section      | 3            | 4  | 21                | 24 | 62                | 72 | 2.69 | 0.54               |
| Executed Boolean operator keyword search       | 9            | 11 | 22                | 26 | 55                | 64 | 2.54 | 0.69               |
| Minimised Internet Explorer™                   | 5            | 6  | 18                | 21 | 63                | 73 | 2.67 | 0.58               |
| <b>Word processing skills</b><br>V126-131      | Basic skills |    | Functional skills |    | Proficient skills |    | Mean | Standard deviation |
|                                                | f            | %  | f                 | %  | f                 | %  |      |                    |
| Selected and opened Microsoft Word™            | 10           | 12 | 19                | 22 | 57                | 66 | 2.55 | 0.70               |
| Selected and opened file from library          | 14           | 16 | 27                | 31 | 45                | 52 | 2.36 | 0.75               |
| Changed selected text to bold print            | 19           | 22 | 23                | 27 | 44                | 51 | 2.29 | 0.81               |
| Changed font sizes                             | 20           | 23 | 19                | 22 | 47                | 55 | 2.31 | 0.83               |
| Deleted second paragraph                       | 22           | 26 | 18                | 21 | 46                | 54 | 2.28 | 0.85               |
| Saved file in library                          | 23           | 27 | 20                | 23 | 43                | 50 | 2.23 | 0.85               |
| <b>Spreadsheet skills</b><br>V132-136          | Basic skills |    | Functional skills |    | Proficient skills |    | Mean | Standard deviation |
|                                                | f            | %  | f                 | %  | f                 | %  |      |                    |
| Selected Microsoft Excel™ application          | 16           | 19 | 18                | 21 | 52                | 61 | 2.42 | 0.79               |
| Selected and opened the file Budget.xlsx       | 23           | 27 | 17                | 20 | 46                | 54 | 2.27 | 0.86               |
| Entered formula for Total expenses             | 31           | 36 | 20                | 23 | 35                | 41 | 2.05 | 0.88               |
| Entered formula for Spending money             | 31           | 36 | 34                | 40 | 21                | 24 | 1.88 | 0.77               |
| Saved the file using same file name            | 22           | 26 | 22                | 26 | 42                | 49 | 2.23 | 0.84               |
| <b>Presentation skills</b><br>V137-141         | Basic skills |    | Functional skills |    | Proficient skills |    | Mean | Standard deviation |
|                                                | f            | %  | f                 | %  | f                 | %  |      |                    |
| Selected the Microsoft PowerPoint™             | 17           | 20 | 10                | 12 | 59                | 69 | 2.49 | 0.81               |
| Selected and opened the file Slides.pptx       | 18           | 21 | 14                | 16 | 54                | 63 | 2.42 | 0.82               |
| Entered a subtitle Academic aids               | 19           | 22 | 21                | 24 | 46                | 54 | 2.31 | 0.82               |
| Added a background colour                      | 30           | 35 | 22                | 26 | 34                | 40 | 2.05 | 0.87               |
| Saved file in PDF format                       | 36           | 42 | 12                | 14 | 38                | 44 | 2.02 | 0.93               |

Descriptive statistics were compiled on the demographical, self-appraisal and situational test sections of the e-readiness questionnaire and were discussed independently from §5.2.1 until §5.2.8.

For reliability purposes, I employed a data reduction technique to reduce bulky data, by combining test items into eleven constructs as discussed in §5.3.

### 5.3 Reliability

Reliability estimates are an indicator of a research instrument's stability to test whether the items within the instrument are valid. Cronbach's coefficient alphas ( $\alpha$ ) were calculated for examining the reliability of test items in the self-appraisal section (Table 5.6) and the situational test (Table 5.7) of the e-readiness questionnaire by means of measuring the internal consistency of a group of items, and by measuring the homogeneity of a group of items. Cronbach's alpha reliability coefficient normally ranges between 0 and 1. Values closer to one indicate a higher internal consistency whilst values closer to zero indicate a lower internal consistency. I considered a Cronbach Alpha of  $\geq 0.60$  (§4.8.2) an acceptable reliability value (Field, 2009:675). Highlighted alphas, as in Table 5.6, ranged between  $\geq 0.61$  and  $\leq 0.92$ , and were higher than minimally acceptable. For that reason the reliability of the self-appraisal's e-skill capability questions reliability was high and satisfactory according to the guidelines of Cohen *et al.* (2011:640).

The internal consistency of a scale can also be examined with item-to-scale correlations and inter-correlations of items within a scale. Measures of inter-item reliability are designed to measure the degree to which answers to one item of the test correspond to answers given to the other items on the test. Clark and Watson (1995:315) are of the opinion that the average inter-item correlation should fall somewhere between 0.15 and 0.55. Constructs highlighted in Table 5.6 such as: Getting started; Navigation; Electronic mail; Software usage; and Hardware operations, were between  $= 0.15$  and  $= 0.55$ , and were regarded as an acceptable level of internal consistency, whilst File management; Web browsing capabilities; Word processing; Spreadsheet; Presentation and PDF skills were higher than 0.55.

Table 5.6 on the next page depicts Cronbach alpha and inter-item correlation analysis around the self-appraisal items for eleven constructs.

**Table 5.6: Reliability of constructs in the e-readiness questionnaire**

| Constructs                | Cronbach alpha | Mean inter-item correlation | Mean | Standard deviation |
|---------------------------|----------------|-----------------------------|------|--------------------|
| Getting started           | 0.85*          | 0.49 <sup>#</sup>           | 2.09 | 0.76               |
| Navigation                | 0.66*          | 0.41 <sup>#</sup>           | 2.00 | 0.84               |
| File management           | 0.92*          | 0.62                        | 2.30 | 0.93               |
| Web browsing capabilities | 0.86*          | 0.86                        | 2.92 | 0.83               |
| Electronic mail           | 0.90*          | 0.54 <sup>#</sup>           | 2.49 | 0.82               |
| Software usage            | 0.85*          | 0.45 <sup>#</sup>           | 2.99 | 0.82               |
| Hardware operations       | 0.61*          | 0.26 <sup>#</sup>           | 2.73 | 0.72               |
| Word processing skills    | 0.92*          | 0.57                        | 2.54 | 0.93               |
| Spreadsheet skills        | 0.90*          | 0.56                        | 3.10 | 0.86               |
| Presentation program      | 0.92*          | 0.61                        | 3.07 | 0.88               |
| PDF skills                | 0.81*          | 0.62                        | 3.30 | 0.87               |

\*Cronbach Alpha  $\geq 0.60$  (Cohen *et al.*, 2011:640)

<sup>#</sup>Mean inter-item correlation = 0.15 to 0.55 (Clark & Watson, 1995:315)

Table 5.7 on the next page depicts reliability estimates, which ranged from  $\geq 0.84$  to  $\leq 0.94$  for the situational test's data. All items, i.e. File management; Web browsing capabilities; Word processing; Spreadsheet and Presentation skills fall in the range that is higher than  $\geq 0.8$  (§4.8.2) and are therefore

regarded as reliable. The mean inter-item correlation for items Web Browsing capabilities; Word processing skills; Spreadsheet skills and Presentation skills tested higher than 0.55, mainly because it was an ability test.

**Table 5.7: Reliability of constructs in the situational test**

| Constructs                | Cronbach alpha | Mean inter-item correlation | Mean | Standard deviation |
|---------------------------|----------------|-----------------------------|------|--------------------|
| File management           | 0.84*          | 0.52 <sup>#</sup>           | 2.64 | 0.51               |
| Web browsing capabilities | 0.90*          | 0.71                        | 2.22 | 0.71               |
| Word processing skills    | 0.94*          | 0.72                        | 1.67 | 0.73               |
| Spreadsheet skills        | 0.89*          | 0.64                        | 1.50 | 0.63               |
| Presentation skills       | 0.90*          | 0.65                        | 1.62 | 0.69               |

\*Cronbach Alpha  $\geq 0.60$  (Cohen *et al.*, 2011:640)

<sup>#</sup>Mean inter-item correlation = 0.15 - 0.55 (Clark & Watson, 1995:315)

Reliability statistics are available in Addendum 5.2, Descriptive statistics. The next section will discuss the findings of numeric data.

## 5.4 Inferential statistics

Inferential statistics (Cohen *et al.*, 2011:606) infer or predict population parameters or outcomes from sampling and statistical techniques and use the information from a sample to reach conclusions about a population, based on probability. Statistical inference depicted conclusions about the population from which the systematic random sample was drawn, using descriptive measures that have been calculated. A small  $p$ -value ( $p < 0.05$ ) was considered as sufficient evidence (§4.5.6.1) that results were statistically significant (Field, 2009:53). Likewise, I tested the effect of the experimental manipulation by way of determining effect sizes. Cohen *et al.* (2011:616) assert that effect sizes measure the effectiveness of treatments. Guidelines for the application of different measurement scales as well as guidelines for the interpretation of effect sizes were explained in §4.5.6.1. I considered data with  $d \geq 0.8$  as practically significant. Only medium and large effects were used in this interpretation. The medium and large effects were shaded within the tables.

The following section presents the results from comparisons by means of a two-way ANOVA (Berenson *et al.*, 2012:408), and by way of two factors. These were indicated in the same manner in subsequent tables:

- Factor 1: Control/Experimental groups
  - Factor 2: OMT/CCM courses
- Control/Experimental groups \* OMT/CCM courses (four-group interaction)

Comparisons were guided by performing three analysis inquiries: (i) group comparisons before the intervention; (ii) comparisons between pre- and post-tests and within groups; (iii) group comparisons after the intervention. Findings were sequenced in each comparison by first discussing participants'

perceptions about their e-skill capabilities, thereafter the findings about tangible e-skill capabilities followed.

#### **5.4.1 Group comparisons before the intervention**

At the onset of the experiment, I first of all determined if there were significant interactions between Control and Experimental groups; secondly, if there were significant interactions between CCM and OMT courses, and where the differences were.

At instances where statistical results in tables did not indicate any significant interactions, comparisons between Control and Experimental groups (Factor 1) as well as between CCM and OMT (Factor 2) were examined. At instances where statistical results in tables indicated significant interactions, only these differences were examined. Calculated statistics are available in Addendum 5.3, Inferential statistics before the intervention.

Section §5.4.1.1, including Table 5.8, provides statistics on the subject of participants' perceptions before the intervention, whilst the second section, §5.4.1.2 and Table 5.9, provides statistics on participants' tangible e-literacy skills before the intervention. Refer to §4.5.6.1 for the analysis of measurement scales.

##### **5.4.1.1 Participants' perceptions about their e-literacy skills capabilities before the intervention**

Table 5.8 indicates significant effects in three constructs. These constructs indicate significant effects between the Control and Experimental groups (Factor 1) and these were found in the CCM qualification (Factor 2). The paragraphs below explain the analyses of this finding.

With reference to participants' perceptions on their Word processing capabilities, calculated results indicated a significant effect for perceptions in Control and Experimental groups,  $p=0.015$ .

The effect size ( $d=0.46$ ), indicated that this difference has a medium effect in the Control groups of CCM and OMT. The large effect size of,  $d=1.06$ , indicated the difference in the Control and Experimental group of the CCM qualification.

Outcomes on participants' perceptions on their Spreadsheet skills indicated a significant effect for the Control and Experimental group,  $p=0.007$ . The effect size ( $d=0.65$ ), indicated that this difference has a medium effect in the Experimental groups of CCM and OMT. The effect size indicated the difference ( $d=1.20$ , large effect) in the Control and Experimental group in the CCM qualification.

Participants' perceptions on their PDF skills indicated a significant effect,  $p=0.007$ , in the Experimental and Control group. The effect size ( $d=1.07$ , large effect), indicated the difference in the Control and Experimental group in the CCM qualification.

From the analysed results above, participants' opinions indicated a difference in their e-literacy skill capabilities. This difference was between the Control and the Experimental group of the CCM qualification.

Table 5.8 on the next page depicts statistics on participants' perceptions about their e-literacy skills capabilities before the intervention.

**Table 5.8: Participants' perceptions about their e-literacy skills capabilities before the intervention**

| Construct elements     | Means   |      |              |      | MSE  | P values |         |               | Effect sizes                 |                              |                              |                              |
|------------------------|---------|------|--------------|------|------|----------|---------|---------------|------------------------------|------------------------------|------------------------------|------------------------------|
|                        | Control |      | Experimental |      |      | E/C      | OMT/CCM | OMT/CCM * E/C | CCM<br>C<br>with<br>OMT<br>C | CCM<br>E<br>with<br>OMT<br>E | CCM<br>C<br>with<br>CCM<br>E | OMT<br>C<br>with<br>OMT<br>E |
|                        | CCM     | OMT  | CCM          | OMT  |      |          |         |               |                              |                              |                              |                              |
| Getting started        | 2.07    | 2.08 | 1.97         | 2.14 | 0.60 | 0.919    | 0.638   | 0.699         | 0.02                         | 0.22                         | 0.13                         | 0.07                         |
| Navigation skills      | 2.20    | 2.02 | 1.65         | 2.03 | 0.71 | 0.215    | 0.642   | 0.196         | 0.21                         | 0.45                         | 0.65                         | 0.01                         |
| File management skills | 2.46    | 2.44 | 2.03         | 2.19 | 0.86 | 0.154    | 0.774   | 0.703         | 0.02                         | 0.17                         | 0.46                         | 0.27                         |
| Web browsing skills    | 2.88    | 2.88 | 2.83         | 3.00 | 0.70 | 0.873    | 0.715   | 0.695         | 0.01                         | 0.19                         | 0.06                         | 0.14                         |
| E-mail usage           | 2.51    | 2.58 | 2.29         | 2.45 | 0.69 | 0.401    | 0.600   | 0.826         | 0.08                         | 0.19                         | 0.27                         | 0.16                         |
| Software usage         | 2.97    | 3.05 | 3.03         | 2.93 | 0.70 | 0.880    | 0.961   | 0.675         | 0.09                         | 0.12                         | 0.07                         | 0.15                         |
| Hardware operations    | 2.76    | 2.82 | 2.88         | 2.59 | 0.52 | 0.724    | 0.502   | 0.371         | 0.06                         | 0.40                         | 0.14                         | 0.32                         |
| Word processing skills | 3.04    | 2.63 | 2.08         | 2.43 | 0.82 | 0.015*   | 0.895   | 0.103         | 0.46 <sup>#</sup>            | 0.39                         | 1.06 <sup>*</sup>            | 0.21                         |
| Spreadsheet skills     | 3.50    | 3.21 | 2.50         | 3.05 | 0.70 | 0.007*   | 0.545   | 0.055         | 0.34                         | 0.65 <sup>#</sup>            | 1.20 <sup>#</sup>            | 0.20                         |
| Presentation skills    | 3.09    | 3.23 | 2.89         | 2.94 | 0.77 | 0.278    | 0.660   | 0.841         | 0.16                         | 0.06                         | 0.23                         | 0.33                         |
| PDF skills             | 3.77    | 3.44 | 2.87         | 3.15 | 0.71 | 0.007*   | 0.914   | 0.164         | 0.39                         | 0.33                         | 1.07 <sup>*</sup>            | 0.35                         |

\*p≤0.05

<sup>#</sup>d≤0.4 small with little or no significant difference

<sup>\*</sup>d0.4≤0.8 medium that tended towards practically significant difference

<sup>\*</sup>d≥0.8 large with practically significant difference

#### 5.4.1.2 Participants' application of their tangible e-literacy skills before the intervention

In this section, I determined if there were significant interactions between Control and Experimental groups; if there were significant interactions between CCM and OMT courses, and where the differences were. Table 5.9 indicates significant effects in all skills applications capabilities. Refer to §4.5.6.1 for the analysis of measurement scales. Calculated statistics are available in Addendum 5.3, Inferential statistics before the intervention. The following paragraphs explain the analyses of this finding.

There was a significant effect indicated for the application of File management skills,  $p=0.005$ , indicated in Control and Experimental groups. The effect size,  $d=1.33$ , indicated a large difference between the CCM Control and the OMT Control group. The effect size,  $d=1.33$ , indicated a large difference between the CCM Control and the CCM Experimental group.

There was a significant effect for Web browsing skills,  $p=0.000$ , indicated in the Control and Experimental group. The effect size,  $d=1.79$ , indicated a large effect difference between the CCM Control and the OMT Control group. The effect size,  $d=1.31$ , indicated a large effect difference between the CCM Control and the CCM Experimental group. The effect size,  $d=0.59$ , indicated a medium difference between the OMT Control and the OMT Experimental group.

There was a significant effect indicated for the application of Word processing skills,  $p=0.006$ , in the Control and Experimental group. The effect size,  $d=1.05$ , indicated a large effect difference between the CCM Control and the OMT Control group. The effect size,  $d=0.40$ , indicated a medium difference between the CCM Experimental and the OMT Experimental group. The effect size,  $d=1.22$  (large effect), indicated a large effect difference between the CCM Control and the CCM Experimental group.

There was a significant effect indicated for the application of Spreadsheet skills,  $p=0.004$ , in the Control and Experimental group. The effect size,  $d=1.02$ , indicated a large effect difference between the CCM Control and the OMT Control group. The effect size,  $d=0.48$ , indicated a medium difference between the CCM Experimental and the OMT Experimental group. The effect size,  $d=1.22$ , indicated a large effect difference between the CCM Control and the CCM Experimental group.

Table 5.9 depicts a significant effects for the application of Presentation skills,  $p=0.012$ , in the Control and Experimental group. The effect size,  $d=1.20$ , indicated a large effect difference between the CCM Control and the OMT Control group. The effect size,  $d=1.06$ , indicated a large effect difference between the CCM Control and the CCM Experimental group.

Statistics on participants' e-literacy skills application capabilities mentioned in the comparisons above are reflected in Table 5.9 on the next page.

**Table 5.9: Participants' e-literacy skills application capabilities before the intervention**

| Construct elements             | Means   |      |              |      | MSE  | P Values |         |                  | Effect sizes              |                           |                           |                           |
|--------------------------------|---------|------|--------------|------|------|----------|---------|------------------|---------------------------|---------------------------|---------------------------|---------------------------|
|                                | Control |      | Experimental |      |      | E/C      | OMT/CCM | OMT/CCM<br>* E/C | CCM<br>C with<br>OMT<br>C | CCM<br>E with<br>OMT<br>E | CCM<br>C with<br>CCM<br>E | OMT<br>C with<br>OMT<br>E |
|                                | CCM     | OMT  | CCM          | OMT  |      |          |         |                  |                           |                           |                           |                           |
| File management skills applied | 2.10    | 2.74 | 2.74         | 2.67 | 0.23 | 0.023    | 0.023   | 0.005*           | 1.33 <sup>#</sup>         | 0.15                      | 1.33 <sup>#</sup>         | 0.15                      |
| Web browsing skills applied    | 1.40    | 2.53 | 2.23         | 2.16 | 0.40 | 0.165    | 0.001   | 0.000*           | 1.79 <sup>#</sup>         | 0.11                      | 1.31 <sup>#</sup>         | 0.59 <sup>#</sup>         |
| Word processing skills applied | 1.07    | 1.80 | 1.92         | 1.64 | 0.49 | 0.058    | 0.209   | 0.006*           | 1.05 <sup>#</sup>         | 0.40 <sup>#</sup>         | 1.22 <sup>#</sup>         | 0.23                      |
| Spreadsheet skills applied     | 1.00    | 1.62 | 1.74         | 1.45 | 0.37 | 0.069    | 0.294   | 0.004*           | 1.02 <sup>#</sup>         | 0.48 <sup>#</sup>         | 1.22 <sup>#</sup>         | 0.28                      |
| Presentation skills applied    | 1.00    | 1.79 | 1.70         | 1.62 | 0.44 | 0.119    | 0.039   | 0.012*           | 1.20 <sup>#</sup>         | 0.12                      | 1.06 <sup>#</sup>         | 0.26                      |

\*p≤0.05

<sup>#</sup>d≤0.4 small with little or no significant difference

<sup>#</sup>d0.4≤0.8 medium that tended towards practically significant difference

<sup>¥</sup>d≥0.8 large with practically significant difference

From the above results participants' opinions indicated a difference in their e-literacy skill capabilities. This difference was between the Control and the Experimental group of the CCM qualification.

The next section will describe comparisons between pre- and post-tests.

#### **5.4.2 Comparisons between pre- and post-tests**

In experiments and fixed designs, data are aggregated rather than related to specific individuals, and look for averages, a range of results, and variations. In calculating differences or similarities between groups at the stages of the pre-test and the post-test, the dependent t-test test (Berenson *et al.*, 2012:408) was used. Calculated statistics are available in Addendum 5.4, Paired inferential statistics. Refer to §4.5.6.1 for the analysis of measurement scales.

In this section four core comparisons were made, and statistical differences between the pre- and post-test, between the control and experimental groups, between qualifications as well as the four-group\* interaction §4.5.6.1 are depicted. The four associations covered are:

- Differences with regard to participants' perceptions around their e-literacy skill capabilities before and after the intervention contained in the Control and Experimental groups and in the CCM and OMT courses, discussed in §5.4.2.1 - §5.4.2.4
- Differences pertaining to participants' actual tangible e-literacy skills application before and after the intervention in the Control and Experimental groups of CCM and OMT, discussed in §5.4.2.5 and §5.4.2.6
- Differences related to participants' perceptions around their e-literacy skill capabilities compared with their actual tangible e-literacy skills application before the intervention within the Control and Experimental groups per qualification, discussed in §5.4.2.7
- Differences concerning participants' perceptions around their e-literacy skill capabilities compared with their actual tangible e-literacy skills application after the intervention within the Control and Experimental groups per qualification, discussed in §5.4.2.8.

With reference to bullet one, descriptions on comparisons between the Control and Experimental groups in the CCM qualification can be found in §5.4.2.1 and §5.4.2.2. Thereafter a discussion on the comparisons between the Control and Experimental group in the OMT qualification (§5.4.2.3 and §5.4.2.4) follows. Numerical data for the associations are depicted in Tables 5.10 – 5.13.

##### **5.4.2.1 Participants' perceptions about their e-literacy skills capabilities between the pre- and post-test in the Control group of CCM**

The dependent t-tests results shown in Table 5.10 demonstrates that there were no significant effects pointed out for any construct between the pre- and post-test for the Control group of the CCM diploma. *P*

values for all constructs ranged from  $p=0.079$  until  $p=0.944$ . Table 5.10 illustrates the significant effect ( $p$  values) and effect sizes ( $d$  values) of the Control group in the CCM qualification.

**Table 5.10: Participants' perceptions about their e-literacy skills capabilities between the pre- and post-test for Control group in CCM**

| Paired Samples Statistics |     |                        |          |    |                |           |    |                |       |
|---------------------------|-----|------------------------|----------|----|----------------|-----------|----|----------------|-------|
|                           |     |                        | Pre-test |    |                | Post-test |    |                |       |
|                           |     |                        | Mean     | N  | Std. Deviation | Mean      | N  | Std. Deviation |       |
| Control                   | CCM | Getting started        | 2.07     | 10 | 0.70           | 1.92      | 10 | 0.70           | 0.193 |
|                           |     | Navigation capability  | 2.20     | 10 | 0.91           | 2.10      | 10 | 0.83           | 0.722 |
|                           |     | File management        | 2.46     | 10 | 0.76           | 2.44      | 10 | 0.99           | 0.944 |
|                           |     | Web browsing           | 2.88     | 10 | 0.59           | 3.15      | 10 | 0.60           | 0.137 |
|                           |     | E-mail                 | 2.51     | 10 | 0.84           | 2.50      | 10 | 0.87           | 0.928 |
|                           |     | Software usage         | 2.97     | 10 | 0.71           | 3.06      | 10 | 0.98           | 0.737 |
|                           |     | Hardware operations    | 2.76     | 10 | 0.49           | 2.83      | 10 | 0.62           | 0.662 |
|                           |     | Word Processing skills | 3.04     | 10 | 0.73           | 3.15      | 10 | 0.87           | 0.690 |
|                           |     | Spreadsheet skills     | 3.50     | 10 | 0.52           | 3.66      | 10 | 0.39           | 0.120 |
|                           |     | Presentation skills    | 3.09     | 10 | 0.60           | 3.39      | 10 | 0.59           | 0.079 |
|                           |     | PDF skills             | 3.77     | 10 | 0.50           | 3.83      | 10 | 0.36           | 0.716 |

\* $p \leq 0.05$

# $d \leq 0.4$  small with little or no significant difference

\* $d 0.4 \leq 0.8$  medium that tended towards practically significant difference

\* $d \geq 0.8$  large with practically significant difference

Results above indicated no significant effects for CCM Control group in their perceptions about their e-skill capabilities between the pre- and post-test. It is concluded that the CCM Control group did not experience any perceptual e-literacy skill capability differences.

#### 5.4.2.2 Participants' perceptions about their e-literacy skills capabilities between the pre- and post-test in the Experimental group of CCM

The results summarised in Table 5.11 show significant effects with values ranging from  $p=0.000$  to  $p=0.020$  between the pre- and post-test for all eleven constructs in the Experimental group of the CCM diploma. Effect sizes for all items measured from  $d=0.83$  to  $d=2.08$  (large effects), indicating an important significant difference in practice.

Table 5.11, on the next page, illustrates the significant effect ( $p$  values) and effect sizes ( $d$  values) of the Experimental group in the CCM qualification.

**Table 5.11: Participants' perceptions about their e-literacy skills capabilities between the pre- and post-test for Experimental group in CCM**

| Paired Samples Statistics                                |             |                        |          |    |                |           |    |                |                          |
|----------------------------------------------------------|-------------|------------------------|----------|----|----------------|-----------|----|----------------|--------------------------|
|                                                          |             |                        | Pre-test |    |                | Post-test |    |                |                          |
|                                                          |             |                        | Mean     | N  | Std. Deviation | Mean      | N  | Std. Deviation |                          |
| E<br>x<br>p<br>e<br>r<br>i<br>m<br>e<br>n<br>t<br>a<br>l | C<br>C<br>M | Getting started        | 1.97     | 10 | 0.51           | 1.00      | 10 | 0.00           | 0.000* 1.90 <sup>‡</sup> |
|                                                          |             | Navigation capability  | 1.65     | 10 | 0.70           | 1.07      | 10 | 0.14           | 0.020* 0.83 <sup>‡</sup> |
|                                                          |             | File management        | 2.03     | 10 | 1.07           | 1.06      | 10 | 0.14           | 0.012* 0.92 <sup>‡</sup> |
|                                                          |             | Web browsing           | 2.83     | 10 | 0.83           | 1.30      | 10 | 0.41           | 0.000* 1.85 <sup>‡</sup> |
|                                                          |             | E-mail                 | 2.29     | 10 | 0.80           | 1.45      | 10 | 0.45           | 0.007* 1.05 <sup>‡</sup> |
|                                                          |             | Software usage         | 3.03     | 10 | 0.80           | 1.43      | 10 | 0.52           | 0.000* 2.01 <sup>‡</sup> |
|                                                          |             | Hardware operations    | 2.88     | 10 | 0.52           | 1.80      | 10 | 0.55           | 0.000* 2.08 <sup>‡</sup> |
|                                                          |             | Word Processing skills | 2.08     | 10 | 0.95           | 1.05      | 10 | 0.07           | 0.007* 1.09 <sup>‡</sup> |
|                                                          |             | Spreadsheet skills     | 2.50     | 10 | 0.86           | 1.11      | 10 | 0.21           | 0.000* 1.62 <sup>‡</sup> |
|                                                          |             | Presentation skills    | 2.89     | 10 | 1.17           | 1.09      | 10 | 0.20           | 0.001* 1.54 <sup>‡</sup> |
|                                                          |             | PDF skills             | 2.87     | 10 | 1.04           | 1.10      | 10 | 0.32           | 0.000* 1.69 <sup>‡</sup> |

\*p≤0.05

<sup>#</sup>d≤0.4 small with little or no significant difference

<sup>‡</sup>d0.4≤0.8 medium that tended towards practically significant difference

<sup>‡</sup>d≥0.8 large with practically significant difference

Results above indicated significant effects for CCM Experimental group in their perceptions about their e-skill capabilities between the pre- and post-test. It is therefore concluded that the CCM Experimental group experienced perceptual e-literacy skill capability differences.

#### 5.4.2.3 Participants' perceptions about their e-literacy skill capabilities between the pre- and post-test in the Control group of OMT

Table 5.12 shows significant effects for three constructs in the Control group of OMT. For construct Getting started, p=0.016 was indicated. The effect size indicated that this difference was not important in practice (small effect d=0.28). Besides this, there was a significant effect indicated for File management, p=0.002, and Presentation skills, p=0.038. Effect sizes of the above constructs indicated that these differences were medium, d=0.42, and small, d=0.34.

Table 5.12 on the next page illustrates the significant effect (p values) and effect sizes (d values) of the Control group in the OMT qualification.

**Table 5.12 Participants' perceptions about their e-literacy skills capabilities between the pre- and post-test for Control group in OMT**

| Paired Samples Statistics       |             |                        |          |    |                |           |    |                |                          |
|---------------------------------|-------------|------------------------|----------|----|----------------|-----------|----|----------------|--------------------------|
|                                 |             |                        | Pre-test |    |                | Post-test |    |                |                          |
|                                 |             |                        | Mean     | N  | Std. Deviation | Mean      | N  | Std. Deviation |                          |
| C<br>o<br>n<br>t<br>r<br>o<br>l | O<br>M<br>T | Getting started        | 2.08     | 34 | 0.73           | 1.88      | 34 | 0.58           | 0.016* 0.28 <sup>#</sup> |
|                                 |             | Navigation capability  | 2.02     | 34 | 0.79           | 1.88      | 34 | 0.81           | 0.252 0.17               |
|                                 |             | File management        | 2.44     | 34 | 0.89           | 2.07      | 34 | 0.81           | 0.002* 0.42 <sup>#</sup> |
|                                 |             | Web browsing           | 2.88     | 34 | 0.80           | 2.85      | 34 | 0.94           | 0.795 0.04               |
|                                 |             | E-mail                 | 2.58     | 34 | 0.83           | 2.61      | 34 | 0.85           | 0.729 0.04               |
|                                 |             | Software usage         | 3.05     | 34 | 0.83           | 3.11      | 34 | 0.90           | 0.563 0.08               |
|                                 |             | Hardware operations    | 2.82     | 34 | 0.74           | 2.69      | 34 | 0.82           | 0.245 0.17               |
|                                 |             | Word Processing skills | 2.63     | 34 | 0.89           | 2.42      | 34 | 0.96           | 0.067 0.23               |
|                                 |             | Spreadsheet skills     | 3.21     | 34 | 0.80           | 3.16      | 34 | 0.99           | 0.711 0.06               |
|                                 |             | Presentation skills    | 3.23     | 34 | 0.81           | 2.96      | 34 | 1.11           | 0.038* 0.34 <sup>#</sup> |
|                                 |             | PDF skills             | 3.44     | 34 | 0.80           | 3.25      | 34 | 1.06           | 0.193 0.25               |

\*p≤0.05

<sup>#</sup>d≤0.4 small with little or no significant difference

<sup>#</sup>d0.4≤0.8 medium that tended towards practically significant difference

<sup>¥</sup>d≥0.8 large with practically significant difference

Results above indicated some significant effects in OMT Control group in their perceptions about their e-skill capabilities between the pre- and post-test. Thus it is concluded that the OMT Control group experienced limited perceptual e-literacy skill capability differences.

#### 5.4.2.4 Participants' perceptions about their e-literacy skill capabilities between the pre- and post-test in the Experimental group of OMT

A pattern was discovered within the Experimental group of the OMT qualification, similar to that (Table 5.13) in the Experimental group of the CCM qualification. Significant differences on all aspects between the two groups were noticeable with similar values of p=0.000 for constructs: Getting started; Navigation capabilities; File management; Web browsing; E-mail; Software usage; Word processing; Spreadsheet and Presentation as well as PDF skills. Construct Hardware operations indicated a p=0.001, indeed a significant effect, according to Field (2009:675). Effect sizes vary between d=0.56 and d=1.84 (medium to large effects), indicating that these effects are important in practice. Cresswell (2012:188) states that effect sizes are a way of identifying the practical strength of conclusions about group differences.

Table 5.13, on the next page, illustrates the significant effect (p values) and effect sizes (d values) of the Experimental group in the OMT qualification.

**Table 5.13 Participants' perceptions about their e-literacy skills capabilities between the pre- and post-test for Experimental group in OMT**

| Paired Samples Statistics                                |             |                        |          |    |                |           |    |                |                          |
|----------------------------------------------------------|-------------|------------------------|----------|----|----------------|-----------|----|----------------|--------------------------|
|                                                          |             |                        | Pre-test |    |                | Post-test |    |                |                          |
|                                                          |             |                        | Mean     | N  | Std. Deviation | Mean      | N  | Std. Deviation |                          |
| E<br>x<br>p<br>e<br>r<br>i<br>m<br>e<br>n<br>t<br>a<br>l | O<br>M<br>T | Getting started        | 2.14     | 32 | 0.89           | 1.15      | 32 | 0.22           | 0.000* 1.12 <sup>‡</sup> |
|                                                          |             | Navigation capability  | 2.03     | 32 | 0.92           | 1.11      | 32 | 0.20           | 0.000* 1.00 <sup>‡</sup> |
|                                                          |             | File management        | 2.19     | 32 | 0.96           | 1.30      | 32 | 0.35           | 0.000* 0.93 <sup>‡</sup> |
|                                                          |             | Web browsing           | 3.00     | 32 | 0.93           | 1.64      | 32 | 0.69           | 0.000* 1.45 <sup>‡</sup> |
|                                                          |             | E-mail                 | 2.45     | 32 | 0.83           | 1.80      | 32 | 0.82           | 0.000* 0.77 <sup>‡</sup> |
|                                                          |             | Software usage         | 2.93     | 32 | 0.88           | 1.85      | 32 | 0.76           | 0.000* 1.22 <sup>‡</sup> |
|                                                          |             | Hardware operations    | 2.59     | 32 | 0.80           | 2.13      | 32 | 0.76           | 0.001* 0.56 <sup>‡</sup> |
|                                                          |             | Word Processing skills | 2.43     | 32 | 0.96           | 1.21      | 32 | 0.35           | 0.000* 1.27 <sup>‡</sup> |
|                                                          |             | Spreadsheet skills     | 3.04     | 32 | 0.93           | 1.43      | 32 | 0.64           | 0.000* 1.73 <sup>‡</sup> |
|                                                          |             | Presentation skills    | 2.94     | 32 | 0.92           | 1.25      | 32 | 0.55           | 0.000* 1.84 <sup>‡</sup> |
|                                                          |             | PDF skills             | 3.15     | 32 | 0.90           | 1.72      | 32 | 0.62           | 0.000* 1.59 <sup>‡</sup> |

\*p≤0.05

<sup>‡</sup>d≤0.4 small with little or no significant difference

<sup>#</sup>d0.4≤0.8 medium that tended towards practically significant difference

<sup>‡</sup>d≥0.8 large with practically significant difference

Results above indicated significant effects for OMT Experimental group in their perceptions about their e-skill capabilities between the pre- and post-test. It is concluded that the OMT Experimental group experienced perceptual e-literacy skill differences.

Subsequently, with regard to bullet two, the second comparison, I describe and explain evaluations of participants' tangible e-literacy skills application at the beginning with their tangible e-literacy skills application at the end. These associations are depicted in Tables 5.14 and 5.15. Analysed data between the Control and Experimental group in the CCM qualification can be found in §5.4.2.5 followed by discussions on comparisons between the Control and Experimental group in the OMT qualification in §5.4.2.6.

#### **5.4.2.5 Participants' tangible e-literacy skills application between the pre- and post-test for Control and Experimental groups of CCM**

Results of dependent t-test and effect sizes in Table 5.14 indicated significant effects in three constructs for the Control group of CCM. A significant effect for Web browsing capabilities, p=0.010, were indicated. The effect size indicated that this difference is important in practice (d=1.74, large effect,). Significant effects for Spreadsheet, p=0.032, as well as Presentation skills, p=0.042, were indicated. The effect sizes for the three constructs indicated that these differences were important in practice (d=0.80 and d=0.75, large effects).

Results of dependent t-test and effect sizes in Table 5.14 indicated significant effects in four constructs for the Experimental group of CCM. Low  $p$  values ( $p < 0.05$ ) indicated a significant effect for Web browsing application,  $p = 0.013$ ; Word processing,  $p = 0.003$ ; Spreadsheet,  $p = 0.000$ , and Presentation skills,  $p = 0.001$ . Effect sizes showed large effects of,  $d = 0.98$ ;  $d = 1.19$ ;  $d = 1.56$  and  $d = 1.52$ , indicating that these differences were important in practice. No significant effect was indicated for construct File Management. Table 5.14 illustrates the significant effect ( $p$  values) and effect sizes ( $d$  values) of the Control and Experimental groups in the OMT qualification.

**Table 5.14: Participants' tangible e-literacy skill applications between the pre- and post-test in the Control and Experimental groups for CCM**

| Paired Samples Statistics |     |                    |          |    |                |           |    |                |        |
|---------------------------|-----|--------------------|----------|----|----------------|-----------|----|----------------|--------|
|                           |     |                    | Pre-test |    |                | Post-test |    |                |        |
|                           |     |                    | Mean     | N  | Std. Deviation | Mean      | N  | Std. Deviation |        |
| C                         | CCM | File management    | 2.10     | 10 | 0.69           | 2.44      | 10 | 0.51           | 0.169  |
|                           |     | Web browsing       | 1.40     | 10 | 0.52           | 2.30      | 10 | 0.67           | 0.010* |
|                           |     | Word processing    | 1.07     | 10 | 0.21           | 1.37      | 10 | 0.57           | 0.179  |
|                           |     | Spreadsheet skill  | 1.00     | 10 | 0.00           | 1.36      | 10 | 0.45           | 0.032* |
|                           |     | Presentation skill | 1.00     | 10 | 0.00           | 1.40      | 10 | 0.53           | 0.042* |
| E                         | CCM | File management    | 2.74     | 10 | 0.63           | 2.98      | 10 | 0.06           | 0.265  |
|                           |     | Web browsing       | 2.23     | 10 | 0.79           | 3.00      | 10 | 0.00           | 0.013* |
|                           |     | Word processing    | 1.92     | 10 | 0.87           | 2.95      | 10 | 0.16           | 0.003* |
|                           |     | Spreadsheet skill  | 1.74     | 10 | 0.71           | 2.84      | 10 | 0.21           | 0.000* |
|                           |     | Presentation skill | 1.70     | 10 | 0.79           | 2.90      | 10 | 0.22           | 0.001* |

\* $p < 0.05$

# $d \leq 0.4$  small with little or no significant difference

\* $d 0.4 \leq 0.8$  medium that tended towards practically significant difference

\* $d \geq 0.8$  large with practically significant difference

Results above indicated a number of significant effects for CCM's experimental participants on their tangible e-literacy skills application capabilities between the pre- and post-test. Only file management did not show any difference between the control and experimental group. Thus, it is concluded that CCM experimental participants experienced tangible e-literacy skill differences.

#### 5.4.2.6 Participants' tangible e-literacy skills applications between the pre- and post-test in the Control and Experimental groups for OMT

Table 5.15 below indicated one significant effect for tangible e-literacy skills application between the pre- and post-test in the Control group of the OMT diploma. Results indicated a significant effect,  $p = 0.003$ , for Word processing application only. The effect size ( $d = 0.47$ ) indicated a medium effect, indicating a tendency to practical significance.

Table 5.15 shows results of the dependent t-tests and indicated significant effects about participant's tangible e-literacy skills application capabilities between the pre- and post-test for the Experimental group of the OMT qualification. Significant effects were indicated at all five constructs such as:  $p=0.017$ , for File management application;  $p=0.000$ , for Web browsing application;  $p=0.000$ , for Word processing application;  $p=0.000$ , for Spreadsheet; and  $p=0.000$ , for Presentation skills application. The effect sizes for the Experimental group indicated medium as well as large effects, with results like:  $d=0.45$ ;  $d=0.98$ ;  $d=1.35$ ;  $d=1.61$  and  $d=1.45$ , respectively. Table 5.15 illustrates the significant effect ( $p$  values) and effect sizes ( $d$  values) of the Control and Experimental groups in the OMT qualification.

**Table 5.15: Participants' tangible e-literacy skill applications between the pre- and post-test in the Control and Experimental groups for OMT**

| Paired Samples Statistics |     |                    |          |    |                |           |    |                |        |
|---------------------------|-----|--------------------|----------|----|----------------|-----------|----|----------------|--------|
|                           |     |                    | Pre-test |    |                | Post-test |    |                |        |
|                           |     |                    | Mean     | N  | Std. Deviation | Mean      | N  | Std. Deviation |        |
| C                         | OMT | File management    | 2.74     | 34 | 0.37           | 2.83      | 34 | 0.32           | 0.274  |
|                           |     | Web browsing       | 2.53     | 34 | 0.54           | 2.51      | 34 | 0.47           | 0.859  |
|                           |     | Word processing    | 1.80     | 34 | 0.64           | 2.10      | 34 | 0.63           | 0.003* |
|                           |     | Spreadsheet skill  | 1.62     | 34 | 0.54           | 1.79      | 34 | 0.65           | 0.106  |
|                           |     | Presentation skill | 1.79     | 34 | 0.62           | 1.90      | 34 | 0.68           | 0.455  |
| E                         | OMT | File management    | 2.67     | 32 | 0.46           | 2.88      | 32 | 0.24           | 0.017* |
|                           |     | Web browsing       | 2.16     | 32 | 0.70           | 2.84      | 32 | 0.31           | 0.000* |
|                           |     | Word processing    | 1.64     | 32 | 0.79           | 2.70      | 32 | 0.46           | 0.000* |
|                           |     | Spreadsheet skill  | 1.45     | 32 | 0.72           | 2.61      | 32 | 0.47           | 0.000* |
|                           |     | Presentation skill | 1.62     | 32 | 0.75           | 2.71      | 32 | 0.44           | 0.000* |

\* $p<0.05$

# $d\leq 0.4$  small with little or no significant difference

\* $d0.4\leq 0.8$  medium that tended towards practically significant difference

\* $d\geq 0.8$  large with practically significant difference

Results above indicated significant effects for OMT Experimental group on tangible e-literacy skills application capabilities between the pre- and post-test. The experimental group with the help of the e-readiness toolkit gained valuable skills and competencies. Hence it is concluded that OMT experimental group experienced tangible e-literacy skills capability differences.

Clarifications and analyses of numerical data on the third comparison are conferred next. I compared participants' perceptions about their e-skill capabilities with their tangible e-literacy skills application before the intervention within the Control and Experimental group per qualification. Outcomes of results for CCM are discussed firstly (Table 5.16), whilst the second breakdown covers outcomes of results for OMT (Table 5.17). Refer to §4.5.6.1 for the analysis of measurement scales

#### 5.4.2.7 Participants' perceptions about their e-literacy skill capabilities compared with their tangible e-literacy skills application before the intervention within the Control and Experimental group for CCM and OMT

There were no significant effects indicated in Table 5.16 between participants' perceptions and their actual e-literacy skills abilities in the Control group of the CCM qualification. However, a significant effect was indicated for Presentation skills,  $p=0.014$ . The effect size indicated that this difference was important in practice (large effect  $d=0.96$ ).

There were no significant effects indicated in Table 5.16 between participants' perceptions and their actual e-literacy skills abilities in the Experimental group of the CCM qualification. However, there was a significant effect indicated for one construct, Web browsing,  $p=0.025$ . The effect size indicated that this difference was important in practice (large effect  $d=0.97$ ).

Table 5.16 below provides records of analysed data of participants' perceptions compared with their tangible e-literacy skills application before the intervention between Control and Experimental groups for CCM.

**Table 5.16: Participants' perceptions compared with their tangible e-literacy skills application before the intervention between the Control and Experimental groups in CCM**

| Paired Samples Statistics |     |                 |          |    |                |           |    |                |         |
|---------------------------|-----|-----------------|----------|----|----------------|-----------|----|----------------|---------|
|                           |     |                 | Pre-test |    |                | Post-test |    |                | P value |
|                           |     |                 | Mean     | N  | Std. Deviation | Mean      | N  | Std. Deviation |         |
| C                         | CCM | File management | 2.46     | 10 | 0.76           | 2.20      | 10 | 0.93           | 0.421   |
|                           |     | Web browsing    | 2.88     | 10 | 0.59           | 3.13      | 10 | 0.69           | 0.248   |
|                           |     | Word processing | 3.04     | 10 | 0.73           | 3.58      | 10 | 0.28           | 0.073   |
|                           |     | Spreadsheet     | 3.50     | 10 | 0.52           | 3.67      | 10 | 0.00           | 0.336   |
|                           |     | Presentation    | 3.09     | 10 | 0.60           | 3.67      | 10 | 0.00           | 0.014*  |
| E                         | CCM | File management | 2.03     | 10 | 1.07           | 1.35      | 10 | 0.83           | 0.176   |
|                           |     | Web browsing    | 2.83     | 10 | 0.83           | 2.03      | 10 | 1.06           | 0.025*  |
|                           |     | Word processing | 2.08     | 10 | 0.95           | 2.44      | 10 | 1.15           | 0.249   |
|                           |     | Spreadsheet     | 2.50     | 10 | 0.86           | 2.68      | 10 | 0.94           | 0.381   |
|                           |     | Presentation    | 2.89     | 10 | 1.17           | 2.73      | 10 | 1.05           | 0.424   |

\* $p \leq 0.05$

#  $d \leq 0.4$  small with little or no significant difference

\*  $d 0.4 \leq 0.8$  medium that tended towards practically significant difference

\*  $d \geq 0.8$  large with practically significant difference

Results above indicated selected significant effects for CCM participants on their perceptions and their actual skills before the intervention. It is concluded that CCM participants did not experience any difference between their perceived and actual e-literacy skill capabilities before the intervention.

Significant effects were indicated in Table 5.17 below, between participants' perceptions and their actual tangible e-literacy skill abilities in the Control group of the OMT qualification. For construct File management,  $p=0.000$ , the effect size (large effect  $d=1.23$ ), indicated that this difference was important in practice. For Web browsing,  $p=0.000$ , the effect size indicated that this difference was important in practice (large effect  $d=1.56$ ). For Spreadsheet application,  $p=0.017$ , the effect size indicated that this difference might be important in practice (medium effect  $d=0.46$ ). For Presentation application,  $p=0.000$ , the effect size indicated that this difference might be important in practice (medium effect  $d=0.76$ ). No significant effect was indicated for construct Word processing.

Significant effects in the Experimental group of OMT indicated differences for File management,  $p=0.000$ . The effect size indicated that this difference might be important in practice (medium effect  $d=0.78$ ); for Web browsing,  $p=0.000$ . The effect size indicated that this difference was important in practice (large effect  $d=0.93$ ), as well as for Word processing,  $p=0.023$ . The effect size indicated that this difference was important in practice (medium effect  $d=0.40$ ). No significant effects were indicated for constructs Spreadsheet and Presentations.

Table 5.17 provides records of analysed data of participants' perceptions compared with their tangible e-literacy skills application before the intervention between Control and Experimental groups for OMT.

**Table 5.17: Participants' perceptions compared with their tangible e-literacy skills application before the intervention between the Control and Experimental groups in OMT**

| Paired Samples Statistics |     |                 |          |    |                |           |    |                |         |
|---------------------------|-----|-----------------|----------|----|----------------|-----------|----|----------------|---------|
|                           |     |                 | Pre-test |    |                | Post-test |    |                | P value |
|                           |     |                 | Mean     | N  | Std. Deviation | Mean      | N  | Std. Deviation |         |
| C                         | OMT | File management | 2.44     | 34 | 0.89           | 1.35      | 34 | 0.50           | 0.000*  |
|                           |     | Web browsing    | 2.88     | 34 | 0.80           | 1.63      | 34 | 0.71           | 0.000*  |
|                           |     | Word processing | 2.63     | 34 | 0.89           | 2.60      | 34 | 0.85           | 0.855   |
|                           |     | Spreadsheet     | 3.21     | 34 | 0.80           | 2.84      | 34 | 0.72           | 0.017*  |
|                           |     | Presentation    | 3.23     | 34 | 0.81           | 2.62      | 34 | 0.82           | 0.000*  |
| E                         | OMT | File management | 2.19     | 32 | 0.96           | 1.44      | 32 | 0.61           | 0.000*  |
|                           |     | Web browsing    | 3.00     | 32 | 0.93           | 2.13      | 32 | 0.93           | 0.000*  |
|                           |     | Word processing | 2.43     | 32 | 0.96           | 2.82      | 32 | 1.05           | 0.023*  |
|                           |     | Spreadsheet     | 3.04     | 32 | 0.93           | 3.07      | 32 | 0.97           | 0.904   |
|                           |     | Presentation    | 2.94     | 32 | 0.92           | 2.84      | 32 | 1.00           | 0.631   |

\* $p<0.05$

# $d\leq 0.4$  small with little or no significant difference

\* $d0.4\leq 0.8$  medium that tended towards practically significant difference

\* $d\geq 0.8$  large with practically significant difference

Results above indicated some significant effects for OMT participants amongst their perceptions and their actual skills before the intervention. It is concluded that OMT participants experienced differences between their perceived and actual e-literacy skill capabilities before the intervention.

In the final comparison (§5.4.2.8, Tables 5.18 and 5.19), I compared participants' perceptions with their tangible e-literacy skills after the intervention within the Control and Experimental group per qualification. Refer to §4.5.6.1 for the analysis of measurement scales.

#### 5.4.2.8 Participants' perceptions about their e-skills capabilities before the intervention between the Control and Experimental controlling for their e-literacy skills capabilities after the intervention

Table 5.18 below demonstrates significant effects in two constructs File management,  $p=0.023$ ; and Web browsing,  $p=0.002$ , for the Control group of the CCM qualification. The effect size for File management (medium effect  $d=0.71$ ) and for Web browsing (large effect  $d=2.03$ ) indicated that these differences were important in practice.

No significant effects were indicated for Experimental groups in the CCM qualification. However, one significant effect was indicated for Web browsing in the Experimental group of CCM,  $p=0.048$ , with an effect size of (large effect  $d=0.72$ ), indicating that this difference was important in practice.

**Table 5.18: Participants' perceptions compared with tangible e-literacy skills application after the intervention in CCM**

| Paired Samples Statistics |     |                 |          |    |                |           |    |                |        |
|---------------------------|-----|-----------------|----------|----|----------------|-----------|----|----------------|--------|
|                           |     |                 | Pre-test |    |                | Post-test |    |                |        |
|                           |     |                 | Mean     | N  | Std. Deviation | Mean      | N  | Std. Deviation |        |
| C                         | CCM | File management | 2.44     | 10 | 0.99           | 1.75      | 10 | 0.67           | 0.023* |
|                           |     | Web browsing    | 3.15     | 10 | 0.60           | 1.93      | 10 | 0.90           | 0.002* |
|                           |     | Word processing | 3.15     | 10 | 0.87           | 3.18      | 10 | 0.76           | 0.858  |
|                           |     | Spreadsheet     | 3.66     | 10 | 0.39           | 3.19      | 10 | 0.60           | 0.060  |
|                           |     | Presentation    | 3.39     | 10 | 0.59           | 3.13      | 10 | 0.71           | 0.381  |
| E                         | CCM | File management | 1.06     | 10 | 0.14           | 1.03      | 10 | 0.08           | 0.589  |
|                           |     | Web browsing    | 1.30     | 10 | 0.41           | 1.00      | 10 | 0.00           | 0.048* |
|                           |     | Word processing | 1.05     | 10 | 0.07           | 1.07      | 10 | 0.21           | 0.757  |
|                           |     | Spreadsheet     | 1.11     | 10 | 0.21           | 1.21      | 10 | 0.28           | 0.107  |
|                           |     | Presentation    | 1.09     | 10 | 0.20           | 1.13      | 10 | 0.29           | 0.465  |

\* $p \leq 0.05$

#  $d \leq 0.4$  small with little or no significant difference

\*  $d 0.4 \leq 0.8$  medium that tended towards practically significant difference

\*  $d \geq 0.8$  large with practically significant difference

Results above indicated some significant effects for CCM participants amongst their perceptions and their actual skills after the intervention. It is concluded that CCM participants experienced selected differences between their perceptions and actual e-literacy skill capabilities after the intervention.

Table 5.19 below indicates significant effects in four constructs for the Control group of OMT. A significant effect was indicated for File management  $p=0.000$ . The effect size indicated that this difference was important in practice (large effect  $d=1.04$ ). A significant effect was indicated for Web browsing in the same group of OMT,  $p=0.000$ . The effect size indicated that this difference was important in practice (large effect  $d=1.26$ ). Effects for Spreadsheet,  $p=0.002$ , as well as Presentation application,  $p=0.027$ , were indicated. The effect size for the first item indicated that this difference was important in practice, (medium effect  $d=-0.56$ ). The effect size for the second item, however, indicated that this difference was important in practice (medium effect  $d=0.44$ ). No significant effect was indicated for construct Word Processing.

Table 5.19 below indicates no significant effects for the Experimental group in the OMT qualification. However, a significant effect was indicated for File management,  $p=0.039$ . The effect size indicated that this difference was not important in practice (small effect  $d=0.38$ ). A significant effect was indicated for Web browsing,  $p=0.003$ . The effect size indicated that this difference was important in practice (medium effect  $d=0.63$ ).

**Table 5.19: Participants' perceptions compared with tangible e-literacy skills application after the intervention in OMT**

| Paired Samples Statistics |     |                 |          |    |                |           |    |                |        |
|---------------------------|-----|-----------------|----------|----|----------------|-----------|----|----------------|--------|
|                           |     |                 | Pre-test |    |                | Post-test |    |                |        |
|                           |     |                 | Mean     | N  | Std. Deviation | Mean      | N  | Std. Deviation |        |
| C                         | OMT | File management | 2.07     | 34 | 0.81           | 1.23      | 34 | 0.43           | 0.000* |
|                           |     | Web browsing    | 2.85     | 34 | 0.94           | 1.66      | 34 | 0.62           | 0.000* |
|                           |     | Word processing | 2.42     | 34 | 0.96           | 2.20      | 34 | 0.84           | 0.164  |
|                           |     | Spreadsheet     | 3.16     | 34 | 0.99           | 2.61      | 34 | 0.86           | 0.002* |
|                           |     | Presentation    | 2.96     | 34 | 1.11           | 2.47      | 34 | 0.90           | 0.027* |
| E                         | OMT | File management | 1.30     | 32 | 0.35           | 1.17      | 32 | 0.32           | 0.039* |
|                           |     | Web browsing    | 1.64     | 32 | 0.69           | 1.21      | 32 | 0.41           | 0.003* |
|                           |     | Word processing | 1.21     | 32 | 0.35           | 1.40      | 32 | 0.62           | 0.082  |
|                           |     | Spreadsheet     | 1.43     | 32 | 0.64           | 1.52      | 32 | 0.62           | 0.517  |
|                           |     | Presentation    | 1.25     | 32 | 0.55           | 1.39      | 32 | 0.59           | 0.221  |

\* $p<0.05$

# $d\leq 0.4$  small with little or no significant difference

\* $d0.4\leq 0.8$  medium that tended towards practically significant difference

\* $d\geq 0.8$  large with practically significant difference

Results above indicated significant effects for OMT participants amongst their perceptions and their actual skills after the intervention. It is therefore concluded that OMT participants experienced a difference between their perceived and actual e-literacy skill capabilities after the intervention.

### 5.4.3 Group comparisons after the intervention

An ANCOVA was used to control for differences in pre-test counts to determine if there was a difference between the Control and Experimental groups for CCM and OMT. Comparisons and analysis were guided by performing two inquiries: (i) participants' perceptions about their e-skill capabilities after the intervention (§5.4.3.1); (ii) participants' tangible e-literacy skills after the intervention (§5.4.3.2). Results for comparisons can be found in Tables 5.20 and 5.21, whilst inferential statistics are available in Addendum 5.5, Inferential statistics after the intervention. Refer to §4.5.6.1 for the analysis of measurement scales.

#### 5.4.3.1 Participants' perceptions about their e-literacy skills capabilities after the intervention

In this section, I determined if there were significant interactions between Control and Experimental groups and CCM and OMT courses, and where the differences were.

At instances where statistical results in tables did not indicate any significant effect, comparisons between Control and Experimental groups (Factor 1) and between CCM and OMT (Factor 2) were examined. At instances where statistical results in tables indicated significant interactions, only these differences were examined.

Table 5.20 indicates significant main effects in eight constructs. These constructs indicated significant effects between the Control and Experimental groups (Factor 1) and the difference was found in the CCM qualification (Factor 2). The following paragraphs explain the analyses of the finding above.

Outcomes indicated a significant effect in participants' perceptions after the intervention about their Getting started skills,  $p=0.000$ , between the Control and Experimental groups. The effect size,  $d=2.45$ , indicated a large effect difference between the CCM Control and the CCM Experimental group. The effect size,  $d=2.10$ , (large effect) correspondingly indicated a large effect difference between the OMT Control and the OMT Experimental group. Results indicated the highest difference in C/E for CCM.

There was a significant effect for participants' perceptions after the intervention on their Navigation skills,  $p=0.000$ , between Control and Experimental groups. The effect size,  $d=1.59$  (large effect), indicated the difference between the CCM Control and the CCM Experimental group. The effect size,  $d=1.46$ , similarly indicated a large effect difference between the OMT Control and the OMT Experimental group. Results indicated the highest difference in C/E for CCM.

Outcomes indicated a significant effect for participants' perceptions after the intervention on their Web browsing capabilities,  $p=0.000$ , between Control and Experimental groups. The effect size,  $d=0.48$ , indicated a medium effect difference between the CCM Control and the OMT Control group. The effect size,  $d=0.40$ , indicated a medium effect difference between the CCM Experimental and the OMT

Experimental group. The effect size,  $d=2.93$ , indicated a large effect difference between the CCM Control and the CCM Experimental group. The effect size,  $d=2.05$ , also indicated a large effect difference between the OMT Control and the OMT Experimental group. Results indicated the highest difference in C/E for CCM.

Table 5.20 reveals a significant effect on participants' perceptions after the intervention on their E-mail skills,  $p=0.000$ , between Control and Experimental groups. The effect size,  $d=0.43$ , indicated a medium effect difference between the CCM Experimental and the OMT Experimental group. The effect size,  $d=1.55$ , indicated a large effect difference between the CCM Control and the CCM Experimental group. The effect size,  $d=1.24$ , also indicated a large effect difference between the OMT Control and the OMT Experimental group. Results indicated the highest difference in C/E for CCM.

There was a significant effect indicated for participants' perceptions after the intervention for their Software usage skills,  $p=0.000$ , between Control and Experimental groups. The effect size,  $d=0.74$ , indicated a medium effect difference between the CCM Experimental and the OMT Experimental group. The effect size,  $d=2.54$  (large effect), indicated the difference between the CCM Control and the CCM Experimental group. The effect size,  $d=1.83$ , also indicated a large effect difference between the OMT Control and the OMT Experimental group. Results indicated the highest difference in C/E for CCM.

Outcomes indicated a significant effect for participants' perceptions after the intervention on their Word processing capabilities,  $p=0.000$ , between Control and Experimental groups. The effect size,  $d=0.93$ , indicated a large effect difference between the CCM Control and the OMT Control group. The effect size,  $d=2.83$  (large effect), indicated the difference between the CCM Control and the CCM Experimental group. The effect size,  $d=1.87$  (large effect), also indicated a difference between the OMT Control and the OMT Experimental group. Results indicated the highest difference in C/E for CCM.

Substantial effects for participants' perceptions after the intervention around their Spreadsheet skills,  $p=0.000$ , between the Control and Experimental groups were pointed out. The effect size,  $d=0.55$ , indicated a medium effect difference between the CCM Control and the OMT Control group. The effect size,  $d=3.17$  (large effect), indicated the difference between the CCM Control and the CCM Experimental group. The effect size,  $d=2.49$ , also indicated a large effect between the OMT Control and the OMT Experimental group. Results indicated the highest difference in C/E for CCM.

There was a significant effect indicated for participants' perceptions after the intervention for Presentation skills,  $p=0.000$ , between Control and Experimental groups. The effect size,  $d=0.69$ , indicated a medium effect difference between the CCM Control and the OMT Control group. The effect size,  $d=3.10$ , indicated a large effect difference between the CCM Control and the CCM Experimental group. The effect size,  $d=2.21$  (large effect), also indicated a difference between the OMT Control and the OMT Experimental group. Results indicated the highest difference in C/E for CCM.

Furthermore, outcomes of results in Table 5.20 indicate significant effects in constructs: File management; Hardware operations; and PDF skills.

Results from the ANCOVA indicated a significant effect for participants' perceptions after the intervention on their File management skills,  $p=0.047$ , in Control and Experimental groups. The effect size of,  $d=0.69$ , indicated a medium effect difference between the CCM Control and the OMT Control group. The effect size of,  $d=2.29$ , indicated a large effect difference between the CCM Control and the CCM Experimental group. The effect size of,  $d=1.26$ , indicated a large effect difference between the OMT Control and the OMT Experimental group.

Outcomes indicated a significant effect for participants' perceptions after the intervention on Hardware operations,  $p=0.024$ , in Control and Experimental groups. The effect size of,  $d=0.90$  (large effect), indicated a difference between the CCM Experimental and the OMT Experimental group. The effect size of,  $d=1.87$  (large effect), indicated the difference between the CCM Control and the CCM Experimental group. The effect size of,  $d=0.70$ , indicated a medium effect difference between the OMT Control and the OMT Experimental group.

Significant effects for participants' perceptions after the intervention with regard to their PDF skills,  $p=0.011$ , in Control and Experimental groups are reflected in Table 5.20. The effect size,  $d=0.64$ , indicated a medium effect difference between the CCM Control and the OMT Control group. The effect size,  $d=0.71$ , indicated a medium effect difference between the CCM Experimental and the OMT Experimental group. The effect size,  $d=3.33$  (large effect), indicated the difference between the CCM Control and the CCM Experimental group. The effect size,  $d=1.98$  (large effect), also indicated a difference between the OMT Control and OMT Experimental group.

From the analysed results above it is concluded that significant perceptual e-literacy skill differences took place between Control and Experimental of the CCM qualification.

Table 5.20 (next page) illustrates means,  $p$  value results and effect sizes on participants' perceptions around their e-literacy skills capabilities after the intervention.

**Table 5.20: Participants' perceptions about their e-literacy skills capabilities after the intervention**

| Construct elements     | Means   |      |              |      | MSE  | P values |         |               | Effect sizes                 |                              |                              |                              |
|------------------------|---------|------|--------------|------|------|----------|---------|---------------|------------------------------|------------------------------|------------------------------|------------------------------|
|                        | Control |      | Experimental |      |      | E/C      | OMT/CCM | OMT/CCM * E/C | CCM<br>C<br>with<br>OMT<br>C | CCM<br>E<br>with<br>OMT<br>E | CCM<br>C<br>with<br>CCM<br>E | OMT<br>C<br>with<br>OMT<br>E |
|                        | CCM     | OMT  | CCM          | OMT  |      |          |         |               |                              |                              |                              |                              |
| Getting started        | 1.93    | 1.88 | 1.04         | 1.13 | 0.13 | 0.000*   | 0.813   | 0.500         | 0.11                         | 0.23                         | 2.45 <sup>‡</sup>            | 2.10 <sup>‡</sup>            |
| Navigation skills      | 2.03    | 1.88 | 1.19         | 1.11 | 0.28 | 0.000*   | 0.381   | 0.791         | 0.29                         | 0.16                         | 1.59 <sup>‡</sup>            | 1.46 <sup>‡</sup>            |
| File management skills | 2.38    | 2.01 | 1.17         | 1.35 | 0.30 | 0.000    | 0.486   | 0.047*        | 0.69 <sup>‡</sup>            | 0.34                         | 2.29 <sup>‡</sup>            | 1.26 <sup>‡</sup>            |
| Web browsing skills    | 3.17    | 2.87 | 1.35         | 1.60 | 0.39 | 0.000*   | 0.882   | 0.087         | 0.48 <sup>#</sup>            | 0.40 <sup>#</sup>            | 2.93 <sup>‡</sup>            | 2.05 <sup>‡</sup>            |
| E-mail usage           | 2.48    | 2.55 | 1.59         | 1.83 | 0.33 | 0.000*   | 0.293   | 0.542         | 0.11                         | 0.43 <sup>#</sup>            | 1.55 <sup>‡</sup>            | 1.24 <sup>‡</sup>            |
| Software usage         | 3.07    | 3.08 | 1.41         | 1.89 | 0.43 | 0.000*   | 0.144   | 0.165         | 0.02                         | 0.74 <sup>‡</sup>            | 2.54 <sup>‡</sup>            | 1.83 <sup>‡</sup>            |
| Hardware operations    | 2.80    | 2.64 | 1.71         | 2.23 | 0.36 | 0.000    | 0.227   | 0.024*        | 0.28                         | 0.90 <sup>‡</sup>            | 1.87 <sup>‡</sup>            | 0.70 <sup>‡</sup>            |
| Word processing skills | 2.94    | 2.38 | 1.24         | 1.26 | 0.36 | 0.000*   | 0.081   | 0.069         | 0.93 <sup>‡</sup>            | 0.03                         | 2.83 <sup>‡</sup>            | 1.87 <sup>‡</sup>            |
| Spreadsheet skills     | 3.49    | 3.11 | 1.37         | 1.46 | 0.45 | 0.000*   | 0.404   | 0.196         | 0.55 <sup>‡</sup>            | 0.13                         | 3.17 <sup>‡</sup>            | 2.49 <sup>‡</sup>            |
| Presentation skills    | 3.38    | 2.88 | 1.17         | 1.30 | 0.51 | 0.000*   | 0.331   | 0.085         | 0.69 <sup>‡</sup>            | 0.20                         | 3.10 <sup>‡</sup>            | 2.21 <sup>‡</sup>            |
| PDF skills             | 3.64    | 3.19 | 1.28         | 1.78 | 0.50 | 0.000    | 0.891   | 0.011*        | 0.64 <sup>‡</sup>            | 0.71 <sup>‡</sup>            | 3.33 <sup>‡</sup>            | 1.98 <sup>‡</sup>            |

\*p≤0.05

<sup>#</sup>d≤0.4 small with little or no significant difference

<sup>‡</sup>d0.4≤0.8 medium that tended towards practically significant difference

<sup>‡</sup>d≥0.8 large with practically significant difference

In addition, effect sizes indicated in Table 5.20 and reflected in Figure 5.1, portray small to large practical differences,  $d=0.02$  and  $d=0.93$ , for Control groups in the CCM and OMT qualifications. Effect sizes,  $d=0.03$  and  $d=0.90$ , indicated small to large practical differences for Experimental groups between the CCM and OMT qualification. Effect sizes,  $d=0.70$  and  $d=2.49$ , indicated medium to large practical differences for Control and Experimental groups in the OMT qualification. Large effect size differences were indicated for Control and Experimental groups in the CCM qualification,  $d=1.55$  and  $d=3.33$ .

Figure 5.1 reflects effect size differences (Table 5.20) for Control and Experimental groups between the CCM and OMT qualification on participants' perceptions about their e-literacy skills capabilities after the intervention.

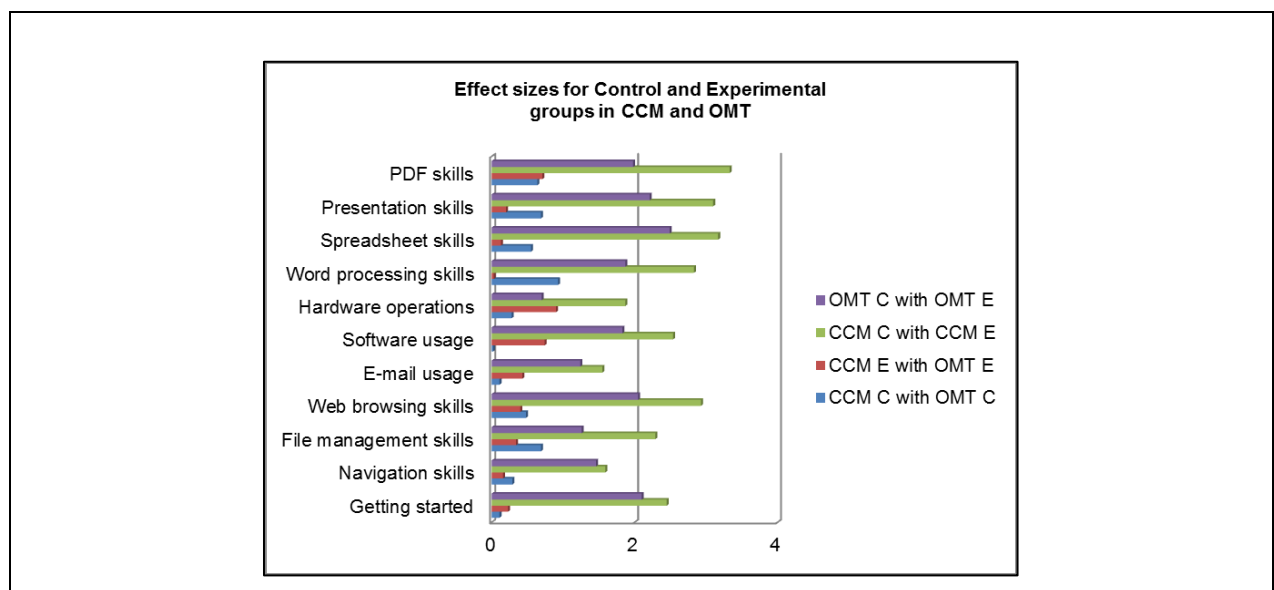


**Figure 5.1: Participants' perceptions effect size differences**

Analysed results after the intervention indicated a major perceptual e-literacy skill difference for the CCM qualification. This indicates that the CCM qualification benefited more from the e-literacy skills training than the OMT qualification. This implicates that the institution should consider significant e-literacy training for the CCM qualification. To conclude the inferential analysis, participants' application of their e-literacy skills after the intervention is discussed next.

#### 5.4.3.2 Participants' tangible e-literacy skills after the intervention

In the last association, I determined if there were significant interactions between Control and Experimental groups (Factor 1) and between CCM and OMT courses (Factor 2), and where these differences lay.

At instances where statistical results in tables did not indicate any significant interactions, comparisons between Control and Experimental groups (Factor 1) and between CCM and OMT (Factor 2) were

examined. At cases in point where statistical results in tables indicate significant interactions, only these differences were examined.

Table 5.21 indicates significant main effects in three constructs. These constructs indicated significant effects between the Control and Experimental groups (Factor 1) and the difference was found in the CCM qualification (Factor 2). The underneath paragraphs explain the analyses of this finding.

Table 5.21 signifies a significant effect for Web browsing skills applied,  $p=0.000$ , between the Control and Experimental groups. The effect size,  $d=1.59$  (large effect), indicated the difference between the CCM Control and the CCM Experimental group. The effect size,  $d=0.84$ , also indicated a large effect difference between the OMT Control and the OMT Experimental group. Results indicated the highest difference for the CCM qualification.

A significant effect on the application of Spreadsheet skills,  $p=0.000$ , between the Control and Experimental groups was indicated. The effect size of,  $d=0.45$ , indicated a medium difference between the CCM Control and the OMT Control group. The effect size of,  $d=2.51$  (large effect), indicated the difference between the CCM Control and the CCM Experimental group. The effect size,  $d=1.80$  (large effect), also indicated a difference between the OMT Control and the OMT Experimental group. Results indicated the highest difference for the CCM qualification.

A significant effect on the application of Presentation skills,  $p=0.000$ , between the Control and Experimental groups was indicated. The effect size,  $d=0.66$ , indicated a medium difference between the CCM Control and the OMT Control group. The effect size of,  $d=2.58$  (large effect), indicated the difference between the CCM Control and the CCM Experimental group. The effect size of,  $d=1.58$  (large effect), also indicated a difference between the OMT Control and the OMT Experimental group. Results indicated the highest difference for the CCM qualification.

In addition, Table 5.21 indicates significant effects in two constructs such as File management; and Word processing.

A significant effect was indicated for the application of File management skills,  $p=0.013$ , between the Control and Experimental groups. The effect size,  $d=1.04$  (large effect), indicated a difference between the CCM Control and the OMT Control group. The effect size,  $d=1.54$  (large effect), indicated the difference between the CCM Control and the CCM Experimental group.

Significant effect on the application of Word processing skills,  $p=0.011$ , was indicated between the Control and Experimental groups. The effect size,  $d=1.05$  (large effect), indicated a difference between the CCM Control and the OMT Control group. The effect size,  $d=2.73$  (large effect), indicated the difference between the CCM Control and the CCM Experimental group. The effect size,  $d=1.34$  (large effect), also indicated a difference between the OMT Control and the OMT Experimental group.

From the analysed results above it is concluded that significant tangible e-literacy skill differences took place between Control and Experimental of the CCM qualification.

Table 5.21 on the next page, summarises means,  $p$  values and effect sizes of tangible e-literacy skills after the intervention for Control and Experimental groups of CCM and OMT.

**Table 5.21: Participants' tangible e-literacy skills capabilities after the intervention**

| Construct elements             | Means   |      |              |      |      | P values |         |                  | Effect sizes              |                           |                           |                           |
|--------------------------------|---------|------|--------------|------|------|----------|---------|------------------|---------------------------|---------------------------|---------------------------|---------------------------|
|                                | Control |      | Experimental |      |      | E/C      | OMT/CCM | OMT/CCM<br>* E/C | CCM<br>C with<br>OMT<br>C | CCM<br>E with<br>OMT<br>E | CCM<br>C with<br>CCM<br>E | OMT<br>C with<br>OMT<br>E |
|                                | CCM     | OMT  | CCM          | OMT  |      |          |         |                  |                           |                           |                           |                           |
| File management skills applied | 2.51    | 2.82 | 2.97         | 2.87 | 0.09 | 0.002    | 0.177   | 0.013*           | 1.04 <sup>‡</sup>         | 0.32                      | 1.54 <sup>‡</sup>         | 0.18                      |
| Web browsing skills applied    | 2.34    | 2.49 | 3.00         | 2.85 | 0.18 | 0.000*   | 0.985   | 0.182            | 0.38                      | 0.37                      | 1.59 <sup>‡</sup>         | 0.84 <sup>‡</sup>         |
| Word processing skills applied | 1.56    | 2.06 | 2.87         | 2.71 | 0.23 | 0.000    | 0.173   | 0.011*           | 1.05 <sup>‡</sup>         | 0.34                      | 2.73 <sup>‡</sup>         | 1.34 <sup>‡</sup>         |
| Spreadsheet skills applied     | 1.53    | 1.75 | 2.76         | 2.63 | 0.24 | 0.000*   | 0.710   | 0.186            | 0.45 <sup>#</sup>         | 0.26                      | 2.51 <sup>‡</sup>         | 1.80 <sup>‡</sup>         |
| Presentation skills applied    | 1.52    | 1.87 | 2.87         | 2.71 | 0.28 | 0.000*   | 0.534   | 0.063            | 0.66 <sup>#</sup>         | 0.34                      | 2.58 <sup>‡</sup>         | 1.58 <sup>‡</sup>         |

\*p≤0.05

<sup>#</sup>d≤0.4 small with little or no significant difference

<sup>‡</sup>d0.4≤0.8 medium that tended towards practically significant difference

<sup>‡</sup>d≥0.8 large with practically significant difference

Additionally, effect sizes indicated in Table 5.21 and reflected in Figure 5.2, portray small to large practical differences,  $d=0.38$  and  $d=1.05$ , for Control groups in the CCM and OMT qualifications. Effect sizes,  $d=0.26$  and  $d=0.37$ , designated small practical differences for Experimental groups in the CCM and OMT qualification. Small to large effect sizes,  $d=0.18$  and  $d=1.80$ , were visible for Control and Experimental groups in the OMT qualification. Large effect sizes (Cohen *et al.*, 2011:616-617),  $d=1.54$  and  $d=2.73$ , were visible for Control and Experimental groups in the CCM qualification.

Figure 5.2 reflects effect size differences (Table 5.21) between Control and Experimental groups for CCM and OMT on tangible e-literacy skills application after the intervention

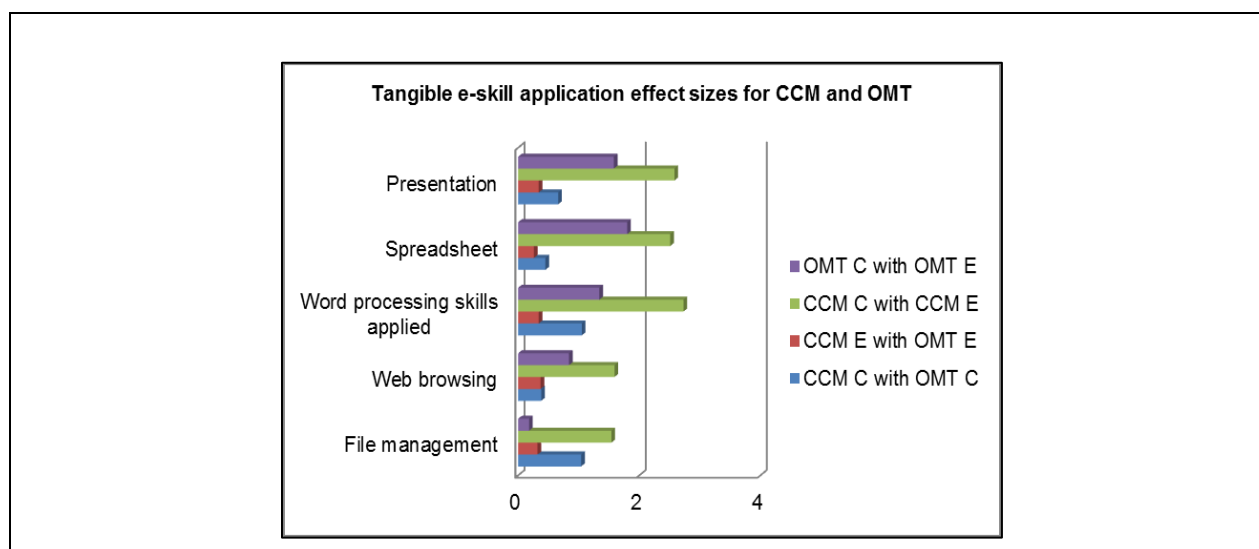


**Figure 5.2: Tangible e-literacy skill application effect size differences**

Analysed results after the intervention indicated a major tangible e-literacy skill differences for the CCM qualification. Again this indicates that the CCM qualification benefited more from the e-literacy skills training than the OMT qualification. This implicates that the institution should consider significant e-literacy training for the CCM qualification.

## 5.5 Chapter summary

Chapter five dealt with the empirical results, analyses and interpretation of data obtained from the e-readiness questionnaire and situational test. Descriptive statistics provided results on biographical data and gave an in depth analysis upon the outcomes of perceptions and e-literacy skills application capabilities of 86 participants.

Descriptive data were furthermore analysed using inferential statistical methods to accomplish comparisons by means of two factors. Factor One was between the Control and Experimental groups, and Factor Two was between the CCM and OMT courses. Respective comparisons were similarly made

between the Control and Experimental groups within the CCM and OMT course, a four-group comparison interaction.

At instances where statistical results in tables did not indicate any significant effect, comparisons between Control and Experimental groups (Factor 1), and between CCM and OMT (Factor 2) were examined. At instances where statistical results in tables indicated significant interactions, only those differences were examined.

The first association compared participants' perceptions about their e-literacy skills capabilities before the intervention with their perceptions about their e-literacy skills capabilities after the intervention. Analogies were discussed separately for the Control and Experimental groups intended for each qualification. The second comparison measured participants' tangible e-literacy skills applications before the intervention against their tangible e-literacy skills applications after the intervention. Thirdly participants' perceptions about their e-literacy skills capabilities were compared with their tangible e-literacy skills application before the intervention and finally participants' perceptions about their e-literacy skills capabilities were compared with their tangible e-literacy skills application after the intervention. Statistical results such as means, standard deviations, *p* values and effect sizes were reflected, utilising numerous tables and figures. Significant effects including medium and large effect sizes were discussed. Larger effect size differences between Control and Experimental groups were indicated for the CCM qualification compared to the OMT qualification. This indicated that the CCM qualification benefited more from the e-literacy skills training than the OMT qualification. Therefore the TUT should consider significant e-literacy training for the CCM qualification.

In the next chapter attention will be paid to the analysis of the focus group interview and open-ended questions finalising the qualitative segment of the parallel mixed method research design.

## **CHAPTER 6: QUALITATIVE DATA ANALYSIS**

- 6.1 Introduction
  - 6.2 e-Literacy and digital divide disparities
  - 6.3 Necessity of e-literacy training
  - 6.4 Participants' perceptions around their own e-literacy skills capabilities
  - 6.5 Impact of e-readiness intervention
    - 6.5.1 Distinctions signified by Control groups
    - 6.5.2 Distinctions signified by Experimental groups
  - 6.6 Implication of e-readiness intervention
  - 6.7 Conclusion
-

# CHAPTER 6

## QUALITATIVE DATA ANALYSIS

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### 6.1 Introduction

Chapter five dealt with a discussion on the empirical findings generated from the e-readiness questionnaire and situational test concealing descriptive and inferential statistics. This chapter addresses secondary research objective five (§1.4) and aims to verify if the e-readiness toolkit was meaningful to novice students at TUT. This secondary data analysis mirrors the empirical report provided in the earlier chapter and, at the same time aims to manifest quantitative findings.

I integrated unstructured data (Dey, 1993:17) collected from a focus group interview and open-ended questions from the e-readiness questionnaire (Addendum 6.1, Atlas PhD qualitative data) in the Computer Assisted Qualitative Data Analysis (CAQDAS) software package (Babbie, 2013:404), Atlas.ti™. The core of qualitative analysis lies in related processes of describing phenomena, classifying them, and seeing how concepts interconnect (Dey, 1993:31). Two primary documents were assigned in a Hermeneutic Unit (Addendum 6.1, Atlas PhD qualitative data) and were categorised and coded according to predetermined codes. Dey (1993:103, 113) points out that categories must have internal and external aspects. Internally categories must be meaningful in relation to the data, and externally they must be meaningful in relation to the other categories that were created. As I categorised qualitative data, clear findings emerged from the utterances of participants. Such confirmatory quotations, cited in Addendum 6.1, Atlas PhD qualitative data and referenced as, for example P1:12, 83-85, can be found in primary document 1, code 12, lines 83-85. Most relevant documented codes derived from the categorised data were e-literacy disparities; necessity for e-literacy training; e-literacy skills perceptions; impact of e-readiness intervention and significance of e-readiness intervention. All documented theme codes are illustrated in Figures 6.1 – 6.4 and 6.7.

Furthermore, to ensure a logical order of discussion, the subsequent qualitative analysis synchronises empirical findings related to Factors 1 and 2 (§5.4), and discusses (i) e-literacy and digital divide disparities; (ii) necessity of e-literacy training; (iii) participants' perceptions around their own e-literacy skill capabilities; (iii) impact of e-readiness intervention and (iv) significance of e-readiness intervention respectively. At the end of each discussion, key findings are summarised as a final point to meet the objectives of this study and to test the null and alternative hypotheses.

## 6.2 e-Literacy and digital divide disparities

Warschauer (2003:109) concurs that literacy and education affect online access at both the macro and micro levels. At the macro level, mass literacy and education serve to grease the wheels of economic development thus creating conditions for greater technologisation of a society. He further claims that (2003:44) access to literacy intersects with unequal opportunities to attend school, inequitable distribution of resources within the educational system, and curricula and pedagogy that meet the needs of certain social groups more than others. SA has insufficient inter-city connectivity and infrastructure in parts of the country. Lately IT policies such as infrastructure development, digital divide and partnerships that focus on the step up of secondary towns, have been implemented by the South African government. Projects like the SA Info Tech Industry Strategy (SAITIS) and Info 2025 Vision (Manase, 2012:21, 22) include investments in infrastructure as well as to bridge the digital divide, and to extend connectivity to all communities through schools and multi-purpose community centres.

Critical and important aspects identified during the focus group interview brought up disparity issues that might be causative to the lack of e-literacy skills in undergraduate students at TUT. In this description themes such as CAT in school and intervention contribution were derived from the inductive analyses and are shown in Figure 6.1.

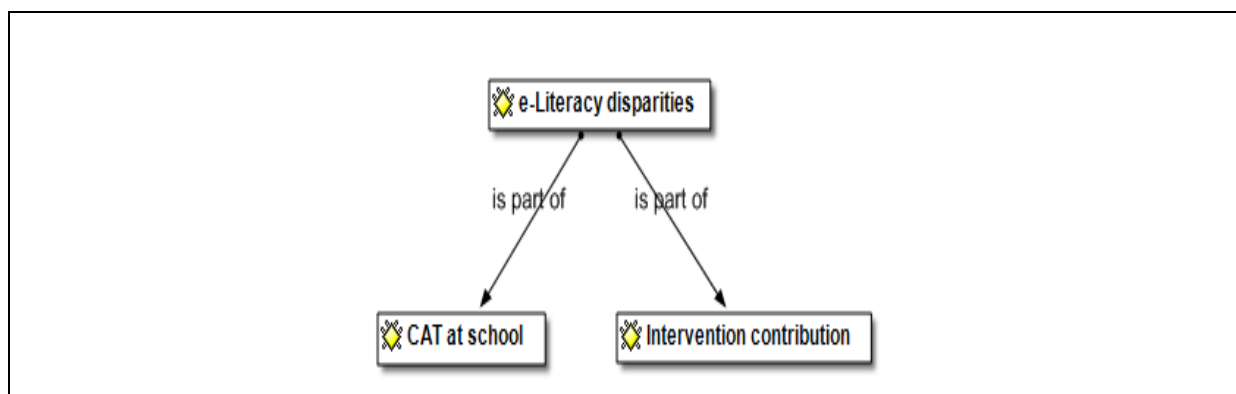


**Figure 6.1: Network display on codes related to e-literacy disparities**

With relevance to the current status of TUT undergraduates' possession (§5.2) of electronic devices (V's 19-23) as well as their connectivity means, findings showed that 24% owned a laptop, 8% owned a desktop computer whilst 13% possessed a tablet. In effect this implies that 76% do not own a laptop and 92% of pupils do not own a desktop computer. Connectivity means indicated that 42% of respondents use 3G, 33% uses wireless broadband and 5% indicated that they purchase data bundles (V's 24-28). Respondents are not acquainted with computers since they do not own one, nor were they exposed to it at school level. Murdoch-Eaton, Manning, Kwizera, Burch, Pell, and Whittle (2012:1038) revealed that the average computer student ratio in three different schools in SA was 1:42. An equivalent account was portrayed in typical quotations by respondents touching digital divide discrepancies:

*The intervention helped me so much because of like when the first time when I came here I did not know anything about a computer because I did not do it at school and at*

*home, I do not have it, so I did not know anything about computers. By coming here I learned some things before class to start I know how to open the computer, how to do some things so that I could apply the skills in class. I met some friends also and I knew some buildings before some other people (P1:18, 147-149).*

*It was difficult because I knew nothing about computers. It was my first time and I did not even know how to open it, so I was afraid and it was difficult for me, but after that e-readiness I enjoyed computer, now I can teach others (P1:12, 83-85).*

*Because of like some learners like me, it was the first time seeing a computer, touching it, so I think it is compulsory for everyone and everyone must do it, to start with it (P1:42, 373-375).*

The South African government had as its goal to make all 26 000 South African public schools ICT capable by 2013, in other words to have the necessary infrastructure to give pupils access to computer-based education (South African Information Technology Report., 2012:30). However, it was noteworthy to determine if participants could possibly select the CAT subject at high school level. Empirical findings indicated that only eight per cent (8%) took the subject at school. This endorses a statement made by Van der Westhuizen (2007:35) that disparities are reflected in South African schools where more than 73,5% (19 000) of schools do not have any computers. Czerniewicz and Brown (2013:45) claim that only 14.8% of South African households have personal computers. From the inductive analysis only one respondent indicated that she took the subject in high school, but that it was offered by a private enterprise and she had to pay for the six months e-literacy course. The respondent replied:

*I did computer literacy as in, what do I call it, it is like a private business coming to our school to learn us, but we were paying and then we graduated within six months (P1:9, 47-49).*

Although computers are valued as the dominant form of technology in HE (Czerniewicz & Brown, 2013:51) there is a definite need within the SA context for increased investment in upgrading resources both in schools and at universities. Bharuthram and Kies (2013:419) assert that for maximum benefit of e-learning interventions, students need to be technologically literate as technology can expedite the learning process.

Table 6.1 summarises the key findings and important aspects for considerations on digital divide disparities.

**Table 6.1: Key findings on digital divide disparities**

| Key finding One                                                                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Empirical findings obtained from §5.2.3 and §5.2.4 as well as Table 5.1 indicated that 92% of participants do not own a desktop computer</li> <li>• Eight per cent (8%) pupils could select the subject CAT at high school level</li> <li>• One respondent attended but paid for a computer literacy course rendered by a private enterprise at their high school</li> </ul> |

This finding is in agreement with Mdakane (2011:184) and Laubscher (2013:77) who state that South African students are not fully prepared and equipped to study at a HEI. This is mainly due to the fact that South African schools experience difficulties and obstructions to teach their learners 21<sup>st</sup> century skills. In

a study to determine whether people from disadvantaged communities in SA can be trained to use a word processing program, it was found that users from these communities suffer from unique limitations. The limited educational background causes them to be unfamiliar with concepts and terminology that others would accept as common sense (Blignaut, 2009:595).

### 6.3 Necessity of e-literacy training

Since ICT is the driving force in the modern economy, one cannot ignore the need to integrate it into education systems. The green paper for post-school education and training (South Africa, 2012:42) states that inadequate student preparedness for university education is probably the main factor that contributes to low success rates. Various approaches for the attainment of e-literacy skills have been attempted by different researchers (Duffelmeyer, 2000:294; Mapuva & Muyengwa, 2009:226; McSorley, 2003:84) to compensate for this problem, and should continue in order to assist underprepared students to make the transition to a successful university career. Similar skills assessments conducted by Van Antwerpen (2013:334) indicate that only ten of the thirty one Office Administrator candidates obtained a final score of fifty per cent and higher for their skill abilities.

In this study, a similar attempt to address e-literacy skills deficiencies in undergraduate students at the TUT was undertaken at the onset of their tertiary education. Essential aspects related to the topic “necessity of e-literacy training” are depicted in Figure 6.2, and are discussed below.

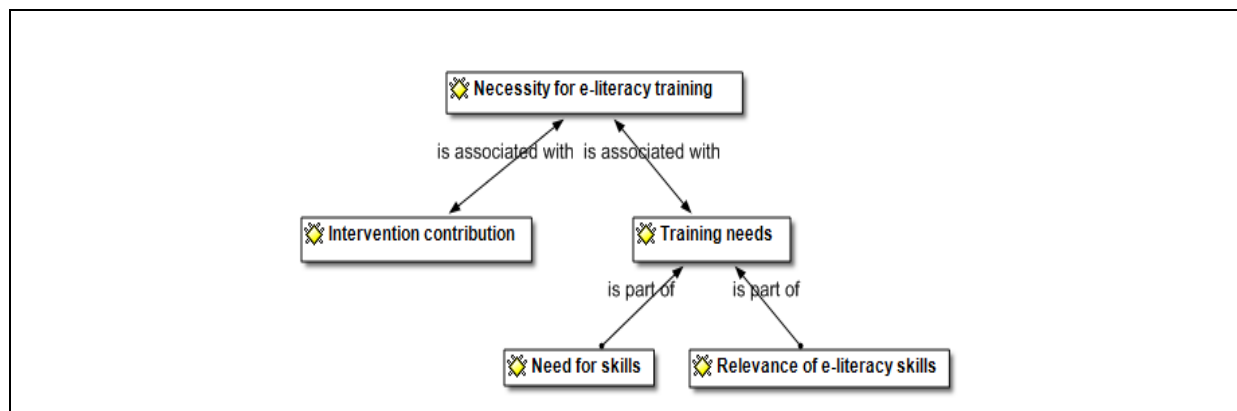


**Figure 6.2: Aspects related to necessity for e-literacy training**

Explored data indicated the necessity of initiation, especially in the University environment which is so different from school. Respondents replied that when they came to TUT for the first time they were very scared at first, but after being exposed to computers, buildings, comrades and subject content, they felt a bit more at ease. They replied:

*University is a different environment from high school. So coming here was a little bit scary knowing that I do not know anyone and I can't do anything, so coming to this intervention it helped me to know people, it helped me get to know new words like e-literacy as at school they did not teach me and in class it helped a lot because I could participate because I was knowing something from the intervention (P1:17, 143-145).*

*I think what you taught us it was enough because if you first showed us the formula button we would have forgotten because it was our first time. So learning the basics was the best way so that when they taught us about the formula bar in class and I forgot how to apply it I am going to go back to what they taught us in e-readiness (P1:23, 185-187).*

Participants indicated the undoubted importance of peer support in the HE environment by replying:

*I think I will help them by telling them how I started and it will encourage some of them and will motivate them and will learn more from them as they are coming as new students and I will try and help them to adapt to this environment of the University (P1:45, 391-393).*

*Because now I know computers better and I am enjoying it, I even want to treat other students, maybe they can be afraid like what I was so I am going to tell them that I was afraid and did not know how anything but now I can type 40 wpm, because this is what is going to happen at the end (P1:44, 387-389).*

This supports the finding of Hsiao, Tu, and Chung (2012:174) that peer support enhances trainees' general or advanced computer self-efficacy and leads to better computer use. Peers have a strongly positive influence on each other and play important roles in their learning context. A similar finding by Chang *et al.* (2012:185) echoes the fact that teaching assistants improve their own computer skills due to their interaction with trainees in a computer literacy training course.

Participants specified their training needs in a number of constructs (§4.5.5.1) through the use of open-ended questions in the e-readiness questionnaire. Respondents indicated that web browsing and how to troubleshoot hardware and software problems including, how to secure documents, are essential skills to have. Laubscher (2013:75) contends that 21<sup>st</sup> century skills need to be part of a teaching curriculum for learners to truly gain pertinent skills and knowledge. On the other hand, Kalman and Ellis (2007:37) argue that as computer literacy becomes mandatory in school curriculums, the need for required introductory courses in HE could become less necessary. An example of providing mandatory skills is set by the University of Kenyatta (Burgess, 2015:39). The basic entrance requirement for all lecturers, students and administrators is that once they come to the university, they are immediately scheduled for computer literacy training.

Specific training requirements indicated by participants for several constructs are summarised Table 6.2 on the next page.

**Table 6.2: Participants' training requirements**

| Constructs                               | Respondent's needs                                                                                                                                                                                                                                                        |
|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>V41<br/>Getting started</b>           | <i>Be able to restore and close active windows. To be taught what tooltips are. Able to use windows help and support system (P2:13, 8)</i><br><br><i>I still need a lot of background training and a lot of skill training (P2:14, 16)</i>                                |
| <b>V62<br/>Web browsing capabilities</b> | <i>I need help on using variety of search engines so that I can be able to copy and paste text from a website (P2:15, 57)</i><br><br><i>I need to know how can I navigate the internet using variety of search engines and how to copy and paste graphics (P2:16, 59)</i> |
| <b>V84<br/>Hardware capabilities</b>     | <i>I need to know how I can correct simple computer problems and how to set up a new computer (P2:17, 107)</i><br><br><i>I have done it at school now I don't know where to start when it comes to hardware (P2:18, 113)</i>                                              |
| <b>V95<br/>Word processing skills</b>    | <i>I need help on processing document and also underline text in a document and all those things that I am not able to do (P2:9, 121)</i><br><br><i>Go into detail about the different styles of page orientation and what are they used for (P2:10, 287)</i>             |
| <b>V103<br/>Spreadsheet capabilities</b> | <i>I need to know how I can create spreadsheet document and how to save those documents (P2:19, 137)</i><br><br><i>I do not actually know what a spreadsheet document is (P2:20, 143)</i>                                                                                 |
| <b>V116<br/>PDF files</b>                | <i>I know what PDF are but I never used it (2:21, 169)</i><br><br><i>To be taught what PF files are. To be able to create PDF files. Use advanced features as to adding passwords (P2:22, 167)</i>                                                                        |

This evidence supports the findings of Esterhuizen, Blignaut, Ellis, and Els (2012:87) that South African practising teachers think the attainment of functional computer literacy will make their work easier if they themselves are better skilled, along with the fact that school learners would benefit from using computers.

Table 6.3 summarises the key findings and important aspects for considerations on the necessity for e-readiness training.

**Table 6.3: Key findings on necessity for e-readiness training**

| Key finding Two                                                                                                                                                                                                   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>Qualitative findings revealed a necessity for e-readiness training especially, at University level since it is quite different from the high school environment</li> </ul> |

Similar findings are also observed in Adamakis and Zounhia (2013:150) who found that students in Athens, Greece, fail to keep up with standards and expectations of the labour market, as they do not feel capable of confidently using basic computer skills. Correspondingly, Cullen and Cobb (2011:30) found a need to include information technology into literacy programs; thereby low literacy members in communities can become more self-sufficient and make better use of available electronic services.

#### 6.4 Participants' perceptions around their own e-literacy skills capabilities

Computer literacy is defined as the general use of computers outside of specialist computer science work, which involves the minimum knowledge, know-how, familiarity, capabilities and abilities regarding the use

of computers to perform a variety of tasks (Blignaut & Els, 2010:101), and is becoming fundamental to the learning process. The 20<sup>th</sup> century was regarded as the information age, but the next century, the 21<sup>st</sup>, has been described as the information processing age. It means that a wide variety of computer skills is useful, and in most cases required as an essential part of our education, learning and employment, for most individuals (Osuji, 2010:151).

In this study, participants were asked to judge their own e-literacy skill capabilities in eleven constructs (Table 4.9, §4.5.5.1) at two occasions. The aim was to identify how they perceived their own e-literacy skills capabilities before the intervention (the pre-test) as well as after (the post-test). In Figure 6.3 related codes around participants' e-literacy skills perceptions and application are illustrated.

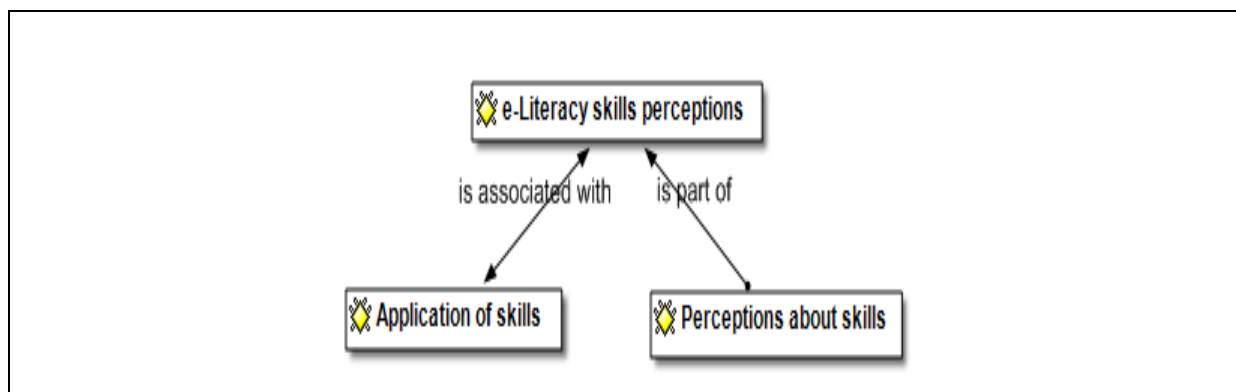


**Figure 6.3: Relationships between e-literacy skills and application of skills**

Empirical findings discussed in §5.4.2.1, Table 5.10 and §5.4.2.3, Table 5.12 indicated no significant interaction effect in participants' perceptions about their own perceived e-literacy skills and abilities before (the pre-) and after (the post-test) for the Control groups of the CCM and OMT qualifications. *P* values ranged between  $p=0.079$  until  $p=0.944$  for the first qualification and  $p=0.002$  until  $p=0.795$  for the latter. Even though two constructs for the Control group in the OMT qualification indicated low *p* values, the effect size of  $d=0.42$  and  $d=0.34$  indicated a small effect, testifying that the difference was not important in practice. This is alike to experimental findings discussed in §5.4.2.7 and Table 5.16 which indicated almost no significant effects in participants' perceptions and their actual e-literacy skill abilities in the Control group for CCM with  $p=0.014$  to  $p=0.424$ . Various significant effects (Table 5.17) were however indicated in participants' perceptions and their actual tangible e-skill abilities in the Control group of the OMT qualification with  $p=0.000$  to  $p=0.855$ .

However, analysed statistical data put forward in Tables 5.11 and 5.13 (§5.4.2.2 and §5.4.2.4) show significant effects in participants' perceptions about their own perceived e-literacy skills abilities between the pre- and the post-test (before and after the intervention) with values ranging from  $p=0.000$  to  $p=0.020$  for CCM and  $p=0.000$  to  $p=0.001$  for OMT in the Experimental groups of both qualifications.

Mutual findings were indicated for the Experimental group of OMT qualification signified in §5.4.2.7 and Table 5.17 with  $p$  values of  $p=0.000$  to  $p=0.904$  in participants' perceptions and their actual e-literacy skill abilities before (pre-test) and after (post-test).

From the summary of participants' responses during the focus group interview, one respondent indicated that he misjudged his own e-literacy skills capabilities by stating: *Because I did not know anything about a computer I choose disagree, disagree, but when I was using the computer I concluded that I was better than what I saw myself* (P1:32, 310-312), whilst others implied that they judged their e-literacy skills appropriately for the reason that, when they applied their skills they saw that they could actually perform particular instructions. Similar responses were noted:

*Yes, I did judge myself correctly because I did not see the use of lying and not learning anything* (P1:35, 322-324).

*When I was busy with the computer and read the instructions I was able to apply those instructions exactly as what I judged it on the paper* (P1:33, 314-316).

*It was easy for me because I knew computers, it was simple, even my judgements* (P1:39, 324-344).

Ingerman and Collier-Reed (2011:138) argue that if a person is technologically literate, one can be sure that such an individual's opinions and decisions are well informed and developed from a sound knowledge base.

Table 6.4 summarises the key findings and important aspects for considerations on participant's perceptions around their own e-literacy skills capabilities.

**Table 6.4: Key findings on participants' perceptions around their own e-literacy skills capabilities**

| Key finding Three                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Empirical findings obtained from §5.4.2.1 and §5.4.2.3 as well as Tables 5.10 and 5.12 indicated no significant effect in participants perceptions about their own perceived e-literacy skills abilities before (pre-test) and after (post-test) for the Control groups in both the CCM and OMT qualification</li> <li>• Correlated experimental findings discussed in §5.4.2.7 and Tables 5.15 and 5.17 indicated almost no significant effects in participants' perceptions and their actual e-literacy skill abilities before (pre-test) and after (post-test) in the Control group for CCM and OMT</li> <li>• Numerical findings put forward in §5.4.2.2 and §5.4.2.4 and Tables 5.11 and 5.13 showed significant effects in participants perceptions about their own perceived e-literacy skills abilities between the pre- and the post-test for the Experimental groups of CCM and OMT</li> <li>• Mutual findings in §5.4.2.7 and Table 5.17 indicated various significant effects in participants' perceptions and their actual e-literacy skill abilities before (pre-test) and after (post-test) in the Experimental group of the OMT qualification with <math>p</math> values of <math>p=0.000</math> until <math>p=0.904</math></li> <li>• Although some participants judged their e-literacy skills lower, the greater part of participants' implied that they appraised their e-literacy skills capabilities correctly</li> </ul> |

These findings draw a parallel with that of Blignaut and Els (2010:105) who indicated that postgraduate students at NWU rated their computer literacy much lower or higher with the self-rating instrument than

their actual practical comperacy reflected. A similar response made at a student instructor meeting (Kalman & Ellis, 2007:34) indicated that students thought they knew more than they did.

## 6.5 Impact of e-readiness intervention

In this digital age, where almost every job is dependent on ICT facilities, it is a survival necessity to have access to latest technologies to enable employees to work smartly, effectively and efficiently (Dewah, 2014:16). Similarly, Bruhns (2003:143) asserts that in order to use technology to its full potential, proper and effective skills training must be provided so that learners can transfer their skills in all subject areas. So as to uncover the impact of the e-readiness intervention in undergraduate students at TUT, it was important to compare tangible e-literacy skills application capabilities before the intervention (the pre-) with tangible e-literacy skills application capabilities after the intervention (post-test). This section refers to and discusses two distinctions made to clarify if the e-readiness intervention was meaningful. The first section discusses “Distinctions signified by Control groups” and the second “Distinctions signified by Experimental groups”. In Figure 6.4 codes related to the impact of e-readiness intervention are illustrated.

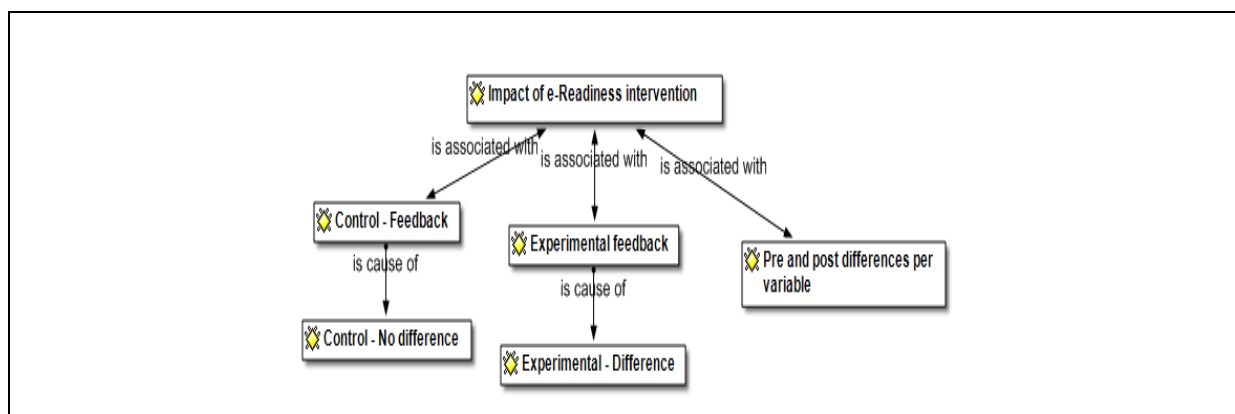


**Figure 6.4: Relationships for pre- and post-test differences**

### 6.5.1 Distinctions signified by Control groups

In the category “Distinctions signified by Control groups”, analysed data from open-ended questions indicated that no e-literacy knowledge was gained from when the pre-test was written until the post-test. Control group responses in the open-ended questions for the construct Hardware operations at the pre-test, Variable 84 (V84), indicated that they do not have knowledge about computer hardware operations:

*I do not have knowledge of the hardware operations.*  
*I cannot operate hardware.*  
*I would like to learn more about hardware.*  
*I need more assistance on hardware operations (P2:11, 275-279).*

At the post-test for the matching construct, respondents were of the opinion that they do not know how to upgrade hardware components and how to set up a computer. Comments at Post Variable (PV84) indicated:

*I know absolutely nothing about hardware operations.  
 I need to know how to upgrade hardware components and also to set up a computer.  
 I have done it at school now I don't know where to start when it comes to hardware.  
 I can identify and correct simple computer like disconnected cables but on the others I  
 have no experience on them.  
 I want to learn how hardware operates (P2:12, 110-115).*

One more indication that no e-literacy skills were gained by Control groups between the pre- and post-test was signposted at V103, My Spreadsheet manipulation skills. Feedback from respondents at the pre-test stated:

*I have never done these before so I have no knowledge on it.  
 I just need to know more about how to use a computer.  
 I do not actually know what a spreadsheet document is.  
 I have never heard of these words before that is why it is difficult for me to answer (P2:7, 141-144).*

Post-test reactions recorded at PV103, My Spreadsheet manipulation skills declared:

*I do not know what spreadsheet is.  
 I know nothing about the spreadsheet.  
 I need to learn how to perform calculations.  
 Please assist me with Excel.  
 Spreadsheet manipulation skills are not very good as I cannot create and save documents (P2:8, 301-305).*

This substantiates empirical findings discussed in §5.4.2.5 and §5.4.2.6 where statistics drafted from Table 5.11 clearly indicated no significant interaction effect in e-literacy skills for Control groups in both the CCM and OMT qualification. *P* values for the CCM qualification ranged between  $p=0.010$  until  $p=0.179$  whilst *p* values for OMT ranged between  $p=0.003$  until  $p=0.859$ . Common effect sizes affirmed that the few designated differences were not important in practice. An overview of the *p* values for Control groups for the CCM and OMT qualification can be found in Figure 6.5.

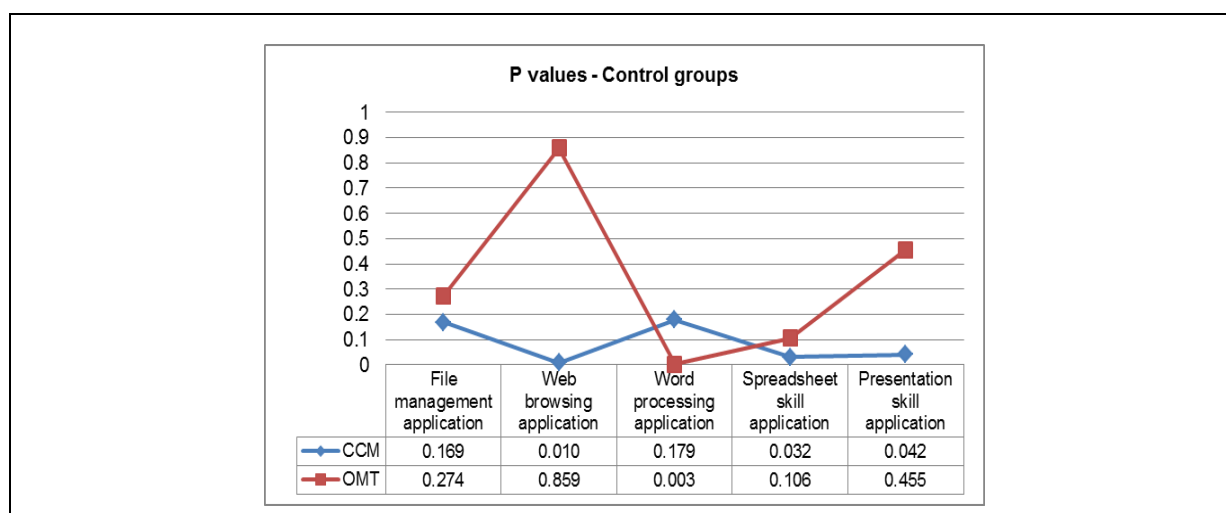


**Figure 6.5: CCM and OMT Control groups' *p* values**

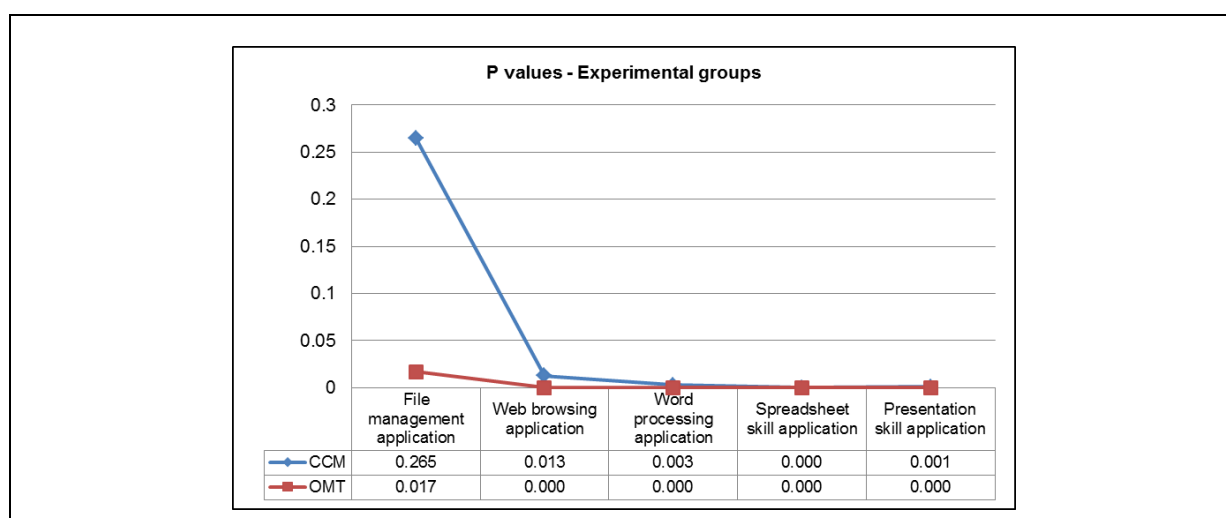
Table 6.5 summarises the key findings and important aspects for considerations on distinctions signified by Control groups.

**Table 6.5: Key findings on distinctions signified by Control groups**

| Key finding Four                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>Sampled constructs such as Vs 84, 103 as well as PVs 84, 103 indicated that no e-literacy skills knowledge was obtained between the pre- and post-test by Control groups in both the CCM and OMT qualification</li> <li>Empirical findings obtained from Table 5.14 and §5.4.2.5 and §5.4.2.6, Table 5.15 indicated limited significant interaction effect in e-literacy skills for Control groups in both the CCM and OMT qualification</li> <li>Figure 6.5 imitate inconsistent <math>p \leq 0.05</math> values for Control groups in OMT and CCM as <math>p=0.003</math> until <math>p=0.859</math></li> </ul> |

### 6.5.2 Distinctions signified by Experimental groups

In the category “Distinctions signified by Experimental groups” it is evident from the numerical data analysis as discussed in §5.4.2.5 and §5.4.2.6 and summarised in Tables 5.14 and 5.15, that respondents in the Experimental groups found that exposure to the e-readiness intervention enhanced their e-literacy skills in many ways. Calculated  $p$  values stipulated in Table 5.14 ranged between  $p=0.000$  until  $p=0.013$  for the CCM qualification. Relevant effect sizes varied between  $d=0.38$  until  $d=1.56$ , indicating a large effect hence it signified that these differences are important in practice.  $P$  values for the Experimental group OMT (Table 5.15) ranged between  $p=0.000$  until  $p=0.017$ . Relevant effect sizes varied between  $d=0.45$  until  $d=1.61$ , a large effect, also indicating that the differences are important in practice.  $P$  values for Experimental groups are portrayed in Figure 6.5.

**Figure 6.6: CCM and OMT Experimental groups'  $p$  values**

To support and strengthen empirical findings pointed out above, remarks from the sample data in the HU Qualitative data implied that respondents experienced a positive change in their e-literacy skills abilities after the post-test, the intervention. They indicated that they learned a lot and subsequently now what to do. They replied:

*Absolutely, I have learned so much (P1:8, 39-41).*

*The post-test was better because I know something that I did not know before the pre-test (P1:14, 101-107).*

*Firstly, like at the beginning I was able to use Microsoft Word but I did not know anything but now since the intervention now I know what is a taskbar and icons, now I know (P1:22, 177-179).*

*I learned a lot. I didn't know that if I type my name on Google, I am going to find everything like my results for grade twelve, my picture on Facebook. So after that I knew that and I learned a lot that even if search someone in class I am going to just type his or her name in Google and find anything about her that I want to know (P1:25, 209-211).*

*Like we did not know how to calculate in Excel, how to do things, but then the intervention helped us a lot in doing that (P1:11, 77-77).*

Furthermore, statements from the integrated data set, for constructs my Navigation capabilities (V45) and File management (V55) in the pre-test were compared with statements participants mentioned in the post-test for the same constructs, PV45 and PV55. Typical comments made by respondents at the pre-test were: *I would love to learn how to back-up my data and what is meant by that?* (P2:3, 37) and *I need help on knowing my pointing devices* (P2:1, 26).

Alternative comments made at the post-test were: *My knowledge in terms of file management is a lot better* (P2:4, 203) and *I cannot say I know enough about the navigation capabilities* (P2:1, 200).

Because of the ubiquitous use of technology in our society, schools and universities often assume that their students are digitally literate, but it is becoming increasingly clear that students differ greatly in their use of technology and therefore in their technology skills (Voogt *et al.*, 2013:410). Supplementary statements made by respondents are put forward in Table 6.6:

**Table 6.6: Pre- and post-test quotations for constructs File management and Navigation capabilities**

| <b>My Navigation capabilities</b>                                                                                |                                                                                                                          |
|------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| <b>V45 (pre-test)</b>                                                                                            | <b>PV45 (post-test)</b>                                                                                                  |
| <i>I lack more knowledge in knowing what a pointing device is and using the mouse for shortcuts</i>              | <i>I can do most of the things and my navigation capabilities are much better than before I got trained</i>              |
| <i>In the above tasks I just heard people talking about them but I do know more about them.</i><br>(P2:2, 20-27) | <i>Please I would like you to show me navigation so that I can be able to learn and understand it</i><br>(P2:1, 192-197) |
| <b>File management</b>                                                                                           |                                                                                                                          |
| <b>V55 (pre-test)</b>                                                                                            | <b>PV 55 (post-test)</b>                                                                                                 |
| <i>I need to get help on how I can create a new document in my document library</i>                              | <i>Understood</i>                                                                                                        |
| <i>I need to know I can save files in my documents</i>                                                           | <i>I have gained a lot of skills on file management</i>                                                                  |
| <i>I need training on how I can back-up my data and how to save files on external devices</i><br>(P2:3, 43-47)   | <i>I know how to back-up my data and to save files on external devices</i><br>(P2:4, 207-211)                            |

Table 6.7 summarises the key findings and important aspects for considerations on distinctions signified by Experimental groups.

**Table 6.7: Key findings on distinctions signified by Experimental groups**

| Key finding Five                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"><li>• Respondents' remarks as well as sampled data from constructs My Navigation capabilities (V45 and PV45 and File Management (V55 and PV55) indicated a transformation in e-literacy skills capabilities between the pre- and post-test</li><li>• Empirical findings obtained from Tables 5.14 and 5.15, as well as descriptions in §5.4.2.5 and §5.4.2.6 clearly indicated significant interaction effects in e-literacy skills for Experimental groups in both the CCM and OMT qualification</li><li>• Figure 6.6 imitates significant <math>p \leq 0.05</math> values for Experimental groups in OMT and CCM as <math>p = 0.000</math> until <math>p = 0.265</math></li></ul> |

The findings are cohesive with assumptions postulated by Safar and Alkhezzi (2013:624), that experimental grouped students were significantly outscoring their counter control group peers by submitting projects of better quality, thereby earning higher final grades and better attendance.

## 6.6 Implication of e-readiness intervention

In this section I will discuss the implication of the e-readiness intervention determined from quantitative and qualitative findings. This mixed methodology approach assisted to crystallise findings and construe conclusions and recommendations. Themes associated with the significance of the intervention are reflected in Figure 6.7.

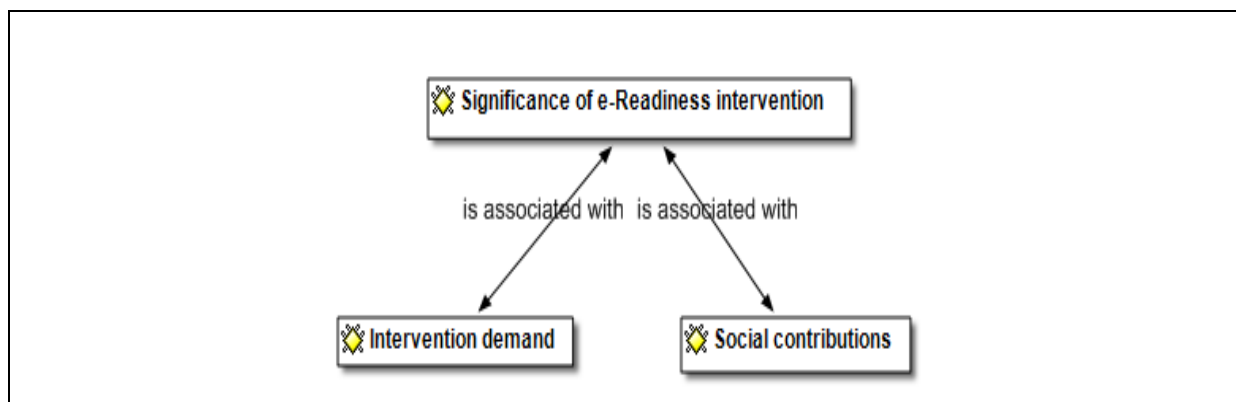


**Figure 6.7: Implication of e-readiness intervention theme codes**

Results from the covariance analysis conversed in §5.4.3.1 and Table 5.20 indicate some significant effects for participants' perceptions on certain constructs (§4.5.5.1) for both Control and Experimental groups after the intervention. Significant effects,  $p = 0.011$ ,  $p = 0.024$  and  $p = 0.047$ , were indicated for three constructs. One respondent indicated that when he attended the first technology class he was already familiar with techniques and did not need to ask for any assistance: *It helped me a lot because for the very first time I attend IAD they ask us to create a folder. So I did not ask the lecturer where to go because I already knew it* (P1:21, 169-171).

Further significant effects,  $p=0.013$ , were indicated between Control and Experimental groups for File Management, and  $p=0.011$  for Word processing, (Table 5.21). In order to support numerical findings respondents, revealed that they knew what procedure to follow to execute instructions in class compared to their friends who had not taken on the intervention. Respondents declared that:

*Yes, because I did not know a lot about computers especially how to do calculations etc. So my other friends also do not know anything about that, they did not even come, so I knew what they didn't know (P1:13, 91-93).*

*On slideshows, like PowerPoint we were not able to time it, like for it to move on at a certain time but then you taught us that you have to follow certain steps for it to function accordingly (P1:24, 201-203).*

*Yes. I did because I know now that there is an operating system which I can say operated there which I have to switch on in order for the computer to operate (P1:20, 161-163).*

*I was so excited because it reminded me about computers because I forgot most of the things, so it reminded me and I was so excited (P1:29, 261-263).*

In addition, respondents indicated that exposure to the intervention placed them in a better position when academic activities started:

*The first week of our class we were doing what we were being taught there. So it helped us a lot because we knew what was happening already, the basics and stuff (P1:10, 71-73).*

A similar finding was reported by (Naidoo & Raju, 2012:42) who studied the impact of the digital divide on literacy training and recommended that computer literacy training is critical to acquaint students with basic computer terminologies, and mouse and keyboard skills. Hence, the timing of computer literacy training is very important and should be offered to students as early as possible. This is consistent with the suggestion made by (Osuji, 2010:155) that an acceleration of progress is needed in the area of computer literacy.

In conclusion, respondents pointed out that the intervention should be made longer and offered to newcomers long before they have to report for orientation and registration. One respondent replied by saying: *I think the intervention course should be made longer before the classes starts because some students can't sometimes work under pressure they do not know what to do but if it is longer, a week or two weeks before they will have enough time to practice and think about it and think about the course they want to do (P1:31, 277-279).*

Other respondents commented by saying that the intervention should be compulsory for every new student and that it boosted their confidence:

*Yes, it did, like I wish it could be compulsory for everyone who does this course to go through this intervention because it really does help, seriously it does (P1:40, 365-367).*

*As E3 said, it helps, it should be compulsory because it will be simpler for the lecturer when the classes starts. The lecturer does not have to start all over again. She can just continue where the e-readiness has stopped (P1:41, 369-371).*

*Yes, I think it must be compulsory especially for students because it make lecturers jobs easier. Students will know how to put their fingers on the keyboard instead of typing, some people do not know how to type their name or where to get font styles, so I think it must be compulsory (P1:44, 377-379).*

*The intervention helped me a lot because I was scared. I only knew three languages. I did not know isiZulu or Xhosa. So I met friends there then I was afraid to even ask. So it helped me a lot because I spoke English with my friends and communicated with my friends then it was easier for me to go around this campus with my friends and even to start my class, so even today I am still with them (P1:19, 151-153).*

Furthermore, participants indicated that the intervention training boosted her self-confidence:

*It helped me a lot because it boosted my confidence. I have learned a lot and I knew buildings that I didn't know of, so after that when attending classes I was familiar with most classes etc. and I also found friends and the computer skills really helped me because in class I was not blank and did not know what to do, but I had some knowledge of the computer (P1:16, 139-141).*

Table 6.8, on the next page, summarises the key findings and important aspects for considerations on significance of e-readiness intervention.

**Table 6.8: Key findings on implication of the e-readiness intervention**

| Key finding Six                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Respondents' remarks as well as sampled data from the HU Atlas PhD qualitative Data indicated a difference in e-literacy skills perceptions and capabilities after the intervention</li> <li>• Empirical findings obtained from Table 5.20 and Figure 5.1, as well as descriptions in §5.4.3.1, indicated higher effect size differences for Control and Experimental groups after the intervention for the CCM qualification compared to the OMT qualification</li> <li>• Empirical findings obtained from Table 5.21 and Figure 5.2, as well as descriptions in §5.4.3.2, indicated higher effect size differences for Control and Experimental groups after the intervention for the CCM qualification compared to the OMT qualification</li> </ul> |

This is consistent with findings in a study conducted by Chang *et al.* (2012:184) that changes took effect after computer training. Before training, lower educated people had higher anxiety levels, but after training and those who owned a computer increased their perceptions of usefulness of computers and had reduced anxiety levels (Turel, 2014:143). Warschauer (2003:46) claims that the "Acquisition of literacy is not only a matter of education, but also of power."

## 6.7 Conclusion

This chapter explicated the qualitative phase of the concurrent mixed multi-mode design. A deductive-inductive data analysis strategy was used and aimed to confirm the  $H_{01}$ ,  $H_{02}$ ,  $H_{A1}$  and  $H_{A2}$  hypotheses of this study.

I offered an interpretive account of qualitative findings to ground my empirical data analysis by discussing five topics such as e-literacy and digital divide disparities, necessity of e-readiness training, participants' perceptions around their own e-skill capabilities, impact of e-readiness intervention and the significance of the e-readiness intervention. Merriam (2009:210) asserts that a qualitative analysis provides readers with a depiction in enough detail to show that the author's conclusions make sense.

Two primary documents were assigned in the HU Atlas PhD qualitative data in the CAQDAS software package, Atlas.ti<sup>TM</sup>. Crystallised quantitative and qualitative data echoed similar findings. A synopsis of findings was recapped in key findings at the end of each section. The most relevant documented themes for each discussion were illustrated in various figures.

In the final chapter, Chapter Seven, the research effort is concluded. I will conduct a brief analysis of the contribution of each chapter towards testing the research hypotheses. This chapter also discusses the salient contribution of the research and my research journey. Finally, I will provide a brief exposition of the methodological and contextual limitations of this research followed by reflections for further research.

## **CHAPTER 7: CONCLUSIONS AND RECOMMENDATIONS**

- 7.1 Introduction
  - 7.2 Overview of chapters
  - 7.3 Research objectives revisited
    - 7.3.1 Primary objective
    - 7.3.2 Secondary objective
    - 7.3.3 Subsequent secondary objective
  - 7.4 Hypotheses revisited
  - 7.5 Limitations of the research study
    - 7.5.1 Methodological limitations
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  - 7.6 Recommendations for further research
  - 7.7 Value of this research project
  - 7.8 Validity and reliability
  - 7.9 Researcher's reflections through a PhD journey
    - 7.9.1 Methodology reflection
    - 7.9.2 Substantive reflection
    - 7.9.3 Scientific reflection
    - 7.9.4 Recommendations for practitioners
-

# CHAPTER 7

## CONCLUSIONS AND RECOMMENDATIONS

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### 7.1 Introduction

Chapter One explained that a quantitative as well as a qualitative approach would be followed in this case study which explored the e-literacy skills of novice students at the TUT. To get a clear picture of how the independent variable, the e-readiness intervention, influenced the dependent variable, the e-literacy skills of novice undergraduate students, a two-group control and experimental design were used to identify associations and differences between the variables. Table 1.1 (§1.5.2.2), gave an overview of the Y, X and confound variables as to verify my intellectual conundrum. I chose the fully mixed methodology concurrent status design (De Vos *et al.*, 2012:441; Leech & Onwuegbuzie, 2009:271) to execute the study, given that it enabled me to assess, to explore and to present an in-depth understanding of the research phenomenon, to achieve my research objectives and ultimately to test my research hypotheses.

My pragmatist and naturalist epistemological viewpoint (§4.2) endorsed the mixed method paradigm, due to the fact that my reality was single and tangible, and due to the fact that my inquiry was value bounded. De Vos *et al.* (2012:436) contend that “mixed methods research is practical in the sense that researchers are free to use all methods possible to address a research problem as well as the fact that they combine inductive and deductive reasoning processes.”

This chapter offers a distillation of the thesis. For the ease of reference, an overview is presented on the research problem statement and the research question, along with the research objectives.

Subsequently, it recaps the null and alternative hypotheses, the research design and methodology as well as quantitative and qualitative data analyses. All the information obtained was applied within the boundaries and limitations of this particular study.

### 7.2 Overview of chapters

Chapter One commenced with a concept map indicating the boundaries of the research project, followed by a statement of the research problem and motivation for the research. After a brief literature review, I described the rationale for using quantitative and qualitative data components. Dependent and independent variables were pointed out in the null and alternative hypotheses. The geographical demarcation of the study, population, sample frame and sampling techniques were pointed out. The measuring instruments intended for the study were described. Vital ethical matters, including ethical clearances as well as the researcher's role, were discussed. In addition, I ascribed its contribution to

other UoTs along with the sub-programme for using Technology Enhanced Learning for Innovative Education and Training in SA by addressing obstacles of inadequate e-literacy skills at HEIs. The chapter concluded with a structure of the study.

The qualitative systematic review of literature dealt with in Chapter Two introduced various important elements within the field of literacy; to be more specific, e-literacy skills. It explicated e-readiness that involved e-literacy skills including a summary of existing models for the development of computer literacies. Along with that, the literature review gave me a clear insight of the South African government's future intentions to uplift the e-literacy skills of its workforce with its proposed SA National e-skills action plan. Adjacent to this, it introduced an understanding of SA's e-readiness rank and its influence on the development of human capital. Finally, the chapter concluded with digital divide categories, and conceptualised the digital divide particularly for Africa and South Africa. The seven step guide of Britten *et al.* (2002:210) helped me to perform this systematic qualitative analysis. A flow diagram for the execution of the review was presented in Figure 2.1. The review of my body of scholarship assisted me to fill my knowledge gap, to make recommendations for future research, as well as to establish the importance of the study. The chapter concluded with a reason why this study was undertaken.

Chapter Three focused on the e-readiness toolkit developed as intervention to alleviate e-literacy skills of undergraduate students. The intervention manual was not bounded to application software versions, but concentrated on the development of e-literacy skills and contained units with learning objectives in constructs such as: Getting started; Navigation capabilities; File management capabilities; Web browsing capabilities; E-mail; Software capabilities; Hardware operations; Word processing skills; Spreadsheet and Presentation and PDF capabilities. User friendly tutorials with explanations including hands-on training exercises and practice files in all units were accessible as well. Each learning unit ended with a narrative of the particular learning outcomes achieved.

My method of reasoning clarified the research philosophy by means of my epistemological and ontological assumptions for this study. The remainder of Chapter Four included the selection of a research approach, such as an experiment and my concurrent mixed methodology approach. The research design, in this instance a case study, included descriptions about the population, systematic random sampling and data collection instruments, as well as the quantitative and qualitative data analyses. The quantitative data collection strategy included the adoption and adaption of an e-readiness questionnaire and situational test. Data collected from the pre- and post-test were analysed using SPSS<sup>TM</sup>. Descriptive statistics were conducted to describe the numerical data analysed and interpreted from the demographical and self-appraisal sections as well as the situational test of the e-readiness questionnaire. Two-way analysis of variance (ANOVA) and a two-way analysis of covariance (ANCOVA) techniques were used to perform inferential analysis. In some instances bar graphs were used to substantiate interpreted data. Qualitative data were collected by way of open-ended questions and a focus group interview analysed and coded using Atlas.ti<sup>TM</sup>. Categories, families and codes that informed the basis for organising qualitative data were illustrated in Figure 4.5. Other important issues such as

validity and reliability of the research project were discussed. Cronbach Alpha ( $\alpha$ ) and mean inter-item correlation tested the reliability of the e-readiness questionnaire and situational test. Ethical clearances and permissions to use fieldworkers as well as to distribute the data collection instruments were granted by both North-West University's and the Tshwane University of Technology's Ethical Committees. The chapter concluded with a narrative on methodological limitations.

Chapter Five reported on the empirical findings of the quantitative data set. Two types of analyses followed: descriptive statistics and inferential statistics. Descriptive statistics gave detailed analysis of the response means and standard deviations organised in frequencies and percentages. Inferential statistics gave detailed analysis on associations considering two factors. Factor One included comparisons between Experimental and Control groups whilst Factor Two included comparisons between the CCM and OMT courses, and where the differences were. Inferential analysis was guided by three inquiries: (i) group comparisons before the intervention; (ii) comparisons between the pre- and post-test; (iii) group comparisons after the intervention. All the way through the analysis, findings on participants' perceptions about their e-skill capabilities were discussed first; thereafter the findings about the tangible e-skill capabilities followed. Statistical differences of  $p < 0.05$  were considered as significant. Effect sizes were calculated to determine practical significance. Practically significant values of  $d = 0.4 \leq 0.8$ , medium effect, that tended towards practically significant difference and,  $d \geq 0.8$ , large effect, indicating practically significant differences were reported exclusively.

Chapter Six revealed qualitative results from open-ended questions and a focus group interview. I imported the two data sources as primary documents in a HU Atlas PhD qualitative data. The computer based qualitative data analysis system, Atlas.ti™ assisted to categorise and code collected data according to themes and codes. The inductive analysis was guided by five headlines: e-literacy and digital divide disparities; necessity of e-literacy training; participants' perceptions around their own e-skill capabilities; impact of e-readiness intervention; and the implication of e-readiness intervention. Narrative accounts of participants' opinions were reported at each applicable point. I explained the location of cited quotations in the Hermeneutic unit such as P1:19, 151-153, that it can be found in primary document one, code nineteen, on lines 151-153. In addition, each inquiry ended with a synopsis of quantitative and qualitative key findings.

The purpose of Chapter Seven, the concluding chapter, is to declare conclusions in response to the research conundrum, the research objectives and ultimately the hypotheses of this study. Furthermore, the chapter indicates contributions as well as methodological and contextual limitations to the Social Sciences field. Validity and reliability issues, the value of this research, together with recommendations for future research, are discussed as well. The chapter ends with a reflection of the researcher's journey through a PhD.

In the following two sections I provide final conclusions upon key findings from the quantitative and qualitative data analyses, grouped according to the primary, secondary and subsequent research objectives as well as the null and alternate hypotheses.

### **7.3 Research objectives revisited**

The primary reason for conducting this study was to minimise the mismatch between expected and actual e-literacy skills competencies of undergraduate students in two National Diploma qualifications in the Office Management and Technology department of the TUT. The determination was to measure perceived and tangible e-literacy skills of undergraduate students at the commencement of their HE training career. After an e-readiness intervention, instructed by the e-readiness toolkit, perceived and tangible e-literacy skills were measured yet again to uncover e-literacy skills differences in participants from Control and Experimental groups within the CCM and OMT qualifications.

The realisation of this purpose was guided by a primary- and two secondary objectives.

#### **7.3.1 Primary objective**

The primary objective (§1.4) tested the intellectual conundrum: Is e-literacy skills training required for e-readiness of novice TUT students?

The primary objective was achieved as soon as perceived e-literacy skills of first time entering students of two National Diploma qualifications in the department OMT were measured prior and subsequent to the e-readiness intervention. The investigation was done on measuring variable differences according to the Factors 1 and 2 analysis (§5.4) by the use of inferential statistical methods analysed in Chapter Five, as well as the HU Atlas PhD qualitative data analysed in Chapter Six. This final conclusion is based on key findings: one (Table 6.1); two (Table 6.3) and three (Table 6.4) as described in §6.2 - §6.4.

Digital divide differences contributed to inadequate e-literacy skills in novice TUT students. The e-readiness training was essential for undergraduates to minimise the e-literacy gap between high school and HE. Empirical findings indicated significant effects in perceived and tangible e-literacy skills capabilities after the e-readiness training for Experimental groups, whilst no significant effects were indicated for Control groups. For that reason novice TUT students perceived e-literacy skills training as a requirement for e-readiness.

#### **7.3.2 Secondary objective**

The secondary objective (§1.4), objective three, empirically determined if e-literacy skills training was efficacious for novice undergraduate students at TUT.

The secondary objective was achieved, as tangible e-literacy skills of first time entering students of two National Diploma qualifications in the department OMT were measured prior and subsequent to the e-readiness intervention. The investigation was done on measuring variable differences according to the Factors One and Two analysis (§5.4) by the use of inferential statistical methods analysed in Chapter Five, and the HU Atlas PhD qualitative data analysed in Chapter Six. The final conclusion is based on key findings: four (Table 6.5) and five (Table 6.7) as described in §6.5.1 - §6.5.2.

Empirical findings indicated no significant interaction effects in tangible e-literacy skills capabilities for Control groups in the CCM and OMT qualifications whilst empirical findings clearly indicated significant interaction effects in tangible e-literacy skills for Experimental groups in the CCM and OMT qualification. Supported qualitative findings indicated e-literacy skills capability transformations between the pre- and post-test for Experimental groups, but not for Control groups. In view of this, e-literacy skills' training was effective for novice undergraduate students at TUT.

### **7.3.3 Subsequent secondary objective**

The subsequent secondary objective (§1.4), objective five, verified if the e-readiness toolkit was meaningful to novice students at TUT.

The subsequent objective was achieved, as the significance of the e-readiness intervention was investigated. The inquiry was done on variables measuring differences and opinions, using inferential statistical methods analysed and described in Chapter Five, and the HU Atlas PhD qualitative data analysed and described in Chapter Six. The final conclusion is based on key finding: six (Table 6.8) as described in §6.6.

Respondents' remarks indicated ample differences in e-literacy skills perceptions and tangible capabilities in first time entering students in the department OMT after the e-readiness intervention. At the same time, empirical findings indicated significant effects in perceived and tangible e-literacy skills capabilities for Experimental groups after the intervention. Therefore, the e-readiness toolkit was meaningful to novice students at TUT.

This lends strong support to a claim made by Kambouri *et al.* (2013:online) that adult learners, in almost all cases in an ICT intervention study, improved their ICT and language skills. In addition, Bharuthram and Kies (2013:419) emphasise that for maximum benefit of e-learning interventions, students need to be technologically literate, as technology can expedite the learning process.

## **7.4 Hypotheses revisited**

The systematic literature review studied contemporary changes in e-literacy practices as well as the importance of 21<sup>st</sup> century e-literacy skills required today. Tangible and perceived e-literacy skills of

undergraduate students in the department OMT were assessed in Control and Experimental groups by means of a pre- and post-test after an e-readiness intervention was put into practice. Empirical findings proved (§5.4.1 - §5.4.3) that the e-readiness training constituted no statistically significant effect in undergraduates' e-literacy skills perceptions and capabilities in Control groups of CCM and OMT, whilst a statistically significant interaction effect in undergraduates' e-literacy skills perceptions and capabilities in Experimental groups of CCM and OMT were visible. Countless qualitative data to support this declaration were noticeable in §6.2 - §6.6.

Consequently the research hypotheses were revisited and were either accepted or rejected based on the qualitative systematic literature review, empirical findings and the crystallised results of this study.

H<sub>01</sub>: There is a no statistically significant effect in Control groups between the pre- and post-test of e-literacy skills.

H<sub>A1</sub>: There is a statistically significant effect in Control groups between the pre- and post-test of e-literacy skills

The null hypothesis, H<sub>01</sub>, was accepted and the alternate hypothesis, H<sub>A1</sub> was rejected. The conclusion was substantiated in key finding four, §6.5.1. The level of statistical significance observed for Control groups in the CCM and OMT qualifications were p=0.169, p=0.010, p=0.179, p=0.032, p=0.042, p=0.274, p=0.859, p=0.003, p=0.106 and p=0.455.

H<sub>02</sub>: There is no statistically significant effect in Experimental groups between the pre- and post-test of e-literacy skills

H<sub>A2</sub>: There is a statistically significant effect in Experimental groups between the pre- and post-test of e-literacy skills.

The null hypothesis, H<sub>02</sub>, was rejected and the alternative hypothesis, H<sub>A2</sub>, was accepted. The conclusion was grounded in key finding five, §6.5.2. The level of significance observed for Experimental groups in two qualifications were p=0.265, p=0.013, p=0.003, p=0.000, p= 0.001, p=0.017, p=0.000, p=0.000, p=0.000 and p=0.000.

The practical meaning of the hypotheses was that it gave the candidate some trust to use the e-readiness toolkit and to have it evaluated and improved in the future. The participants who participated in the intervention acknowledged the valuable contribution the e-readiness toolkit made to develop their e-literacy skills. The findings of this study concurs with Baker's (2013:350) view that educators must teach students which aspects of e-literacy skills are essential, how important e-literacy skills are, and how these will be used in practice. In the current context, McSorley (2003:84) asserts that getting up to speed or becoming e-ready is effectively not merely a material condition but also a moral one.

The e-readiness toolkit is recommended as a training manual for e-illiterate students. It is also recommended to educators and universities of technology to prepare novice students to utilise academic e-learning platforms in order to actively engage in their own learning process. A summary of the main findings obtained from testing the null and alternative hypotheses is presented in Table 7.1.

**Table 7.1: Summary of main findings of study**

| Main findings                                                                                                        | Relevance to literature                                                                                                                                                                                                                                                                            |
|----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| e-Readiness toolkit (the intervention) did not influence e-literacy skills of control grouped novice students        | Due to the use of technology in our society, schools and universities often assume that their students are digitally literate, but it is becoming increasingly clear that students differ greatly in their use of technology and therefore in their technology skills (Voogt <i>et al.</i> , 2013) |
| e-Readiness toolkit (the intervention) influenced e-literacy skills of experimental grouped novice students          | Safar and Alkhezzi (2013) claim that experimental grouped students were significantly outscoring their counter control group peers by submitting projects of better quality, thereby earning higher final grades and better attendance                                                             |
| e-Literacy training is required for novice CCM qualification students at the TUT                                     | Cullen and Cobb (2011) found a need to include information technology into literacy programs; thereby low literacy members in communities can become more self-sufficient and make better use of available electronic services                                                                     |
| Hypotheses results confide in the use of the e-readiness toolkit and to have it evaluated and improved in the future | This is consistent with the suggestion made by (Osuji, 2010) that an acceleration of progress is needed in the area of computer literacy                                                                                                                                                           |

## 7.5 Limitations of the research study

In spite of careful planning and execution of research methods, all studies inherently have limitations which could relate to choices of theoretical limitations, selection of methodological approaches and the encountering of constraints during data collection and analysis. However, the reader should take cognisance of subsequent limitations of this study:

### 7.5.1 Methodological limitations

- The level of confidence and the permissible sample error was a concern for the researcher because not all voluntary participants returned for the post-test.
- Contamination in the data might have occurred due to computer resource constraints. The computer laboratories accommodated a maximum of fifty persons per session, therefore the pre- and post-tests were written over a period of two days in order to accommodate four sessions.
- Extraneous variables such as participant, intervention and situational factors may well indicate experimental error mainly because the important characteristics of participants from the Control and Experimental groups were different.
- The intervention might not have been exactly the same for all participants, especially when it came to variations in sequences, the duration and content of the intervention, practices and the assistance provided by the fieldworkers. A matter of great concern was the fact that one fieldworker took longer tea breaks than was permissible.

- Although the researcher might have assured participants of the anonymity of their responses in the focus group interview, participants might still have been cautious in the amount of information that they disclosed.

### **7.5.2 Contextual limitations**

- The sample frame that was used in the study was undergraduate students in one department only, namely OMT in the TUT. It is thus important to be aware that any references made to this study should not be read as representing the population, but rather seen in context of the sample frame that was used.
- Since this is a single (Babbie, 2013:338) bounded case study, I did not aim to generalise the results; instead the intent was to provide for the extension of the findings which will enable others to understand similar situations and apply these findings in subsequent research or practical situations. Therefore findings and conclusions are limited to this case study alone.
- The qualitative systematic literature review focused on specific topics. Having specific inclusion rules may cause the exclusion of topics and concepts that may prevent conceptual advances in the e-literacy skills field.

## **7.6 Recommendations for further research**

The following opportunities for further research were identified during the course of this research study:

- Fieldworkers' e-literacy skills matured via their interaction with undergraduates during the e-readiness intervention. This is an example of mutual learning that was not expected and was not investigated in the current study. It is suggested that future research can study this aspect to further understand the value of learning occurring between mentors and learners in training programmes.
- An extension of this study to determine the impact of digital divide discrepancies on students' e-literacy skills coming from rural, semi-rural and urban areas.
- An extraction of empirical results to compare and associate respondents' basic, functional and proficient e-literacy skills with their rural, semi-rural and urban surroundings.
- Accounts for the difference in results between the CCM and OMT courses are to be investigated.
- A study to investigate ICT literacy skills assessment instruments depleted by researchers over the past decade could reveal valuable information around e-literacy skills evaluation and questionnaire design.
- A study that will investigate how the non-use of ICT and e-illiteracy affect people in their daily lives.
- There is a great deal of recent literature on mobile use in education in SA. This is of special interest in developing the contexts of countries (Joseph, 2015:18) where access to computers is still limited but access to cell phones is widespread. Future research should focus on 21<sup>st</sup> century e-competence measurement in both mobile (Nwakanma, 2015:26) and computer end users.

- Possible reasons for the higher significant differences found between the eleven constructs could be investigated.

## 7.7 Value of this research project

This research study made a contribution to e-skills project: Establishment of a national system of physical network hubs to coordinate existing and new efforts in e-skills located at HEIs in SA (South Africa, 2010:5). In addition, it contributed to the scientific community in the following ways:

- As the practice of science is increasing, and a move towards a global knowledge economy is accelerating, the necessity to have a thriving scientific community to generate new knowledge and to exploit it, both in the academic and industrial world, has become indisputable. In this present day it is essential to incorporate technology effectively into education so as to be in a position to satisfy educational challenges of the 21<sup>st</sup> century. For this reason it was important to keep track of present day ICT development in HE.
- Although the location of my work provides considerable scope for creating new knowledge about learning, research drives the business of education. This scientific research project effectively contributed to the intellectual source of new findings and has an influence on the future e-literacy skill directions in HE.
- This study contributed to the National e-Skills Action Plan (NeSPA) of SA.
- It furthermore contributed to the establishment of HEI's ICT awareness and e-skilling of the SA nation.
- The literature review narrowed a defined gap in knowledge and created a base for e-literacy and concepts of digital divide. It helped to build an understanding of e-readiness and prevailing e-readiness curricula as well as to comprehend the role of HE in development.
- This project contributed to the research output of the North-West University, and the TELHE research entity.
- The concurrent mixed methodology status design contributed to a comprehensive data analysis, whilst the crystallised (Merriam, 2009:216) data set enhanced the trustworthiness of the study.
- The research developed and validated an e-readiness toolkit as instrument for educators to reduce the e-literacy skills mismatch in undergraduate students.
- The e-readiness toolkit equipped undergraduate students with basic e-literacy skills habits that will shape their computer abilities during the course of their studies and almost certainly throughout life. It especially equipped and inspired them to provide peer e-literacy skills support to other first year students who did not participate in the study.
- Not only did this intervention enhance concrete e-literacy skills of undergraduates but it also empowered their self-confidence. This exposure lowered anxiety levels and granted undergraduates a step ahead during initial lectures, especially at University level where the ambiance is so different from school.
- Results indicated that the e-readiness intervention had a larger effect in Contact Centre Management undergraduates than those of the Office Management and Technology qualification.

- The e-readiness toolkit will be recommended to other academic departments at TUT as an e-literacy module in their induction programme. In this way I enhanced the value of my line of work.

## 7.8 Validity and reliability

Where research integrates quantitative and qualitative methods, an argument exists for identifying specific validity requirements such as representation, legitimation and integration (Cohen *et al.*, 2011:198).

Representation in this study was acquired by using only words and pictures that caught the dynamics of lived experiences. To enhance transferability (Merriam, 2009:227), I gave rich and thick descriptions to contextualise the study in order for readers to determine the extent to which their situations match the research context. To enhance reflexivity (Merriam, 2009:219), I limited research bias. To contain my personal bias, field workers were used to facilitate the administration of the pre- and post-test. Using external facilitators helped to increase anonymity, benefited ethical concerns as well as assisted to peer review the focus group interview.

Legitimation was achieved by ensuring that results were dependable and trustworthy. I explained the investigator's position by means of an epistemological viewpoint that justified the mixed methodology approach used to collect and analyse raw data. I applied systematic random sampling in a true experiment to evaluate how well my methodology choice met the research objectives, answered the research question and validated the hypotheses of this study. Treatment and measurement was adequately controlled (Cohen *et al.*, 2011:208) by the researcher in a two group pre- and post-test design (Control and Experimental group). Reliability of the e-readiness questionnaire was confirmed by means of Cronbach alpha ( $\alpha$ ) and inter-item correlations (Cohen *et al.*, 2011:201). The reliability of this study was further substantiated in the consistency of the empirical findings. Statistical significant effects were endorsed with effect sizes to strengthen findings. All this was done to ensure that research findings can be replicated (Merriam, 2009:221).

Integration was achieved by combining quantitative and qualitative methods. Methodological triangulation (Cohen *et al.*, 2011:196) generated a crystallised (Merriam, 2009:216) data set that obtained consistent and dependable data.

In addition, all information regarding the research such as questionnaire data, transcribed focus group interview, ethical consent forms, quantitative and qualitative analysed data, has been preserved to enable independent persons to verify the findings. Addenda applicable to this study are available in electronic format on CD-ROM. The CD-ROM is attached to the back of this thesis.

The next section discusses what lessons were learned from this research.

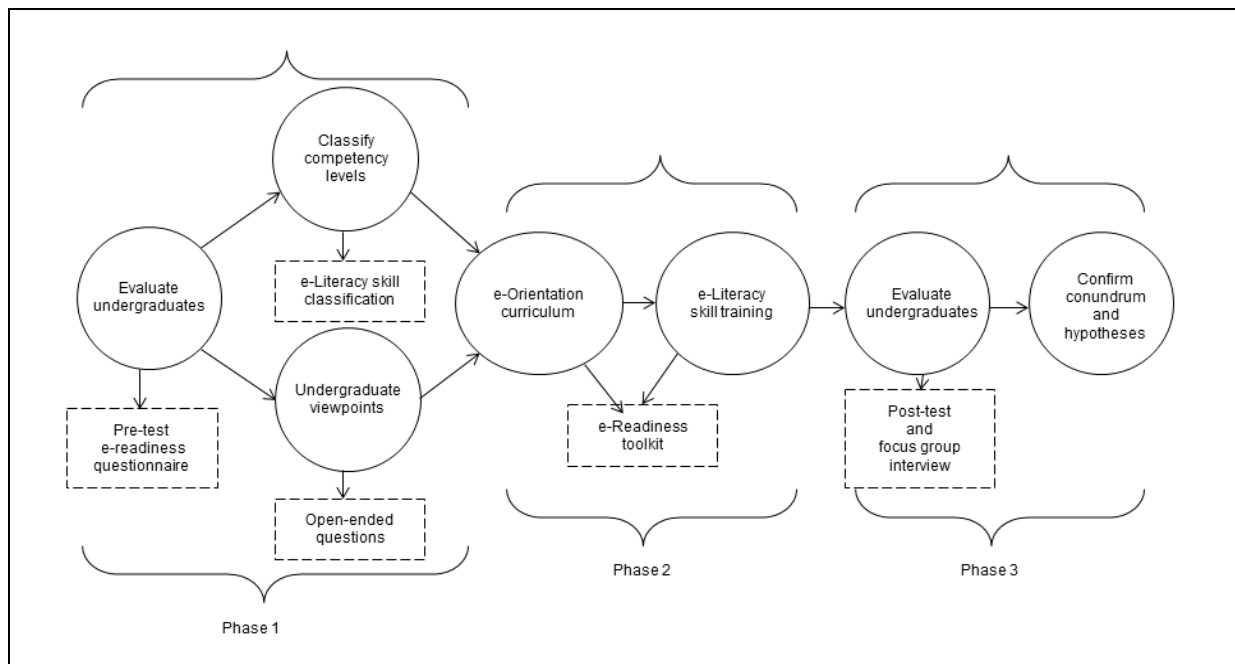
## **7.9 Researcher's reflections through a PhD journey**

A need for investigation about the level of ICT skills as well as its sustainability became evident during my lecturing years as I realised that first time entering students lack basic e-literacy skills required for OMT administrators and CCM managers, especially in the area of Information Administration where end user computer and software skills are highly pitched. This research study become part of my life for the past three years and started when I completed my Master's degree in Education Technology. Doing this research taught me continuous self-appraisal, persistence and endurance. Not only did it enrich my life and teach me perseverance, but it also gave me the opportunity to gain useful experience in conducting significant empirical research.

### **7.9.1 Methodology reflection**

The concurrent mixed method research design (Leech & Onwuegbuzie, 2009:271) reinforcing the true experiment executed in this single bounded case study, allowed me to obtain a holistic view of the research phenomenon at hand. It facilitated the research circle (Figure 4.2, §4.3) by which empirical findings were confirmed with an analysis of evidence from participants. I took pleasure in analysing qualitative data and learned a great deal about inferential statistics together with the analyses and interpretation thereof. It was stimulating to discover where the level of significance  $p < 0.05$ , indicated a significant effect for Experimental groups in contrast to Control groups. This scientific discovery confirmed  $H_{01}$  and  $H_{A2}$  and weakened the  $H_{02}$  and  $H_{A1}$  hypotheses of this study. Therefore, this research expanded my repertoire of empirical methodologies and equipped me with research innovative skills to experiment with new ways to foster learning. As a result, I am in a privileged position to use my knowledge to guide prospective Masters and Doctoral postgraduate students with their envisaged research projects.

My pragmatist and functionalist ontological viewpoint mandated the mixed methodology and gave me a pluralist approach in this research study. Due to my utilitarian nature, I made an effort to solve a practical problem, the inadequate e-literacy skills of undergraduate students, as well as in the practical world of Office Administrators and Contact Centre managers, by assessing the problem objectively and by confirming the e-literacy skill problem with empirical evidence. Figure 7.1 (on next page) illustrates the practical routine of this process.



### 7.9.2 Substantive reflection

The significance of this research lies in its contribution to filling the gap in my knowledge. Conducting a qualitative systematic literature review was a stimulating process. Published and unpublished literature as well as full text papers assessed against criteria for eligibility, delineated the boundaries of the research and helped me to write a focused literature review on my research phenomenon, e-literacy skills, as well as to broaden my body of knowledge. The literature review further enabled me to associate with other researchers' theoretical perspectives (Summers, 2001:408) and integrated what they have found. I compared, referred and narrated results of this research with other classified research and significant developments in the same field.

I have learned that many fundamental curricula have been developed to uplift e-literacy skills in various academic courses as well as in business sectors. In spite of this, economic disproportions causing the inevitable digital and e-readiness divide is still a great concern for developing countries in the 21<sup>st</sup> century. In addition, I sensed that HE students are introduced to computers and Internet technology for the first time when they enter these institutions, and subsequently grapple with basic e-literacy skills.

Furthermore, I produced authentic (McMillan & Schumacher, 2001:414) and analytical descriptions of my research phenomena, which are informative and useful to research communities, readers, students and participants.

I have learned from critique and feedback from colleagues in other disciplines to better understand my strengths and weaknesses, thus creating opportunities to improve my impact as individual.

### 7.9.3 Scientific reflection

The findings from both the empirical and qualitative parts of this study helped to create a link between the X and Y variables. I successfully provided comparisons of situations in which the independent (X) and confound variables (§1.5.2.2) influenced the dependent (Y) variable by means of a true experiment. Empirical findings effectively verified that the e-readiness intervention had no significant effect on Control groups but had significant effects on Experimental groups, thereby confirming the  $H_{01}$  and  $H_{A2}$  and rejecting the  $H_{02}$  and  $H_{A1}$  hypotheses of the study. Qualitative analysed data reinforced empirical findings in all cases in point. This systematic discovery was noticeable in the achievement of the primary, secondary and subsequent objectives of this study. This alone justified the e-readiness toolkit (intervention) undergraduate students of the OMT department endured.

I strived to strengthen HE by contributing to the dedicated professional community of educators. The e-readiness toolkit addressed the obstacle of inadequate e-literacy skills at HEIs and contributed together with similar e-literacy skills development curricula frameworks recognised from the qualitative systematic literature review (§2.3.3.) to the sub-programme *Frameworks for using TEL in HE*.

This PhD study resides under the research focus area TELIT-SA and contributed towards its research output.

As an educator, I experienced that supplementary e-literacy skills training should be provided to undergraduate students, mainly because of fundamental digital and e-readiness differences in SA. Hopefully the e-readiness toolkit will serve as a training manual in order to prepare undergraduate students for e-learning platforms, as e-learning is offered at TUT.

### 7.9.4 Recommendations for practitioners

The e-readiness toolkit serves as a training manual to bring novice students on par with the minimum e-literacy skill requirements for enrolment at a UoT. Significant e-literacy training should be presented to the CCM qualification. The e-readiness toolkit prepares novice students to adapt to e-learning platforms, as e-learning is offered at HEIs in SA. In addition, this study provided an e-literacy training solution to UoTs.

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