VAAL UNIVERSITY OF TECHNOLOGY

Faculty of Applied and Computer Sciences

AN APPROACH TO A CREATIVE PEDAGOGY TO IMPROVE THE LEARNER–CONTENT RELATION IN TERTIARY ICT EDUCATION IN SOUTH AFRICA

R van Eck

Magister Technologiae in Information Technology

20468237

Research Project and Thesis (AIRPP6A) submitted in complete fulfilment of the requirements for the Doctor Technologiae in Information Technology degree in the Department of Information and Communication Technology at the Vaal University of Technology.

Promoter: Prof A Jordaan

December 2018

DECLARATION

I, Rene van Eck, declare that the contents of this thesis represent my own unaided work, and that the thesis has not previously been submitted for academic examination towards any qualification. Furthermore, it represents my own opinions and not necessarily those of the Vaal University of Technology.

Signed **Date**

ABSTRACT

The work-integrated learning (WIL) concept was introduced to enhance the employability of students completing their IT qualification at universities of Technology (UoTs) in South Africa. Employability is defined as a combination of characteristics that make a person a useful and thereby desirable employee. WIL is defined as a component of a curriculum to improve the value of student learning by integrating academic training and practical workplace exposure. However, a large cohort of students registered for the IT qualification at UoTs do not find company placement for WIL, resulting in these students having to complete this final qualifying module of their qualification by undertaking a group project on campus. The group project entails developing a software system for a client. The overall sentiment expressed by employers, lecturers and students in this study is that students who remain on campus for the group project are not as well-prepared as those who find placement at a company for their in-service training.

This study aimed to develop and propose an approach to a creative pedagogy in the form of a simulated working environment on campus within a tertiary educational setting to contribute towards enhancing the learner-content relation of WIL students, in order to improve the employability of students by providing the on-campus project students with an equal opportunity to those going into industry for their in-service training. The philosophy adopted for this research is interpretivism, with the Vaal University of Technology as the case of the research. The investigation adopted a mixed-method approach where respondents were requested to complete questionnaires focusing on their perceptions of on-campus group work vs. in-service training at companies for the WIL component of the IT qualification. Five respondent groups were identified for participation in the study, namely: i) In-service training students, i.e. WIL students who found placement in a company; ii) Project students, i.e. WIL students who remained on campus to do a group project; iii) Graduates, i.e. students who already completed WIL and graduated; iv) Employers of WIL students who found placement at a company; and v) Lecturers involved in WIL training on campus. The responses of the various respondent groups were analysed qualitatively and quantitatively. Comparisons of the perceptions of the respective groups were made to explore the possibility of a viable solution to the on-campus group work challenges that were identified.

Based on reviewing recent literature, analysing the data collected from the completed to questionnaires by different role players, and adapting and the institutional strategy framework for WIL developed by Jacobs in 2015, an approach to a creative pedagogy in the form of a virtual company on campus for WIL students is presented to provide students who cannot find placement in industry for their in-service training with an equal experience to the in-

service training company students. The proposed pedagogical approach incorporates the five standards defined by Tharp in 2018 as requirements for an effective and successful curriculum in the development of the actual virtual company. These include: contextualisation, challenging activities, joint productive activity, intellectual conversation and language development.

The proposed approach adopts a three-layered approach to a creative pedagogy, with the aim of improving the employability of on-campus WIL students. The first layer lays the basis for implementing a virtual company on campus and includes aspects such as the objective for a simulated working environment on campus, employer preferences, and the skills set students should possess for employers to offer them a placement in their company for in-service training. The second layer focuses on the details that should be in place for a virtual company to be successfully implemented. This practical layer in the implementation of the virtual company focuses on infrastructure, Finance, HR, legislative approval, and appropriate assessments. The third layer only follows when the second layer has been put into place. This layer deals with how academic content can be included in the proposed pedagogical approach.

The study also revealed that in addition to adopting the concept of a virtual company on campus for WIL students, a substantial focus should be on soft skills training. The exit level outcomes (ELOs) related to a simulated working environment for the WIL module of the IT are specified in the HEQF (Higher Education Qualifications Framework) document as set out by the South African Qualifications Authority.

Keywords: Work-integrated learning, employability, creative pedagogy, pedagogical approach, Information and Communications Technology, in-service training, virtual company, simulated working environment.

ACKNOWLEDGEMENTS

I wish to use this opportunity to thank:

- My Heavenly Father for granting me the wisdom and patience to be able to complete this study
- Prof Annelie Jordaan, my mentor, for her continued support, encouragement and guidance in completing this research. Without her support I would not have been able to complete this study
- Prof Ahmed A Wadee for his academic and personal support, mentoring and supervision throughout this journey. I can say with all honesty that this document would not have 'materialised' if it was not for his support
- My husband Manie and daughters Megan and Chanel, for their love and unconditional support
- VUT for granting me sabbatical leave that enabled me to complete this study

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS/ABBREVIATIONS

Acronym / Abbreviation	Full Word / Term
BA	Business Analysis
CAST	Centre for Applied Special Technology
CHE	Council on Higher Education
DHET	Department of Higher Education and Training
HE	Higher Education
HEI	Higher Education Institution
ICT	Information and Communications Technology
IT	Information Technology
ITS	Integrated Tertiary System
UDL	Universal Design for Learning
SAQA	South African Qualifications Authority
UoT	University of Technology
VUT	Vaal University of Technology
WIL	Work-Integrated Learning

LIST OF DEFINITIONS

Term / Word	Definition
Action orientation	An academic orientation that focuses on actions and applies content rather than simply concentrating on the knowing of intellectual content (Abeysekera, 2006).
Co-operative module	A module or a subject that forms part of a course where students are required to do work-integrated learning in industry (CHE, 2011).
Creative tools	Creative tools are seen as educational tools, a powerful and useful means of stimulating greater motivation towards learning (Lin, 2011). Examples of creative tools are game-based tools and the use of simulations.
Disciplinary skills	An individual's understanding of subject matter concepts and how these concepts relate to the larger body of knowledge (MSP-KMD, 2018).
Employability	Refers to graduates having a combination of content knowledge and employability skills such as communication, team work and problem solving, which enables effective professional practice (Patrick et al., 2008).
Formative assessment	Assessment activities undertaken by teachers / lecturers and learners to provide information that can be used as feedback to adjust the teaching and learning activities in which they are involved (Andersson & Palm, 2017).
Informal learning	**Learning** that is not deliberately planned and takes place outside a formal **learning** setting (Manuti et al., 2015).
Information Technology (IT)	Information Technology is the theory and practice of using computers to store and analyse information (Collins English Dictionary, 2018e).
Information and Communications Technology (ICT)	In this study, ICT is used as the name of the qualification that is offered to students.
Intellectual orientation	Knowledge fields that offer a general process of intellectual development, which are less likely to include elements from the workplace or industry into the curriculum. The emphasis of learning is on ‘knowing’ rather than ‘doing’ (Barnett et al., 2001).
In-service training	Training offered to employees during the course of employment (Collins English Dictionary, 2018a). In this research it refers to training offered to in-service WIL students who found placement at a company.
Internship	*See* Work-Integrated Learning.
Pedagogy	Pedagogy is the study and theory of the methods and principles of teaching (Collins English Dictionary, 2018b).

Term / Word	Definition
Placement	The placing of students in a company to gain experience in their field of study (Hodges et al, 2014).
Play-centred learning	Learning that takes place through the action of play (Westera et al., 2008).
Project students	Refers to students in their final (WIL) module of their IT qualification who could not find in-service placement in companies and therefore remained on campus to conduct a group project.
Psycho-physical environment	The physical features in the environment the student finds him/her in, including noise, lighting, temperature and the existence of windows. This influences the individual's attitudes, behaviours, satisfaction and performance (Rashmi, 2012).
Summative assessment	Summative assessments are used for determining the examinees' competence to progress to the next level (Harrison et al., 2014).
Simulation-based learning	Learning by means of working through a simulation of the problem situation to be solved (Gledson & Dawson, 2017).
Tertiary education	Tertiary education, following secondary (school) education, at a college or university (Collins English Dictionary, 2018c).
Transferable skills	Something that is transferable; can be passed on or moved from one person or organisation to another and used by them (Collins English Dictionary, 2018d). A transferable skill is thus learnt in the course of study that can now be used in a different setting such as the workplace.
Work-Integrated Learning	Work-Integrated Learning (WIL) or cooperative education is a strategy in which students undergo conventional academic learning, mostly at a higher education institution (HEI), and combine this learning with some time spent in a workplace relevant to their programme of study and career aims (Coll et al., 2009). Work-integrated learning, in-service training, experiential learning and co-operative education are all used as synonyms in this thesis.
Work shadowing	Taking in and absorbing what masters and advanced apprentices do, who they are, and how they work (Packard et al., 2014).

CHAPTER 1: INTRODUCTION, PROBLEM STATEMENT AND OBJECTIVES

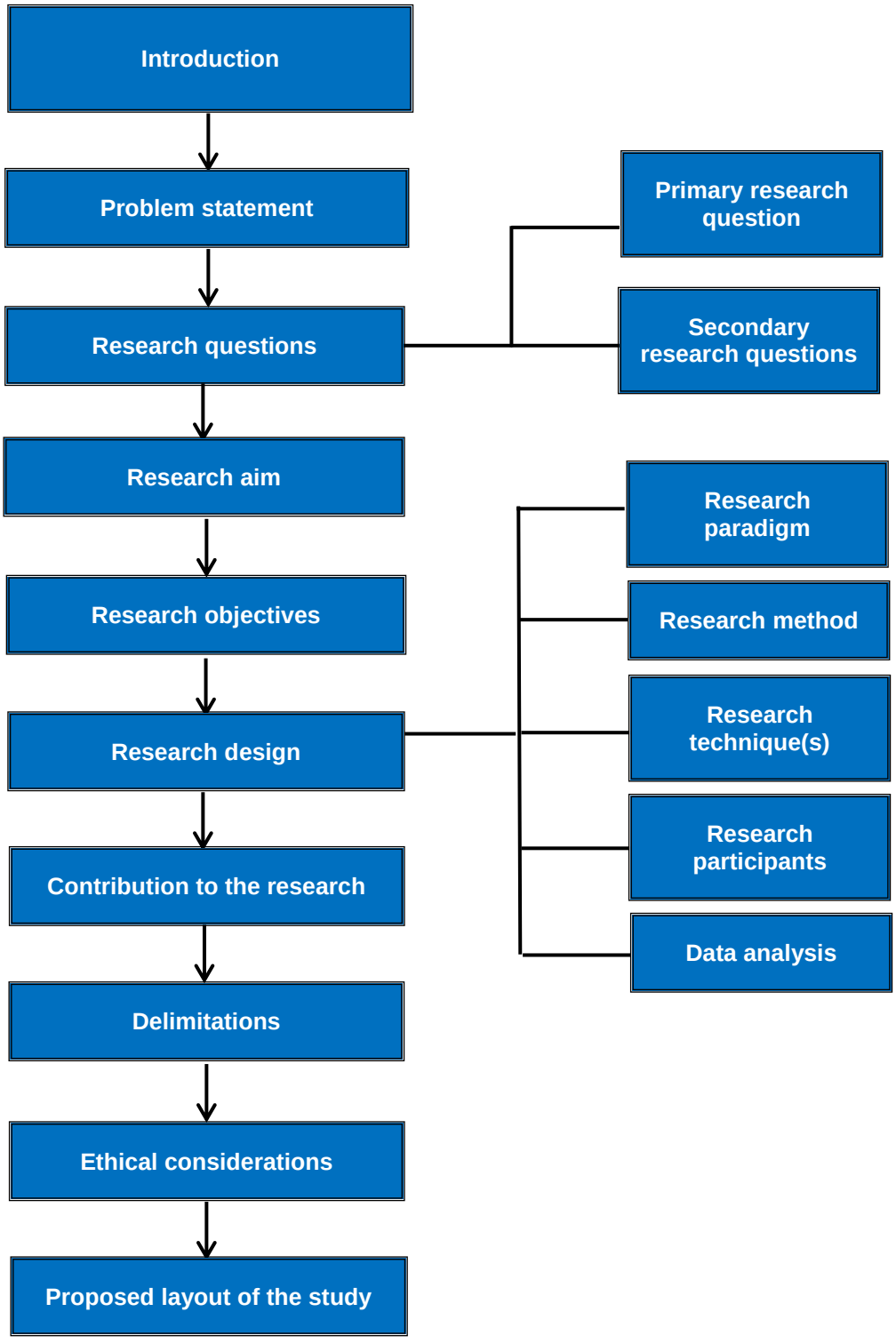

Figure 1.1: Outline of Chapter 1

1.1 Introduction

Creative tools, also commonly referred to as play-centred tools, have been highly recommended as powerful tools for teaching and learning. The effectiveness of creative tools (e.g. games or simulations) as well as their effectiveness in education has been confirmed by research, for example, it has been found to stimulate learners' motivation towards learning (Jenkins, 2001; Liu, 2005) and improve computer literacy (Gee, 2007), while Garcia & Pintrinch (1992) confirmed enhanced critical thinking, Dean (2015) revealed better problem-solving, Pillay (2002) corroborated increased cognitive capabilities, and Feldgen & Clua (2004) asserted improved attitude. These proposed benefits are substantiated by more current research that also confirms the applicability of creative tools in adult education (Amory, 2007; González-Alvarez et al., 2011; Hainey et al., 2011; González-González & Blanco-Izquierdo, 2012; Gewurtz et al., 2016). It is however important to note that the design and study of educational creative tools for teaching and learning involve multifaceted processes that may challenge existing pedagogical practices.

Learner-content interaction plays an essential and critical role in ensuring the success of the learning experience and education of learners in general (Xiao, 2017) and preparing them for the world of work. The way learners interact with and relate to content can determine the success they achieve (Xiao, 2017). Davies et al. (2013) posits that a creative pedagogy has the potential to contribute towards improving the relationship learners have with the subject content to ultimately improve their overall performance. It is therefore important that course materials and content achieve the intended learning outcomes when used together with a creative pedagogy.

Creative pedagogy is best described as the application and usage of creative tools in learning (Lin, 2011). Game-based learning can be similarly described as the use of games (i.e. creative tools) for learning (Smith & Mann, 2002). However, a more detailed definition of the creative pedagogical approach is proposed in this study, namely the method or process of using a creative idea and developing an activity to bring forward this idea in a way that is challenging, fun and motivating to the learner. This includes simulation-based and play-centred learning approaches (Westera et al., 2008; Ferns & Zegwaard, 2014).

In effect, there is a similarity between the creative learning approach (creative pedagogy) and problem-based learning. According to Jonassen (2000), when real-world problems are used as material for learners to learn problem solving and critical thinking skills, it is known as problem-based learning. Awareness is evident in educators that the use of simulations or games in education has comparable benefits. This is especially applicable to the implementation of simulating a work-based environment (Gledson & Dawson, 2017).

But why use creative tools such as simulations? Simulations are learner-centred, which is the focus of the social-constructivism learning theory, where emphasis is on the important influence of context on learning (Hodges et al., 2014). Activities adapted to the requirements of learners are incorporated into the curricula. This is known as active learning, which is described a set of activities and practices used to encourage learners' engagement with content, crossing the learner-content gap. Furthermore, the learner is motivated by this. In any effective learning environment, motivation is an important factor (Ames, 1992; Fallows & Steven, 2000; Trede, 2012).

Tertiary education strives towards and supports both access and quality in education. Lecturers and teachers must do more than simply offer subject content in the traditional teacher-centred way to achieve this goal (Arendale, 1994). New creative ideas, concepts and strategies are embraced by learners when these are located within the context of something familiar that they already know and for which they can see the immediate application (Higbee et al., 2005; Craft et al., 2014).

It is important to note that play together with using simulation techniques in teaching and learning is commonly associated with younger children. It is therefore not surprising that most research on the efficiency of play in teaching and learning is based only on the younger child (Whalen, 1995; Sally, 2003). However, one of the objectives of this study is to focus on the effectiveness of creative teaching methods on the adult learner using play-centred or simulation learning tools. More and more studies show a positive relationship between play and learning for the adult learner. Fallows & Steven (2000), Ott & Tavella (2009), Lewis et al. (2005) and Cremin (2015) support this finding by pointing out that in adult learning, the play factor seems to be more effective than most other motivators.

Researchers have found that aspects such as curiosity, challenge, achievement and rewards, choice, fantasy and control are all important in making a creative tool effective (Tuzun, 2004). When developing a creative pedagogy, these factors should be considered as elements to include in the design of the pedagogy for the use of creative learning methods in a curriculum (Tuzun, 2004). The degree to which a learner is engaged in the learning activity has been identified as a factor critical to the successful use of all methods of instruction (Bangert-Drowns & Pyke, 2002). The authors note that the idea of becoming part of the activity (i.e. engagement) is seldom truly applied in most learning activities. Three factors influencing the success of learning has been identified as the role of the instructor, time, and the way in which learners relate to the content, with the latter being the most important, according to Paulus et al. (2006). It can therefore be reasoned that the focus should primarily be on learner-content relation when implementing a creative tool, while including the learner as part of the teaching activity.

The Universal Design for Learning (UDL) framework, prescribed by educational theorists, directs the development of learning environments that are flexible, thereby accommodating learning differences in all individuals (Rose & Meyer, 2002). By recognising that the way in which individuals learn can be very unique, the UDL framework, first defined by the Centre for Applied Special Technology (CAST) in the 1990s (Orkwis & McLane, 1998), calls for the creation of a curriculum that provides for the following:

- Several ways of representing the content (i.e. giving learners multiple means of obtaining information and knowledge)
- Several ways of expression (i.e. giving learners alternatives for showing what they know)
- Several ways of engagement (i.e. using learners' interests, making the work appropriately challenging, and motivating them to learn)

The UDL approach as described by Rose & Meyer (2002) is visually depicted in Figure 1.2.

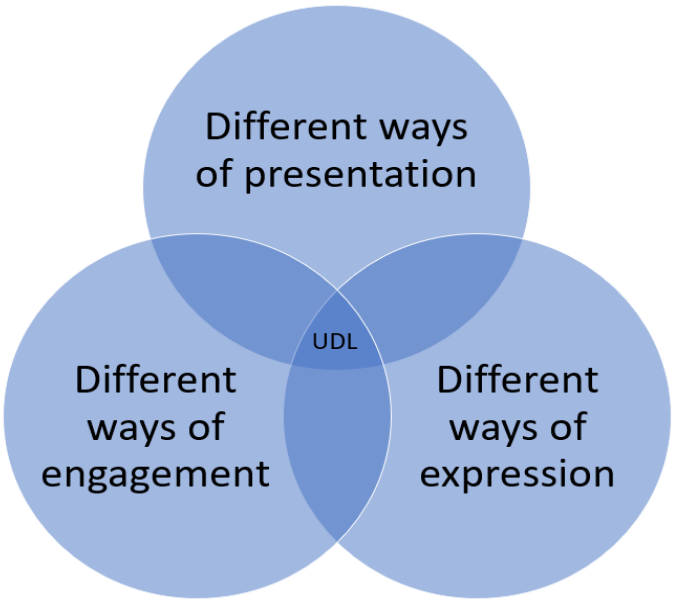

Figure 1.2: The UDL framework (Adopted from Rose & Meyer, 2002)

In higher education, creativity by means of creative methods and tools has been largely ignored. As such, not many studies have been conducted on the effectiveness of creative tools in teaching and learning for tertiary institutions. When considering the factors of problem-solving, motivation and creativity, no studies in South Africa based on a creative pedagogy could be found in literature. Furthermore, no model or approach is available to support the curriculum developer or teacher in determining which creative tools to use to improve the learner-content relation and how these tools can be combined in an effective manner.

The idea that creative tools can be useful in education has been supported by numerous scholars (Garcia & Pintrinch, 1992; Jenkins, 2001; Pillay, 2002; Feldgen & Clua, 2004; Liu, 2005; Gee, 2007). Among emerging educational tools, creative tools such as game-based tools and the use of simulations are perceived to be a powerful and useful means of instilling greater motivation towards learning. However, the question of how tertiary educational institutions can effectively implement creative tools remains.

1.2 Problem statement

In the context of enhancing learner-content relation and learner work-readiness through the use of creative tools in conjunction with a creative pedagogy in a tertiary educational setting, the following scenario exists: Students at universities of technology (UoTs) in South Africa are required, after having completed all their IT qualification subjects, to complete a final module that serves as their in-service training. In this module, the third (final) year students have the choice of either finding placement at an IT company, or if placement is not available, remain on campus to complete a group project where they design and develop a fully functional software system for a user of their choice. This type of training at UoTs where students are prepared for the world of work is called work-integrated learning (WIL). Pilgrim (2011) defines WIL as various forms of learning experiences, with the purpose of developing a learner's professional capabilities and knowledge of the workplace.

Students remaining on campus work in groups of four to five individuals to develop a software system for a business or company. The perception of various stakeholders (Harmse, 2018; Joubert, 2018; VUT Advisory Board, 2017) is that these student groups who design and implement software systems are not as well-prepared for the world of work as students who are on-site at companies for their in-service training. The general remarks of the lecturers assessing the systems designed and implemented by on-campus WIL students is that only two or three people in the group work on the system while the others pass the subject by simply being part of the group. This situation has also been reported by students who passed the module and afterwards admitted that not all students in the group worked on the system. Although measures have been implemented to address this problem, students stand together and do not want to admit that one (or more) of the members in the group did not bring his/her part. The respective of lecturers who work with both groups – students going into industry for their WIL training and students working on their systems on campus – is that the industry students have a major advantage over students remaining on campus in terms of how prepared and employable they are after graduation. The current structure of the final semester WIL module of the IT qualification at UoTs in South Africa needs to be critically evaluated in terms of the creative tools used (if any) to enhance the learning

experience of students in such a way that both groups of WIL students (projects on campus and in-service training at a company) have the same benefits.

The problem statement for this research is encapsulated as follows: The perception of ICT students and lecturers at UoTs in South Africa is that the learner-content relation of WIL students who remain on campus to conduct a group project does not address student readiness for the world of work in an IT environment as adequately as the training offered by companies to WIL in-service students who found placement in industry.

1.3 Research aim

The aim of this research is to propose an approach to a creative pedagogy in the form of a simulated working environment on campus within a tertiary educational setting to contribute towards enhancing the learner-content relation of WIL students, in order to address student readiness for the world of work in an IT environment by providing the on-campus project students with an equal opportunity to those going into industry for their in-service training.

Currently, higher education (HE) requires specific action plans and the setting of strategies to assure graduates a place in the demanding and highly competitive world of work (Laverde et al., 2007; CHE, 2011), especially for the information systems development environment. By proposing an approach to a creative pedagogy for ICT tertiary education, the researcher aims to contribute towards enhancing the learner-content relation of WIL students in tertiary ICT education in South Africa through a simulated work-based environment as a creative learning tool. The study thus endeavours to alleviate the challenge of WIL students not finding placement at companies by using the simulated environment in the form of a virtual company to prepare them for the world of work that awaits them upon graduation.

1.4 Research questions

In this study, two categories of research questions are presented. First the primary research question is formulated, where after the secondary research questions are stated, as highlighted in the following two sub-sections.

1.4.1 Primary research question (PRQ)

The primary research question guiding this study is as follows:

PRQ: What approach to a creative pedagogy will contribute to enhancing the learner-content relation of WIL students in tertiary ICT education in South Africa, thereby improving the perception of readiness of ICT graduates to enter the world of work?

1.4.2 Secondary research questions (SRQs)

The secondary research questions guiding this study are as follows:

SRQ1: Why are creative pedagogies increasingly needed in education?

SRQ2: What characteristics should be incorporated into a creative pedagogical approach?

SRQ3: How is WIL applied in tertiary education?

SRQ4: What are the perceptions of tertiary students, lecturers and employers in accepting a creative pedagogical approach in the learning experience to prepare students for the world of work?

SRQ5: What skills should a creative learning pedagogical approach address for WIL, on campus in a simulated company environment?

SRQ6: What factors can influence the success of creative learning in WIL, on campus in a simulated company environment?

SRQ7: How can these factors be incorporated into an approach to a creative pedagogy for WIL, on campus in a simulated company environment, to adequately prepare students for the world of work?

1.5 Research objectives

The research objectives of this study are:

- To investigate why creative pedagogies are increasingly needed in education
- To determine what characteristics should be incorporated into a creative pedagogical approach
- To investigate how WIL is applied in tertiary education
- To determine what the perceptions of tertiary learners, lecturers and employers will be in accepting a creative pedagogical approach in their WIL learning experience to prepare them for the world of work
- To determine what skills a creative learning pedagogical approach should address for WIL, on campus in a simulated company environment
- To determine the factors that may influence the success of creative learning in WIL, on campus in a simulated company environment
- To determine how these factors can be incorporated into an approach to a creative pedagogy for WIL, on campus in a simulated company environment

1.6 Research design

Research design, also referred to in literature as the research approach or research methodology, mainly consists of five main elements, namely the research philosophy, research method(s), research technique(s), research participants and data analysis Saunders & Tosey (2012), each outlined in the following sub-sections.

1.6.1 Research philosophy

The objectivist view of the world says that knowledge of this world or reality can increase through the accumulation of more complete information and knowledge, but it starts with the assumption that the world exists and is real (Saunders et al., 2012). The philosophy adopted for this research is interpretivism, which aims to understand the subjective meanings of persons in the studied domains (Goldkuhl, 2012). Interpretivists argue that reality can only be fully understood through the intervention and interpretation of the occurrence of reality. Goldkuhl (2012) further states that the core idea of interpretivism is to work with the subjective meanings already present in the social world, to acknowledge their existence, to reconstruct them, to understand them, to avoid distorting them and to use them as building blocks in creating theories. The investigation cannot be separated from the researcher studying the environment and the multiple ways the researcher interprets reality (Lee, 1991). Lee (1991) further states that it is agreed that the numerous explanations of reality are part of the scientific knowledge being pursued. It is characterised by seeking explanations for the phenomena in the social realm where the research will be conducted. The overall approach, to provide essentially rational explanations, is ideal since this study seeks to provide answers to the question of how to improve the comprehension and learning experience of adult learners by introducing creative learning interventions.

1.6.2 Research method

Literature recognises three research methods, namely quantitative, qualitative and mixed-methods (Ivankova et al., 2012). The researcher's philosophical orientation, the methods used to obtain knowledge and the type of knowledge the researcher wants to obtain will determine the choice of the research method adopted. When aspects of both quantitative and qualitative research are followed in a study, a mixed-methods approach is said to be used. This methodology is usually chosen when parts of one approach are found lacking or where a shortcoming in the chosen approach is identified (Creswell, 2012).

The relations between variables using numerical data are established in quantitative research. According to de Vos & Schulze (2002) and Nieuwenhuis (2010), the quantitative research philosophy is grounded in rationalism, objectivism and positivism.

The understanding and interpretation of certain phenomena, with research conducted in a natural setting is described as qualitative research (Creswell, 2012). The approach is grounded in interpretivism and constructivism, among others. A mixed-methods research approach combines quantitative and qualitative data to investigate a phenomenon more completely (Creswell, 2012).

The nature of this study warrants both the use of quantitative and qualitative research and tools for the measurement and analysis of the questionnaires completed by the respondents (Prince, 2015). The qualitative paradigm is however the dominant status in this study. The results of the quantitative analysis were converted into qualitative narratives (Saunders et al., 2012).

The aim of the study is to propose an approach to a creative pedagogy for WIL, on campus in a simulated company environment. Consequently, a mixed-method approach is followed.

1.6.3 Research technique(s)

For this study, the survey method in a case setting has been adopted. The case is the Vaal University of Technology (VUT) in Gauteng province, South Africa. The research participants are ICT students at VUT, enrolled for Business Analysis (BA) 3.2. BA3.2 is the terminating module of the IT qualification where students can either do in-service training at companies, or, if placement is not found, they remain on campus, working in groups to design and develop complete software systems for real businesses. BA3.2 is thus regarded as the WIL module of the qualification.

A survey brings together aspects of sampling, designing questions, and the method of data collection. The combination of these three aspects is essential to efficient survey design. The key to good sampling is finding a way for each of the members of the population to have the same chance or probability to be selected (Fowler, 2013). Using questions as a measuring tool is an essential part of the survey process. The major advance in question design in the last 20 years focused on improving strategies for evaluating questions (Fowler, 2013). Questions should be evaluated to ensure they are well understood. The mode of data collection for surveys include in-person interviews, telephone interviews, on-line interviews (the mailing of questionnaires to respondents or the online filling of questionnaires), or questionnaires that are physically handed to respondents for completion (Fowler, 2013). Data should be collected from the respondents using the same variable or characteristic, with the goal of formulating a data grid as end goal (De Vaus, 2013).

For this study, questionnaires were mailed electronically and handed in person to respondents for completion. The survey was completed by students and lecturer(s) as well as employers of in-service training students.

1.6.4 Research participants

The full set of cases where the samples are taken from is known as the population of a research case (Saunders et al., 2012). For the data collection phase, three distinct populations were identified for this study. The first population of this research case is the employers of the WIL students. An employer is viewed as a representative of the company where the student found placement to work. For 2017, the IT students found placement across six (6) companies.

The second population comprises students registered for the Business Analysis 3.2 module in 2017 and prior, i.e. the final year students of the IT qualification at the Vaal University of Technology as well as students who completed their IT qualification previously and who might be employed. To further clarify, the student population is divided into the following sub-groups:

a) Students registered for the final (WIL) module and placed in industry for in-service training.
b) Students registered for the final (WIL) module and who remained on campus to complete a group project.
c) Students who completed their final year WIL module and who were either registered for their postgraduate qualification or employed (i.e. graduates).

All three student sub-groups were given a separate questionnaire to complete.

The third population is the WIL lecturers in the ICT department at VUT.

Figure 1.3 graphically depicts the different respondent groups.

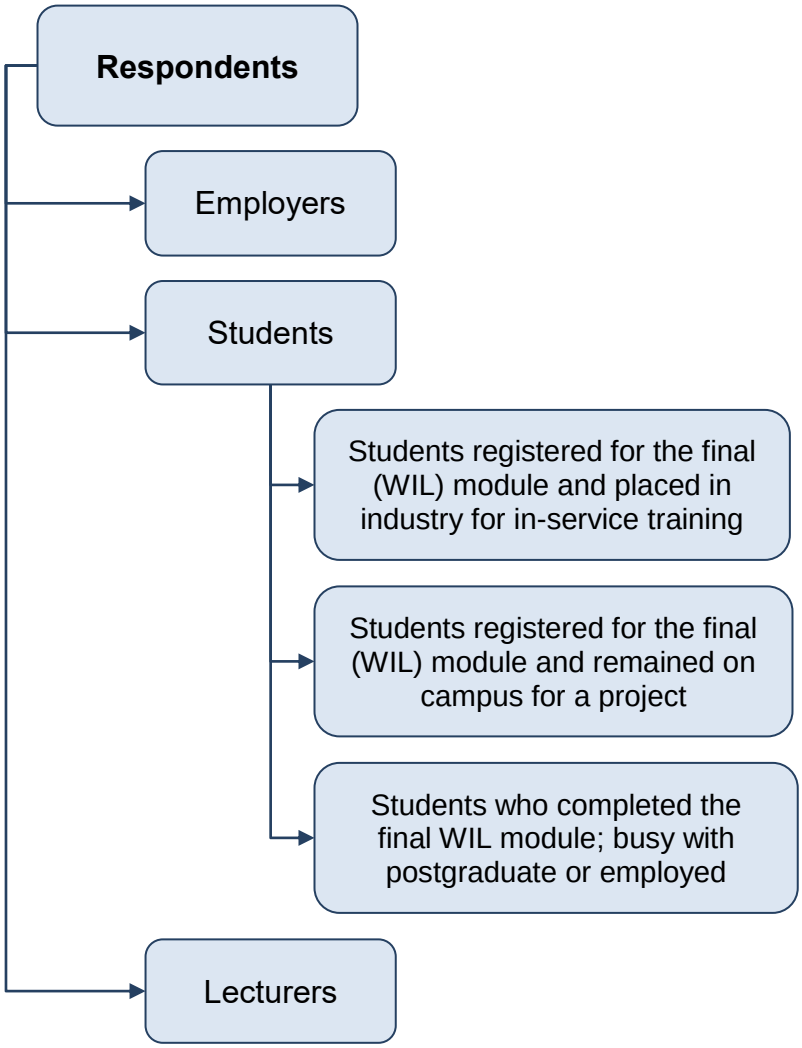

Figure 1.3: Research respondent group classification

1.6.5 Unit of analysis

The unit of analysis for this study is the WIL module in the current IT qualification of VUT. The analysis is to determine whether an alternative, feasible method of offering WIL at VUT can be found to adequately prepare students for the world of work.

1.6.6 Unit of observation

The unit of observation includes the employers providing in-service training to VUT students, the three VUT student groups, and the lecturers involved in WIL at VUT.

1.6.7 Data analysis

The data captured on the questionnaires are both quantitative and qualitative. Quantitative data were analysed using Excel. Then, qualitative data were organised and reduced by

means of coding, using *Atlas.ti*, into manageable themes and categories. After the data were analysed, organised and summarised into categories and themes, the data collected were interpreted to formulate and present conclusive statements.

For any research project, it is important to ensure trustworthiness. Trustworthiness refers to establishing rigor and is based on four criteria, as defined by O'Leary (2017). These criteria include conformability, credibility, dependability and transferability. These terms are described as follows:

- **Conformability** denotes the degree to which the respondents have shaped the findings of a study without researcher bias
- **Credibility** refers to how much confidence there is in the truth of the findings
- **Dependability** confirms the consistency, validity and the trustworthiness of the results
- **Transferability** refers to the degree to which the results can be applied or transferred to other comparable contexts or other participants (O'Leary, 2017).

1.7 Contribution of the research

Research conducted to investigate the possible implementation of a simulated (virtual) company on campus for ICT students to provide an in-service training module, is limited. The study is unique in addressing this specific problem within a South African setting. Hofstee (2009) states that research studies are important in the contributions they make to theory and practice. The significance of the proposed research study is therefore to make a contribution to the existing body of knowledge, together with proposing an approach to an effective implementation of a creative pedagogy. This entails the introduction of a virtual company (i.e. a simulated environment) on campus for the WIL training module of the IT qualification.

1.7.1 Theoretical contribution

According to Remenyi et al. (2002), there are two types of contributions that can be made in research, namely *value in use* and *value in exchange*. Value in use refers to the academic contribution the research could make to the body of knowledge, while value in exchange denotes the financial benefits the researcher could gain from conducting the research.

This research is directed towards value in use, and therefore contributes to the body of knowledge. The research seeks to investigate the detachment that exists between the work readiness of students in industry and those completing group projects on campus, and to ultimately make recommendations on how this separation can be addressed.

For this study, three themes were developed from the data analysis and findings: (i) Virtual Company (laying the basis), (ii) Perceptions (details), and (iii) Curriculum value (content). These themes were used to answer or inform aspects of the proposed approach to a creative pedagogy to improve the learner–content relation in tertiary ICT education in South Africa. This proposed approach is discussed in detail in Chapter 6 and presented as an inverted triangle in Figure 6.6.

The basis of the Institutional Strategy Framework for WIL, developed by Jacobs (2015) for his doctoral thesis, was used and customised for the purposes of this study. Figure 6.2 is a graphical depiction of the framework.

1.7.2 Practical contribution

The study contributes to the existing body of knowledge by proposing an approach to a pedagogy that can be used to implement a virtual company on campus, thereby enabling the solving of real-world problems by WIL students who cannot find placement at companies (and who are consequently not work-ready). It can also benefit the University, as it delivers more work-ready graduated to IT companies. At the same time, it has the potential to benefit IT companies to receive work-ready graduates who require less training as new employees, thus contributing to companies almost instantly. The study explores the different perceptions of students, lecturers and employers on in-service training, whether on campus or placed at companies. The study further aims to provide an understanding of the factors contributing to the successful implementation of a virtual company for WIL students on campus and a proposed approach to a creative pedagogy for the implementation of such a simulated company.

1.8 Delimitations

This research focuses on proposing an approach to a creative pedagogy for WIL students in an educational setting. During the time of the study, only six (6) companies provided employment to ICT students for their in-service training, of which five completed the questionnaire. The sample group of students was also limited to those registered for the final module (i.e. the WIL module) of the IT qualification, while the sample group of lecturers was limited to the lecturers in the ICT department involved in the assessment of the final year WIL group projects. As such, the outcomes of this study cannot be generalised to other tertiary educational institutions, as participant selection was not random. The study furthermore focuses only on the delivery of IT-related course content, and findings can therefore not be extrapolated to other courses or subject areas.

1.9 Ethical considerations

The reasons for adhering to ethical norms in research are numerous. The adherence to the goals and objectives of the research such as knowledge, truth, and avoidance of error are some of the values that these standards promote (Resnik, 2011). The ethical considerations in educational research focus mainly on the academic justice and academic fairness towards students (Parhizgar, 2010). Informed consent was obtained from all participants (see Annexure A), participants were treated with respect and confidentiality, and anonymity has been (and will continue to be) upheld at all times. Research ethics, which include autonomy, were specifically taken into account to ensure voluntary participation in the study. Confidentiality was adhered to, as no personal information was asked of the respondents. The researcher collected data in such a way that it was not harmful to anybody. Collected data were not manipulated or altered, and no conflicting interests existed that could interfere with the ability to objectively conduct the study. In terms of institutional ethical consideration, ethical clearance was obtained from the Higher Degrees Committee of the Vaal University of Technology (Annexure L).

1.10 Chapter layout

Chapter 1: Introduction, problem statement and objectives of the study

Chapter 1 provides a brief introduction of the creative pedagogical approach and learner-content relation in tertiary ICT education. Work-integrated learning and how it is applied at universities of technology in South Africa is outlined. The research problem statement, primary and secondary questions, aim, objectives, methodology, limitations and significance of the research are also discussed.

Chapter 2: Literature review

Chapter 2 examines existing literature on creative pedagogies, with specific focus on a virtual business environment. A thorough investigation provides the necessary background knowledge on which the rest of the research is based.

Chapter 3: Research design and methodology

Chapter 3 reinforces the research design and methodology used in the study, following an interpretivist philosophy. A summary of the research philosophy, describing the ontological and epistemological assumptions, is provided. An overview of various research paradigms is discussed, and the research approach adopted in this study is provided. The data collection methods and data analysis strategies are described, as well as the trustworthiness and ethical considerations of the study.

Chapter 4: Analysis and findings

Chapter 4 involves the analysis and presentation of the data gathered in the case setting through the use of questionnaires.

Chapter 5: Discussion

In this chapter, the researcher organises and groups the data that were collected with the aim of identifying and grouping common factors, thereby obtaining the required results to answer the research questions of the study.

Chapter 6: Proposed approach to a pedagogy for the implementation of a virtual company on campus

Chapter 6 provides a layout and an in-depth discussion of the proposed approach to a pedagogy based on the findings derived from the analysed data and the in-depth discussion in Chapter 5.

Chapter 7: Conclusions and possible future implementation

Conclusions regarding the study are drawn in this chapter. The research questions are answered, which is critical in any research report. Concluding comments are made about the incorporation of important factors into a creative pedagogy for WIL, on campus in a simulated environment. Further research opportunities are also presented.

CHAPTER 2: LITERATURE REVIEW

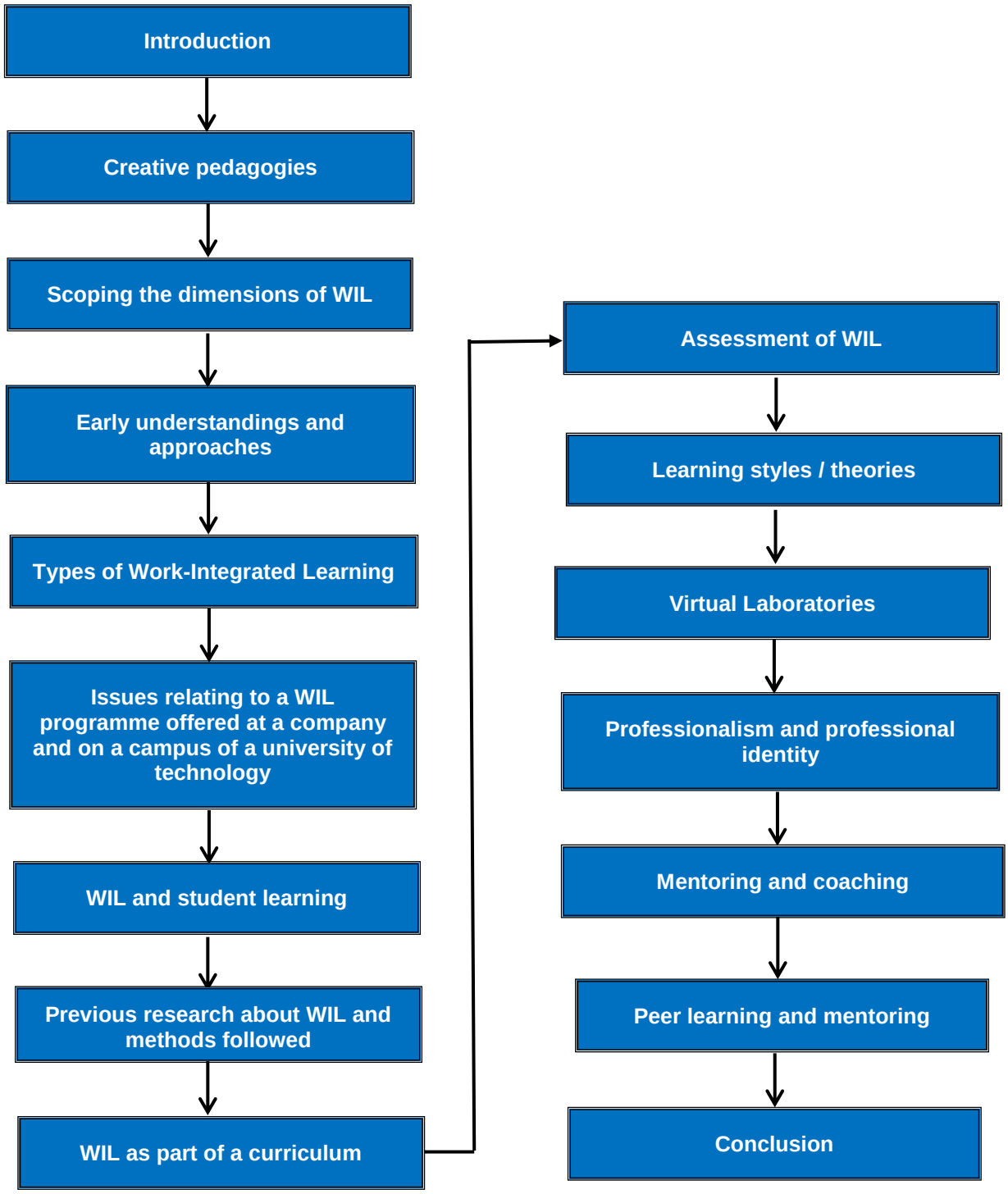

Figure 2.1: Outline of Chapter 2

2.1 Introduction

Chapter 2 describes the literature review on work-integrated learning (WIL) and how this type of training impacts on the employability of students. SRQ1, SRQ2 and SRQ3 are answered in the literature review (see sections 7.3.1, 7.3.2 and 7.3.3 for a summarised version).

It is a generally accepted fact that the higher education sector in South Africa is under growing pressure from government, industry and the community to address skills shortages (CHE, 2011; DHET, 2013). There is substantial interest, both in South Africa and internationally, in curricular and pedagogical improvements to support students from various backgrounds and prepare them for the challenges of the global economy and support them in becoming responsible citizens (CHE, 2011).

Consequently, Patrick et al. (2008) and Hanson & Yoon (2018) state that higher education should respond to the requirements of a workforce that is professional, resulting in work-ready graduates. This, according to the South African Department of Higher Education and Training (DHET, 2013), can be achieved through combining theoretical knowledge and practical experience (WIL). The fast-paced, demanding world of today seeks well rounded, work-ready employees (Patrick et al., 2008; CHE, 2011; Gamble et al., 2012; DHET, 2013). This is not easily achieved by new graduates entering the working environment (Pilgrim, 2012; DHET, 2013). Exposure to become work-ready can be provided through WIL, where students are expected to complete a specified period of training in a relevant industry, involving the employer and academic staff in the assessment process (CHE, 2011; Hamilton et al, 2018). Knowledge of general principles and laws are provided by covering theory in the classroom, which enables additional learning and adaptation to new technologies. Practical experience, as offered through WIL, creates functional knowledge and develops self-confidence in someone's ability to act effectively (DHET, 2013). Employers demand work-ready graduates (Patrick, et al., 2008; Jackson, 2018); students on the other hand demand employable knowledge and skills (Robertson & Scott, 2010).

The central goal of WIL is to take into account professional experience, employability and job ready skills for all ICT students. According to Nagarajan (2012), this can be achieved using external models (WIL, internships or work shadowing) or internal models (project work as well as university-based case studies and simulated opportunities). Previous studies indicate that participants consistently reported on the positive aspects and benefits of WIL (Reeders, 2000; Pilgrim, 2011; Sykes & Dean, 2013). WIL programmes have recently become popular with government, employers, universities and students (Pilgrim, 2011). A major benefit of WIL programmes is the increased employability of students (Fallows & Steven, 2000; Cooper et al., 2010; Pilgrim, 2011; Ferns & Zegwaard, 2014; Smith-Ruig, 2014; Jackson, 2015).

One of the specific benefits of WIL as stated by Smith-Ruig (2014) and (Jackson et al., 2018) is that it enables students to apply or transfer the knowledge obtained through their formal university education to the reality of the workplace. This ties in well with the trend whereby students look towards 'a return on their investment' in education. Literature studies on WIL programmes in relation to ICT in the South African context for Universities of Technology (UoTs) are relatively few. This is in contrast to studies emanating from Australia where considerable research in this area has been undertaken (McLennan & Keating, 2008; Patrick et al., 2008; Pilgrim, 2011; Nagarajan, 2012; Trede, 2012; Sykes & Dean, 2013; Smith-Ruig, 2014; Jackson, 2018). This can primarily be attributed to UoTs in South Africa not having a compulsory co-operative module where students are required to seek employment in industry. Students may elect to enter industry for the WIL component, or complete a project on campus. There is a problem with **where** students can find placement, and this is particularly true for non-South African students whose visa regulations do not allow them to accept employment in any South African company for more than 20 hours per week (SouthAfrica.info, 2016).

To be able to address some issues as outlined in the previous chapter (section 1.2) and to identify ways of improving the student's learning experience in relation to WIL, a broad literature review on WIL was conducted. The review included research topics such as creative pedagogies, types of WIL, WIL as part of a curriculum, and virtual labs. These will be discussed in the sections below.

This study proposes an approach to a creative pedagogy that will integrate a simulated environment into the WIL module of an undergraduate ICT programme, specifically in the South African UoT context. The importance of WIL programmes in general is followed by a discussion on how WIL, work and knowledge are related to each other, and how the two types of implementation (on campus project vs. in-service placement in industry) benefit or disadvantage students. The types of available WIL programmes are discussed in relation to their applicability to an ICT programme.

2.2 Creative pedagogies

Creative pedagogy is defined by Rashmi (2012) as the practice that improves creative development through four interconnected elements: creative teaching, teaching for creativity, creative learning, and psycho-physical environment. The psycho-physical environment encapsulates the elements in the physical environment that might have and influence on the learning of students (Rashmi, 2012). As shown in Figure 2.2, the four interconnected elements complement each other, and when the one aspect is present, it results in the next.

A supportive environment is created for the development of creative abilities and qualities through the collaboration between three factors, namely creative and effective teaching, creative learning, and a supportive, positive psycho-physical environment. A distinction is made between creative teaching and teaching for creativity. Creative teaching is defined as "using imaginative approaches to make learning more interesting and effective" (Rashmi, 2012:195), while teaching for creativity can be seen as identifying young people's creative abilities, as well as encouraging and providing opportunities for the development of those capacities. In this study, creativity in the teaching situation might be achieved by proposing an approach to a creative pedagogy.

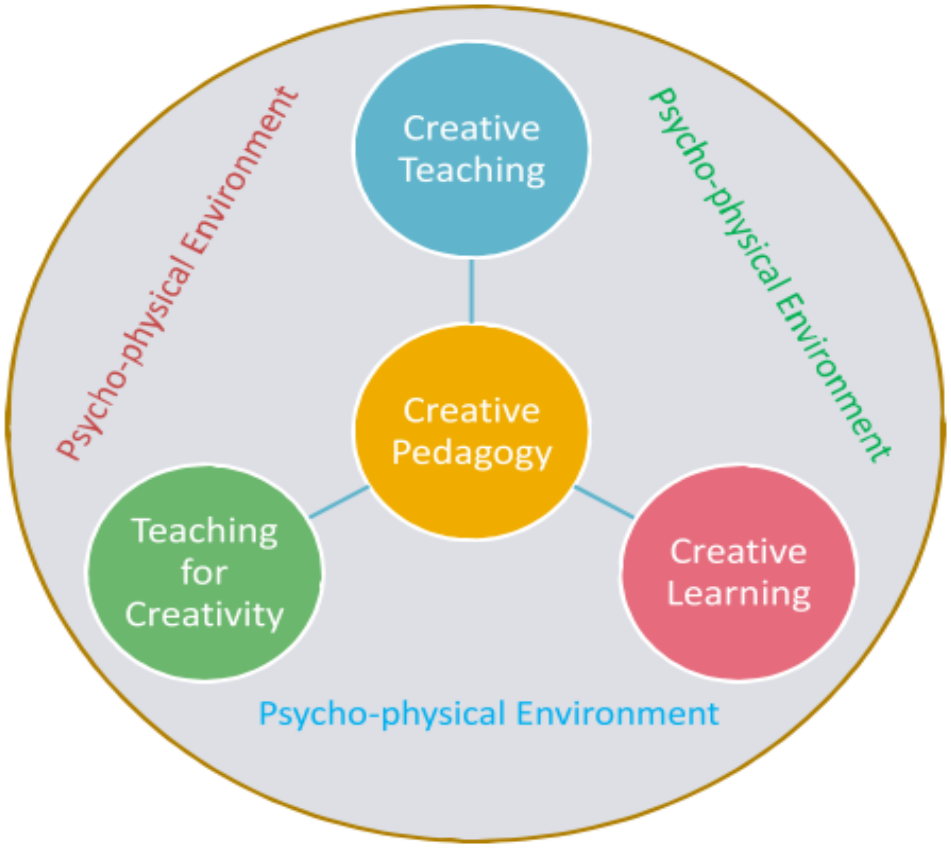

Figure 2.2: The four-element model of creative pedagogy as developed by Rashmi (2012)

According to Ageyev (2012), the source of all educational problems and difficulties is the consuming and overwhelming character of education. To overcome this problem, Ageyev (2012) argues that education should move from education that is based on the consumption of knowledge to education that is based on creativeness, i.e. self-dependent creation of the new knowledge. Craft et al. (2014:18) state that the emphasis of a creative pedagogy should involve an "imaginative and innovative arrangement of curricula and teaching strategies in school classrooms to develop children's creativity". Although the study of Craft et al. was conducted at a primary school, it rings true for higher education as well, and this can be

achieved through WIL by simulating a company on campus where students learn through real-life problem solving in creative ways.

Studies in the use of creative pedagogies mainly focus on teaching and learning situations in basic education (Lin, 2011; Davies et al., 2013; Kuntz et al., 2013; Craft et al., 2014). Fewer studies have been conducted for using creative pedagogies in higher education (Cochrane et al., 2014). Cochrane et al. (2014) and Tanggaard (2018) focus on the development of creative thinking in higher education and found that the most valued attributes of higher education graduates to potential employers are that they are creative, self-directed and can work effectively in teams. The authors further argue that an education system that focuses only on the delivery of content and learning measured by examinations does not inspire creativity (Cochrane et al., 2014; Rubenstein et al., 2018). The implementation of a creative pedagogy in higher education should concentrate on a rounded approach to education, focusing on the learner becoming part of a professional community (which can be simulated on campus), where learners can excel in knowledge and performance to become part of the community they will work in. Cochrane et al. (2014) indicate that a framework for a rounded approach should focus on using creative pedagogies within the context of the curriculum.

Most of the studies conducted on creative pedagogies do not focus on the pedagogy itself, but on the impact it has in the learning environment. Studies focus on how to improve creativity (Lin, 2011; Cremin, 2015), how to develop creative thinking (Yang, 2012), the development of creative skills (Davies et al., 2013), how to foster creative thinking and creative behaviours (Newton, 2013), and creative writing practices (Edwards-groves, 2012). Furthermore, the studies on creative pedagogies concentrate on using computers as simulated environments or introducing computers into the learning environment, such as digital game based learning (Yang, 2012), using a computer environment (Young, 1995), and the use of mobile devices in teaching (Cochrane et al., 2014). Kuntz et al. (2013) found that teachers or lecturers obliged to teach scripted curricula and discouraged from engaging as critical thinkers are denied the creativity involved in problem-solving. To allow and encourage such creativity among teachers, they need to exercise their own creativity to continue investigating established knowledge and to critically evaluate established truths (Kuntz et al., 2013), even if such truths only exist in how one should teach. Craft et al. (2014) identified a number of characteristics needed to implement creative pedagogies, which can also be applied in a simulated working environment for higher education students:

Characteristic 1: Co-construction

This indicates moving away from teaching a prescribed curriculum towards the students participating in determining aspects of the curriculum that acknowledge their interests.

Characteristic 2: Student ownership

The emphasis should be on providing a trusting, engaging environment, encouraging students' decision-making, offering them ownership and control over their learning.

Characteristic 3: High expectations

Students are expected to engage in creative problem solving and in having high expectations of their creative engagement skills, rising to these expectations (Craft et al., 2014).

The approach to a creative pedagogy proposed in this study – not necessarily to create or develop creativity in students, but to change the current *status quo* of how WIL is offered – is a simulated environment in the form of a virtual company on campus to teach WIL students the real-world experiences they need.

2.3 Scoping the dimensions of WIL, what it is and what it is not?

For the purpose of this study, WIL is seen as the action of students entering a workplace to perform real-life work. The 'employment' is focused on the practical execution of the knowledge gained from the theoretical curriculum. This enables the student to experience company culture and other soft skills required by appropriate companies.

There are many other terms in the literature that encompass the same meaning as WIL. In this study, the following terms are used interchangeably with the term WIL:

- In-service training
- Experiential learning
- Co-operative education

As the purpose of this study is to propose an approach to a creative pedagogy that integrates a simulated environment emulating a real-life working situation for WIL students on campus, the study will firstly concentrate on WIL in the workplace, followed by focusing on a simulated working environment in the form of a virtual company on campus.

Many definitions in relation to WIL have been published (Reeders, 2000; Barnett et al., 2001; Wagner et al., 2001; Beard & Wilson, 2006). Beard & Wilson (2006:2) define WIL as the "sense-making process of active engagement between the inner world of the person and the outer world of the environment". Winter et al. (2018) define WIL as an approach founded on three principles – it is assessed, focuses on a real-world problem, and is industry or community based. Reeders (2000) defines WIL as students who learn, with the aim of earning credit. This learning may either occur in the workplace or within a campus setting that imitates key aspects of the workplace. This definition fits the manner in which universities of technology in South Africa undertake the WIL module for ICT students.

Consequently, students may choose to find placement in industry or remain on campus to complete a work-related project. A characteristic of WIL is that it is an interaction between the self and the external environment (Beard & Wilson, 2006). This is where it can be seen that the practical experience gained through WIL is building knowledge that can be applied to everyday, real-life situations. Consequently, it also develops self-confidence in someone's ability to act efficiently in situations they might encounter in their line of work. According to Wagner et al. (2001), a WIL programme focuses on establishing relationships across three areas: (i) education and the economy, (ii) the theory and practice of what is happening in educational processes, and (iii) education and training and associated firms. The goal of a WIL programme should be aimed at establishing links between knowledge gained through practical and theoretical exposure. Barnett et al. (2001) suggest that to maximise knowledge gained in a WIL programme, the emphasis of the programme should be to focus on several aspects, namely changing the emphasis from what a student should know to knowing how to do a specific task, to move from disciplinary skills to transferable skills, to shift the focus from intellectual orientation to action orientation, to move from knowledge-based problem solving to task-based problem-solving, and to not only depend on theoretical-based learning but also trust experiential learning (Barnett et al., 2001). Aggett & Busby (2011) confirm that any higher education institution can improve the graduate's chance of ensuing and finding employment when it offers not only gaining disciplinary knowledge, but also learner independence, skills and experience.

2.4 Early understandings and approaches to WIL

One of the first educational theorists who believed that people learn by doing and that all real learning is achieved through experience was Dewey (1938). In addition, Dewey (1938) also believed that a career is a calling. This leads to an ethically grounded identity within a chosen career. Because of this believe, academics started to see the importance of structuring curricula to include academic engagement with the key issues of company life, which links professional and vocational competence. Another theorist, Kolb (1984), however points out that whilst experience forms part of learning, on its own it is not an adequate condition for learning. Similarly, Biggs (2011) claims that in the higher education context, effective learning requires (i) a theoretical knowledge base, (ii) some motivational context, (iii) learning activities, and (iv) interaction. Biggs (2011) further elaborates that for learning to take place, experience needs to be observed and reflected on, concepts need to be developed to make sense of the experience, and then these concepts should be applied and tested through new experiences. The importance of reflection and reflective practice in the education of professionals is pointed out by Schön (1983). Kolb's (1984) view of work-integrated learning confirms that a student's learning in the workplace is unique to each student. Each student's

development is then the result of the learning experiences he/she has and the prior knowledge and experiences he/she brings to each learning situation (Hodges et al., 2014). It is however important to keep in mind that experiences and general reflection is not a guarantee for student learning, especially if they do not think critically about those experiences and do not take responsibility for the creation of awareness through reflection (CHE, 2011). If WIL is only seen as a method for gaining information about the workplace and not to link technical knowledge with workplace application as well, its effectiveness is not fully developed. The experiential learning cycle described by Kolb (1984) suggests a cyclical process in experiential learning. As can be seen in Figure 2.3 below, the process can start at any point in the cycle. For undergraduate students it will probably start with an abstract conceptualisation, which is their theoretical knowledge base that they build up through their undergraduate studies. This could be followed by an active experimentation step, which may be built into the undergraduate programme. The experimentation step requires students to apply their theoretical knowledge, which is viewed as an action step where WIL starts to make an appearance. The next step in the cycle is actual exposure, where students experience the 'real world' of their WIL programme. Students in the last step are expected to undergo reflective observation such that they could bring the theory and practice together after engaging in WIL.

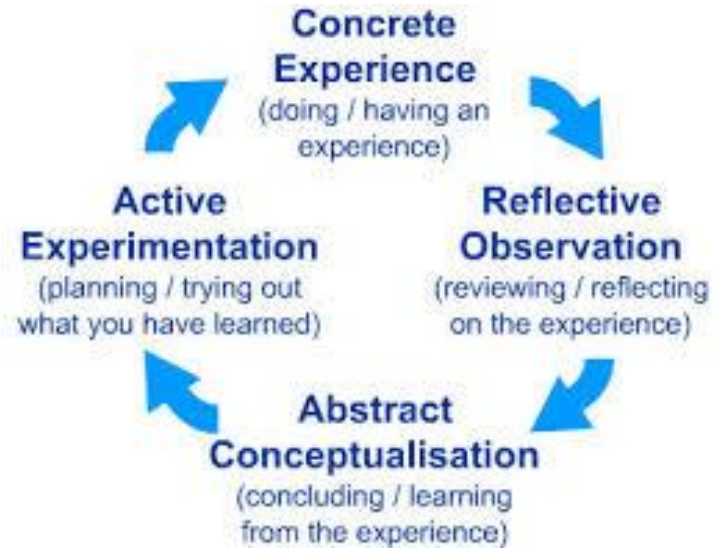

Figure 2.3: Kolb's cycle of experiential learning (Source: Kolb, 1984)

'WIL-like' programmes should therefore be designed with Kolb's steps in mind to accommodate both students who succeed in obtaining industry placement and those who remain on campus in the university environment in order to ensure that all WIL students experience the entire cycle of learning.

2.5 Types of WIL

The most important benefit and goal of WIL programmes is to build employability skills for students into the higher education curriculum (Fallows & Steven, 2000), as well as delivering more self-directed learners, which means they are able to self-organise their learning (Gerhardt & Mackenzie-Philps, 2018). A combination of practical training and learning theoretical knowledge is essential (DHET, 2013). Theory underpins the knowledge of general principles and laws, while practical experience increases applied knowledge and develops self-confidence in one's own abilities. These practical experiences can be achieved by WIL programmes offered at universities (DHET, 2013).

It is important to know what types of WIL programmes exist in order to make an informed choice when reporting on the format of the approach to a creative pedagogy to be proposed in this study. Currently a variety of WIL programmes are offered by different institutions. Each programme has unique benefits and disadvantages in the context of an ICT curriculum as outlined below:

i) **The ad-hoc approach:** Students find their own work placement, and they gain experience in their respective workplace situations. There is no specific curriculum to be followed in the workplace; students learn as the day progresses and learning opportunities arise. The core understanding of this scenario is that students first gain knowledge and skills form subjects undertaken at university and then learn to apply these in practice Reeders (2000). This is the most used model for ICT education at UoTs in South Africa. A distinct hurdle in this model is that many students do not find placement in the immediate vicinity of the university, or worse, they do not find placement at all. Many companies are only willing to employ graduates, not students who are still busy with their undergraduate qualification. The difficulty with this situation is that students are required to pass WIL as a compulsory module in order to acquire his/her qualification. This is a 'catch 22' situation – students who applying for WIL placement at companies are unsuccessful because they do not yet have a qualification, but they need WIL to obtain their qualification.

ii) **Co-operative education:** This is a contractual agreement between the university and an outside agency (Abeysekera, 2006). The university through a central office finds placement for students at appropriate agencies or companies. Students normally alternate between work and the classroom. However, it is also possible to complete the theoretical component on campus, followed by WIL. This model is not currently used for UoTs in ICT education in South Africa, as it is not compulsory for students to do WIL at companies to obtain their qualification. It is however used in some other qualifications such as Engineering, Biomedical Technology and Computer Systems

Engineering. The advantage of this model is the strength of the institution's reputation and recommendation rather than the student attempting to convince a corporate of the merits of his/her abilities. Nevertheless, some students could still remain without placement for a number of reasons, but mainly due to the unavailability of posts. Consequently, students not finding placement in the specified time may not graduate until such placement becomes available and is completed.

iii) Development of work-based programmes for organisations: This programme focuses on the institution as an agent for change rather than an inactive recipient of industry demands. The model recognises workplace characteristics such as culture, structure, management and systems that are central to the nature and scope of learning (Kirkpatrick & Garrick, 2001). The university plays a role in setting targets in terms of the requirements for the student's learning and experience.

iv) **Workplace-based programme:** In this model the degree is taught in the workplace. Students do not attend classes at a university – all learning takes place in industry (Abeysekera, 2006). This model is not used for IT degrees in South African UoTs. The appropriateness of a workplace-based programme in an IT undergraduate degree or diploma could be questioned if the majority of ICT students are working full-time or part-time in junior positions at firms.

v) **Service learning:** This is work performed in a university setting. It is a carefully monitored service experience in which the student has intentional learning goals and reflects actively on what has been learnt throughout the experience (Abeysekera, 2006).

When Rowe et al. (2012) describe the types of WIL in terms of a frame of locality, the difficulty of providing a single definition for WIL is evident, but it also shifts thinking towards appreciating the purposefulness of particular activities. Figure 2.4 can be used to frame certain activities into the curriculum for a simulated environment on campus. For example, job readiness programmes can be built into the curriculum while students are busy with a problem-based project for a virtual client.

For UoTs, programmes (i) and (v) as indicated above are currently used. As a consequence of students not being able to secure placement, industry forces them to join the service learning opportunity provided by the UoTs. This model is implemented through a practical project whereby students create systems for users in the vicinity of the institution. The project/system is then evaluated as the outcome of the service learning module. The project entails designing and developing a working real-life system for a company, implementable by the company.

For example, a specific group of students might design and develop a Point of Sale (POS) system for a flower shop, and another group might design and develop a booking system for a Bed and Breakfast business in town. The students are not developing these systems as employees of the respective companies – they provide a service. The goal of developing the systems is gaining work experience, not finding employment. Projects are undertaken in groups when student numbers are high. This however presents the problem, as described by many lecturers, of students not equally participating in their respective groups, but they ultimately pass the module because the group obtained a pass mark. These students (graduates) then enter the workplace with limited skills or a significant lack of practical skills – a challenge corporates and universities are expected to grapple with.

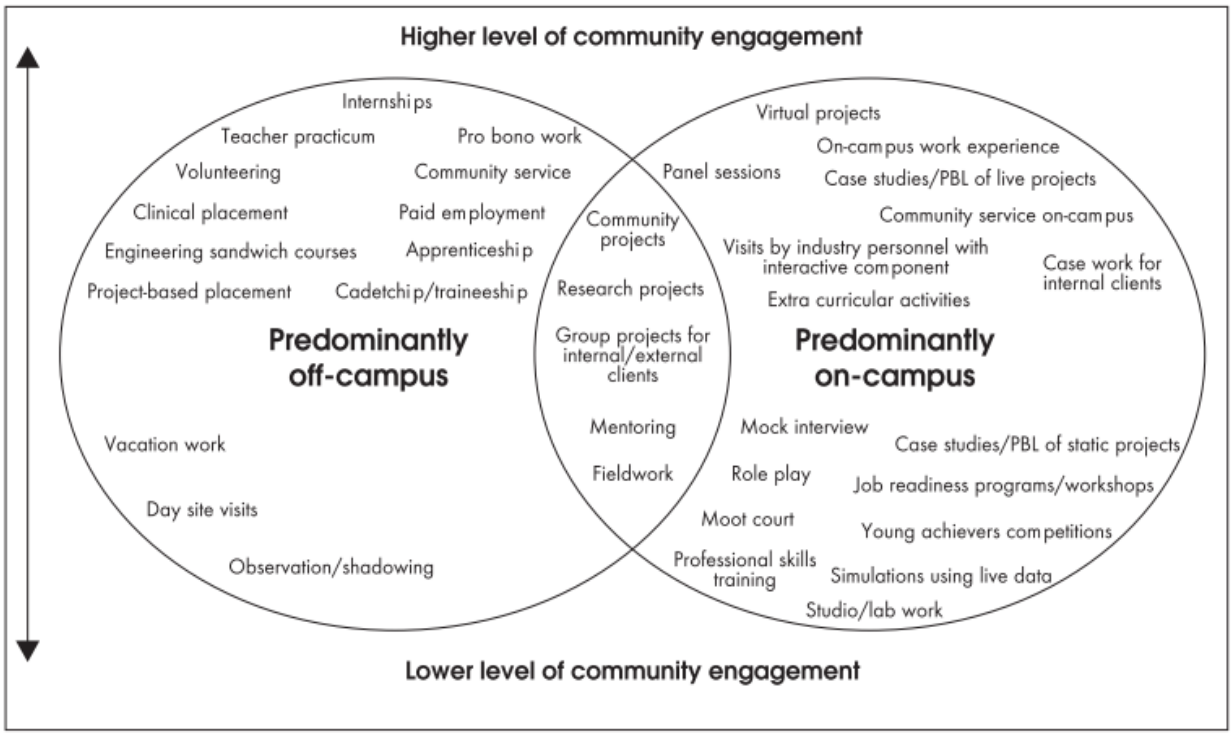

Figure 2.4: The framing of WIL in terms of locality
(Source: Rowe, MacKaway & Winchester-Seeto, 2012:251)

2.6 Issues relating to a WIL programme offered both at a company and on campus

Students who find placement have their own set of challenges to overcome (Nagarajan, 2012). Evidence suggests that some employers do not allow students to participate in the actual activities of the company that will provide the necessary skills as described in the ICT programme. Consequently, they are missing out on a training opportunity. Students should therefore still be monitored carefully by the university to ensure they indeed gain the intended experiences planned for them at the companies.

A major issue arising as a consequence of WIL students opting to remain on campus and work in groups is the difficulty of non-uniform commitment to the project, as only some within a group engage in the project and others 'sail along' together with a distinct lack of exposure to the corporate environment.

2.7 WIL and student learning

The significance of WIL (or variations of WIL, which includes a simulated work environment) for students' professional development and employability is widely accepted by both employers (Patrick et al., 2008) and the higher education sector (CHE, 2011). The various benefits for students who participate in WIL, according to the Council on Higher Education (CHE, 2011), include:

- **Academic benefits:** These may include benefits such as improved general academic performance, increased motivation to learn, and an enhancement in interdisciplinary thinking
- **Personal benefits:** Through the experiences in the workplace students may experience increased communication skills, improved team work abilities, better leadership and co-operation
- **Career benefits:** Examples might include career clarification, professional identity, increased employment opportunities and salaries, development of positive work values and ethics (Ferns et al., 2014; Hunt & Scott, 2018).
- **Skills development:** Examples may include increased competence and increased technical knowledge and skills

According to the Council on Higher Education (CHE, 2011), WIL should not be regarded as a 'quick fix' solution to the national industry's lack of competitiveness, nor can it transform a 'low skills' society into a 'high skills' one overnight. The CHE further states that WIL can, however, play a role in the readiness and employability of graduates to enter and contribute to the South African society and the world of work.

Universities are in the business of offering a broad and critical education, one that enables students to engage with both the world of science and the world of work (DHET, 2013). Programmes that include WIL, whether undertaken in the workplace or a simulated environment on campus, offer opportunities for students to be better prepared for the world of work, learn from the workplace, and be able to transfer curriculum-based theory and skills learnt in their formal education to an accurate context as a colleague and employee, with all the responsibilities and expectations such a role would expect from them.

2.8 Previous research on WIL and methods followed

Koppi et al. (2010) engaged in an online questionnaire-based study involving 719 graduates to understand the relevance of the university curriculum in their current employment. The questionnaire was designed to determine which abilities or skills learnt at university students found valuable for their professional work, as well as their perceptions on their preparedness for the corporate environment. The study adopted the mixed-methods methodology with both quantitative and qualitative data gathered from the questionnaire. It was found that graduates who were awarded an internship or who completed some work-integrated learning while studying were more able to stress the importance of the abilities listed for the workplace because of their combined work and industry experience.

Sykes & Dean (2013) performed a study that focused on the reflection on workplace activities – a technique often used to support student learning (Chamberlain, 2012). The limitations of current methodologies to support students' reflective learning on workplace practices have been highlighted (Kotzee, 2012; Sykes & Dean, 2013). The study employed a practice-based approach, where the researchers sought to refocus WIL reflection on workplace practices. Emphasis was placed on the social, practical and material aspects of students' reflective practices in the workplace. Sykes & Dean (2013) found that reflection, while instituted in the midst of the action taking place, is an often-overlooked contribution that shifts attention from understanding to action. This case study of Sykes & Dean (2013), with one representative WIL student who illustrated the importance of 'reflection in the midst of action', highlighted the limitations of some of the methods used to capture this type of reflection. It was also found that reflection methods should change to support a learning approach that is more consistent with workplace action and context. It is therefore important to connect learning activities to student learning workplace practices when designing WIL curricula.

In a study conducted by Pilgrim (2012), the recommendations focus on enhancing the professional practice capabilities of graduates. The study also comments on various issues relating to work-integrated learning. Results were obtained from surveys completed by academics teaching ICT, other university staff, and industry representatives. The research methodology followed was a mixed-methods study. Questionnaires focused on both quantitative and qualitative aspects. Two questionnaires were used: the first involved managers and educators who teach ICT at Australian universities, while the second questionnaire focused on representatives from industry. The results suggest that most of the universities regard WIL as a key feature in ICT degrees, and that students should be actively encouraged to find industry placement. It also shows that from a university perspective, WIL is helpful in developing professional attributes in students. University representatives are in

support of virtual or simulated experiences and it is viewed as a valid option for students who cannot find placement (Pilgrim, 2012). From an industry perspective, the traditional forms of WIL appear to be considered more desirable and effective in developing employability attributes in graduates. Industry representatives were unsure whether virtual or simulated experiences would be of similar value. The results confirm support for work-integrated learning that incorporates actual workplace experiences, although industry-linked projects for students who cannot find placement are still regarded as a good alternative to WIL (Pilgrim, 2012). Industry respondents however indicated that simulated or virtual experiences conducted on campus are less authentic in achieving employability skills. A possible reason for this might be attributed to the lack of confidence industry has in academics to provide students with an understanding of ICT work in a professional setting. Pilgrim (2012) further notes that in future research, the development of clear learning objectives for WIL should be outlined. It was noted that the development of shared and agreed learning objectives would lead to the acceptance of different WIL models, including simulated or virtual experiences, where the authenticity of each form of WIL is evaluated according to the achievement of the learning objectives (Martin & Rees, 2012).

2.9 WIL as part of a curriculum

Curriculum is a term widely used in an everyday sense to refer to subject content or a "syllabus" (Tyler, 2013). However, within the field of Curriculum Studies, generally and for WIL, the term "curriculum" includes all of the following: content of subjects, information on how knowledge within a subject is arranged, how lecturers teach, how students learn, and how all of this is assessed (Smith, 2012). The focus of developing a curriculum for WIL should be to enable a better "relationship" between the academic programme and the world of work (CHE, 2011). It is important when designing a WIL curriculum, whether it is for work placement or a simulated environment, to ensure that the investment in WIL is well-structured and allows for sustainable, high quality experiences and the participation and growth of stakeholders (Edwards & McMillan, 2015). This can be achieved through ensuring that the objective of aligning the WIL curriculum is to match learning outcomes, pedagogy and assessments (CHE, 2011). A curriculum can be described as a mixture of measurements and elements rooted in disciplinary developments, the student market and a growing academic-employer discussion (Barnett et al., 2001). In the case of WIL, the development of a curriculum will require of university lecturers and curriculum developers to engage with disciplinary, educational and professional knowledge (Rowe, MacKaway & Winchester-Seeto, 2012). As with any curriculum, it is important for WIL curricula to be in alignment with course outcomes, WIL activities and assessment practices. However, there is a distinct need for a framework that encapsulates the important, pedagogically applicable

features shared by most or all WIL-type curricula (Smith, 2012). To overcome this gap, it is necessary to create current and effective, applicable, meaningful learning outcomes for the programme (Tyler, 2013). According to the Council on Higher Education (CHE, 2011), the implementation of successful strategies in the design and implementation of WIL curricula will ensure that the focus of students shift to the integration of theoretical knowledge and practice. This will enable them to link theoretical or disciplinary learning with workplace application, which can be achieved through the following:

- Design learning activities that necessitate the integration of theoretical and workplace-relevant knowledge and skills (Martin et al., 2012)
- Bring workplace and professional practice to the centre of the WIL curriculum, as this is when students begin to integrate disciplinary (theoretical) knowledge and practical learning. It must still be recognised that some workplace practices may be incorrect or out of step with theoretical knowledge. This fact should be used as a catalyst for integrative learning, reflection, critique and the development of new knowledge (CHE, 2011)
- The encouragement of students to interpret and reflect on their experiences of professional practice and transfer of academic knowledge to the workplace (and *vice versa*) should be at the heart of learning activities for students in WIL curricula, according to Sykes & Dean (2013). This would be a solution to achieving enhanced and integrated learning

2.10 Assessment of WIL

For any WIL programme to be successful, whether training takes place in a company or through a simulated environment, the assessment of students should be in place. Students are required to meet learning objectives that have been agreed to (Ferns & Zegwaard, 2014). Assessment is perceived as central to the integrity and accountability of a university, and long-standing theories regarding best practice in assessment exist. Still, endorsing quality assessment practices in WIL has been recognised to be difficult (Ferns & Zegwaard, 2014). The challenges of creating and using rigorous and effective assessment methods are more evident with WIL because the outcomes are unpredictable, variable, and socially constructed (Garnett, 2012). Hodges et al. (2014) state that the primary goal of any educational programme is to enable and assist students in learning and in educational programmes and assessment is intrinsically linked to student learning and performance. In WIL, this learning mostly occurs in two settings: the educational institution and the workplace (Clements & Cord, 2011). Whilst assessment of student learning in educational institutions has been strongly theorised and well-researched, the assessment of students in work placements and internships has been more problematic (Hodges et al., 2014). Students rarely work alone in

the workplace and this adds a level of complexity to the WIL assessment challenge, as the student is not the only one to determine whether the intended outcomes have been reached. Kuriakose & Swart (2014) created and suggested a rubric as one method that can be used to assess a report the student has to submit at the end of the WIL period. One of the desired learning outcomes of WIL placement in industry is the student's ability to work with professional teams where the learning inputs are extremely flexible and outside the control of either the student or the university (Ferns & Zegwaard, 2014). In general, there are two broad types of assessment, categorised as either formative or summative. Formative assessment can be perceived as helping students progress and improve as they work, while summative assessment makes judgments and evaluates levels of achievement at the end of a learning period (Harrison et al., 2014). Formative assessment, which is often defined as feedback by a teacher or mentor, can be an important component in WIL placements, as a student learns while doing his work in the company (Hodges et al., 2014). The use of reflective journals and commentaries as an assessment tool within the context of WIL has invoked fervent discussions (Young, 1995; Chamberlain, 2012; Sharma, 2013). An issue dominating these discussions is how such reflections should be assessed, and what exactly should be assessed (Chamberlain, 2012). The workplace itself, and the employees within the workplace, play a pivotal role in incorporating and maximise learning in the student's WIL experience (Sharma, 2013). This notion gets underpinned by Young (1995) who states that assessment must move away from a linear additive model, accepting at the outset the complex, nonlinear, and possibly chaotic nature of real learning.

Input and feedback from employees or experts in the workplace provides considerable benefits for student learning by exposing them to the reflection on content and skills in the workplace (Hodges, 2011). Such associations are most effective when it is viewed as a mutually beneficial partnership where roles and expectations are clearly communicated (Ferns & Zegwaard, 2014). When a simulated work environment is planned, this form of feedback and input by a practitioner or mentor should be considered an important aspect present in the pedagogical planning of such an environment. McNamara (2013) and Ferns & Zegwaard (2014) recommend that a combination of evidence, provided by the student, the workplace supervisor and the academic supervisor should be used to assess professional competence in WIL.

2.11 Learning styles/theories

It is important to know how students learn, as this is an influential factor that must be taken into account when assessing methods of implementing a simulated working environment on campus. Learning is a complex cognitive process and as such, there is no single best explanation of learning (Woolfolk Hoy et al., 2013). Different theories of learning that have

been identified include behavioural, cognitive, constructivist, and sociocultural theories (Woolfolk Hoy et al., 2013). Traditionally, instructional practices used in the classroom relied mostly on individual learning, although some more recent studies show that well-structured group learning activities are preferable in a variety of learning situations (Isotani et al., 2013). A simulated working environment on campus will have some group learning activities as well as individual learning opportunities. According to Isotani et al. (2013), group activities should be designed to support long-term learning and in accomplishing this, well-planned collaborative learning scenarios should be designed. For group learning in a simulated working environment on campus the activities should be designed to assure that students reach the desired outcomes in a limited amount of time. Pritchard (2009) argues that when teachers or lecturers have a better understanding of the processes of learning and individual learning preferences, they will be able to provide enhanced learning scenarios that are more likely to lead to effective learning. An understanding of cognitive/learning styles leads to a consistent and fitting inclusion of different learning styles into the design of a curriculum (Riding & Rayner, 2013). Gewurtz et al. (2016) explains that problem-based learning (PBL), of which WIL in a simulated environment is an example, has been linked to several theories of teaching and learning. Problem-based learning consists of the following elements:

i) Groups of students are presented with a scenario. In a simulated working environment these scenarios are based on real-life assignments that workers encounter in their everyday working life.

ii) The lecturer changes from being the source of information to the facilitator of learning. In a simulated working environment the lecturer will not tell students how to solve these scenarios, but rather give the students a chance to find the solutions to the problems through collaborative problem solving (Gewurtz et al., 2016). Siemens (2014) however identified some noteworthy tendencies in learning that emerged over the past years. These tendencies or trends are important to note when arriving at the point of creating a curriculum for a simulated working environment for WIL students. These tendencies, according to Siemens (2014), are that students will probably not stay in their original field of study, but will migrate to a variety of possibly unrelated fields over the course of their career lifetime. Learning through communities of practice, personal networks and through the completion of work-related tasks – also known as informal learning – forms a significant part of a student's learning experience. Learning is a lifelong process (Scott, 2015).

Informal learning is a significant aspect of our learning experience. Formal education no longer comprises the majority of our learning. Learning now occurs in a variety of ways – through communities of practice, personal networks, and through completion of work-related tasks. Learning and work-related activities are no longer separate. In many situations, these

are the same. Furthermore, Siemens (2014) specifically notes the changes in the way we access and retain knowledge in the technological era. He argues that more attention is given to knowledge management and the way we access knowledge or information. This implies that many of the processes previously handled by learning theories (especially in cognitive information processing) can now be supported by technology. This means that all knowledge and information is not embedded in the person any more (Siemens, 2014). In addition to knowing how to perform certain tasks and the knowledge we possess, the understanding of where to find knowledge is now also needed. This brings us to the argument that learning theories have been concerned with the actual process of learning and not with the value of what is being learnt. Siemens (2014) states that the worthiness of learning something should be evaluated before learning itself begins. In today's environment, action is often needed without personal learning – that is, we need to act by drawing information outside of our primary knowledge. The ability to synthesise and recognise connections and patterns is a valuable skill and is known as connectivism. This method of learning should be a focus in a simulated working environment so that students can learn to search for needed information to solve work-related problems where they do not necessarily have the knowledge themselves on how to solve such problems. Siemens (2014) further argues that connectivism is driven by the understanding that decisions are based on rapidly changing knowledge foundations. New information is continually being developed and acquired. The ability to distinguish between important and unimportant information is vital. The ability to identify when new information changes the landscape based on decisions made yesterday is also critical. In a simulated working environment created on campus, it is thus vital for students to learn and understand that learning is a process of connecting different specialised information sources and that the capability to know more, is more important than what is currently known. Students should realise that identifying and maintaining connections is needed to facilitate continual learning and that the ability to see links between fields, ideas, and concepts is a vital skill. For ICT WIL students, the fact reiterated by Siemens (2014), namely that connectivism also addresses the challenges in knowledge management activities faced by many corporations where knowledge that resides in a database needs to be connected with the right people in the right context in order to be classified as learning, is an important skill to learn. The flow of information in an organisation is an important element in organisational effectiveness. Our ability to learn and know what to learn for what we need for tomorrow is more important than what we know today (Siemens, 2014).

2.12 Virtual laboratories

Expecting all WIL students do their in-service training at a company, or making WIL industry placement a compulsory part of the qualification, is problematic. There are some students

that simply cannot find placement at a relevant company due to limitations in the availability of such positions in a particular semester. International students are another group that cannot find industry placement. Based on their student visa regulations, international students are not allowed to be employed for more than twenty hours per week (SouthAfrica.info, 2016). This notion is supported by Sixsmith & Litchfield (2010), who note that WIL places students in applicable work experiences to improve their general skill development as well as their understanding of business practice. Since not all students are able to undertake such placements, opportunities to develop their general skills should be provided through the curriculum. Simulating the work environment to enable students to experience aspects of the workplace within an educational framework might be a feasible opportunity for these students (Sixsmith & Litchfield, 2010). A simulated working environment used to obtain professional and graduate attributes would probably not be a replacement for those obtained through industry placement, but it should still be realised as a necessary and valuable addition for those students who cannot find placement in companies (Sixsmith & Litchfield, (2010; Ferns et al., 2014). The curriculum content developed for a simulated environment needs to cover these professional and graduate skills (Coldwell-Nielson & Craig, 2012). Most references in the literature for simulated working environments relate to the situation where employees work for a company, but have a virtual office (Cascio, 2000). Other authors describe 'virtual reality' as an environment where software is used to create virtual situations (Young, 1995). In these cases, students work in a virtual environment where certain work situations are simulated on the computer (Precision Group, 2016a). There are testimonies that this method does have successes, as the following quote shows:

> "We find Precision Group's Simulated Business environment is an excellent learning tool to support some of our participants. Participants are able to access an online business structure with resources and templates which helps support their classroom learning. Precision Group provides a unique point of difference through this additional service and adds value to us and our students" (Precision Group, 2016b).

This research, however, intends to find an approach to a creative pedagogy for a simulated work environment where an actual company is simulated, and students 'work' on campus for this company. A similar model has been described by Veillard (2012) who specifically investigated the transfer of knowledge in a virtual company. Veillard stated that this type of situation is difficult to manage, even for an experienced teacher because it does not have the clearly defined learning outcomes a theoretical subject has (Veillard, 2012). One company following a similar method to what this study aims to reach is Digital Academy (2016). In this situation, final year students from different institutions are enlisted for different projects with the aim of students developing specifically required systems for the company. The company specifically seeks commercial outputs.

The same principle can be applied to a virtual company on campus where simulated projects are introduced that need to be solved by students without the expectancy of commercial benefits. An excerpt from the Digital Academy (2016) website explains their aims: “Our interns learn practical, hands-on development skills that are needed in the real world whilst building commercial facing products via a rapid internship programme”. One of the problems identified by Veillard (2012) is that whilst students can easily transfer concrete knowledge gained from the workplace to their academic environment, they find it difficult to transfer theoretical concepts and methods taught at university to their working environment. By implementing a simulated working environment on campus this stumbling block could be addressed, as an academic mentor would be available to the students at all times. Similar to the South African company Digital Academy (2016), a study conducted by Schroder (2014) followed the model that this research study aims to explore. Schroder (2014) closely followed a virtual company named Future Technologies for Expertise Development (FuTEx). At FuTEx, information technology (IT) workers can obtain a qualification towards an IT specialist certificate. The qualification in this virtual company is not for graduate students, but for anyone who wants to complete an IT qualification. The qualification addresses jobseekers who cannot participate in a regular qualification according to Advanced IT Training System (AITTS), which is a German certification company (Schroder, 2014). As Schroder (2014) describes, FuTEx is a company based on a virtual platform that provides a virtual work environment for the qualification of jobseekers. The personal working experiences of students are enriched by a workplace that functions as a learning place and by real in-company job tasks that provide learning opportunities. Students in this virtual company are joined to form project groups. These groups are challenged by different learning objectives in their training and are assigned different roles in actual developmental projects. The participants are accompanied by a tutorial team that consists of a facilitator or a mentor, a technical expert, and a project leader. The functions of the facilitator include individual coaching and support throughout the learning process of the students. Schroder (2014) reports the following results of this study:

i) A competency-oriented IT specialist qualification, which meets the requirements of AITTS, the certification authority and international standards in Germany, is possible in a virtual work and learning space.
ii) The processing of a real work tasks, problems or projects must be central to the qualification.
iii) Social and personal competences such as team work skills are developed in addition to technical competence.
iv) Training providers and participants found the qualification structure and elements feasible and practicable.

v) FuTEx qualifications are regarded as economically viable in all the educational institutions this company is involved in.
vi) Acceptance of FuTEx amongst participants was high.
vii) A FuTEx qualification with a recognised certificate significantly improved the chances of re-entry into the labour market.
viii) FuTEx has created a completely new perspective and enhancements for development in vocational training through its real-work processes that are embedded in their virtual space training (Schroder, 2014).

These findings are encouraging for implementing a simulated working environment on campus.

2.13 Professionalism and professional identity

According to Trede (2012), there has been an increasing focus on the student in terms of integrating classroom and workplace learning. On campus, at the university, students are seen as learners, while in a workplace context students are perceived as pre-accredited professionals. It is important to note that in both of the above mentioned contexts students can be facilitators of peer learning. Through workplace learning experiences and the fact that students participate in professional roles in the workplace, they have opportunities for learning that create a professional identity formation and a sense of professionalism (Trede, 2012). An essential characteristic of WIL is the development of a professional capability or competence – the ability of students to perform in the workplace. When evaluating the curriculum for an on-campus WIL solution, a component that should be assessed during the WIL module is the student's demonstration of professional competence in the workplace (McNamara, 2013). Professional competence in WIL is, however, a challenging aspect to assess. In a situation where students conduct WIL at external companies, it may be impractical for the WIL mentor to assess professional competence when he/she mentors a large number of students. The student's ability to express his/her own capabilities can also interfere with the validity of the professional competence assessment. The possibility also exists that the evidence of professional competency provided by the WIL mentor can be profoundly dependent on the individual mentor and may therefore be unreliable (McNamara, 2013). Professional development for an IT career can be done through WIL across a wide range of job situations. The most useful combination to attain professional development appears to be a combination of theory studied at a university and related professional IT work (Koppi et al., 2010). According to Pilgrim (2011), WIL is beneficial in developing certain professional attributes in students and many universities regard WIL as a key feature of their qualifications. There are, however, concerns regarding the need for 'hard evidence' of the value of WIL in terms of professionalism. Improvements have been noted in students

completing WIL in a range of employability skills that include team working, problem-solving, communication, information literacy and professionalism (Jackson, 2015).

2.14 Mentoring and coaching

For a simulated work environment on campus to be efficient, the supervision and mentoring of students who 'work' in this environment will play a pivotal role in their successful completion of the module. Smith-Ruig (2014) conducted a study on students in a mentoring programme, and some of the benefits reported have been classified as career-related, psycho-social benefits, including improved knowledge, a stronger focus on their chosen profession or career path, and increased confidence. The importance of mentoring to encourage the development of employability skills in students are stressed by Martin et al. (2012), especially the skills of time management and autonomy, as well as their ability to successfully apply their skills (Jackson, 2015). Introducing a well-structured mentoring programme into a simulated work experience will benefit students and should be a goal for academics and career development professionals in higher education.

A positive outcome of well-implemented mentoring is to better integrate theoretical knowledge with the realities of the workplace, thereby helping to prepare students more efficiently for their careers (Smith-Ruig, 2014). Coll et al. (2009) found that the skills gained through off-campus learning are mostly behavioural or soft skills. These include skills on effective communication, time management, respect towards colleagues and clients, developing a good work ethic, and an understanding the workplace culture. Consequently, students also develop a sense of professionalism that will instil in them an appreciation of what it means to be a professional in their specialty area (McNamara, 2013). Holmes et al. (2012) argue that the development of knowledge is limited without action or practical application. For knowledge gained through action, Veillard (2012) adds that it is crucial to understand and nurture the social learning relationships of WIL. One form of social learning is mentoring, and it can be used as a method through which work-integrated or contextual learning is obtained by the student (Smith-Ruig, 2014).

There are several benefits for students through the process of mentoring, according to Wadee et al. (2010), such as better adaptation to the new environment and better independence, but it is also important to train the mentors well, to be able to maximise profits for the mentees. Mentoring empowers the student to understand and learn about and experience the realities of a workplace environment and their intended profession through the relationship with their mentor, and also the information passed on by their mentor (Rowe et al., 2012). Smith et al. (2009) argue that the opportunity for the sharing and development of work-related skills and experiences can be achieved through mentoring. Furthermore, it

provides an opportunity for the development of individual, academic and work-related goals as well as career development. These developments might not have materialised through theoretical learning without access to a mentor. Smith et al. (2009) found that in practice, mentoring can range from being an informal relationship as in peer support or support provided by co-workers, or a formal structured programme. In addition to this, mentoring can take place as a one-to-one relationship, either as face-to-face or via the web, or in small groups. This informal or formal mentoring should then also occur with students working in a simulated working environment to maximise their learning to the same level as students placed at real companies.

According to Schunk & Mullen (2013), common assumptions about mentoring do exist. Firstly, mentoring is a dynamic, developing and often informal process through which students' learning and independence are improved as relationships with mentors become stronger. This should be taken into account by mentors who are part of a simulated environment on campus to ensure students emerge as independent learners who have the ability to solve real-life problems in IT companies. A second assumption, according to Schunk & Mullen (2013), is that mentoring relationships are not pre-defined or in the 'one size fits all' category, but are rather perceived as unique to each student because the goals, settings, and relationships are not fully known or completely predictable and have a tendency to change over time (Mullen & Fletcher, 2012). Mentors in a simulated environment should not attempt to deal with all students in a similar manner, but rather assess the situation and each student on an individual basis. Thirdly, mentoring relationships are social learning partnerships focused on the students' interests and growth (Schunk & Mullen, 2013). Based on this assumption, mentors in a simulated environment should not enforce a student-lecturer relationship, but rather a collegial relationship.

Mentoring functions identified by Levesque et al. (2005) include providing acceptance and confirmation to the mentee, help assessing difficult situations or offering perspective on problem situations, and providing mentees with sufficient difficult or challenging tasks. Mentors should also act as coach in providing feedback, sharing ideas and encouraging career development. In their study, Levesque et al. (2005) found that the mentees valued the following mentoring types as most important: coaching, information support, exposure and visibility, and political assistance. However, the coaching process is very different to mentoring and could be used in conjunction with mentoring and/or supervision (Wadee et al. 2010; Wadee, 2016). These functions can then be classified as providing career-related support.

There are however some mismatched expectations between students and mentors/ supervisors. These contributing factors have been identified by Rowe et al. (2012) as:

- Lack of communication
- Lack of sufficient preparation of students for the realities of ‘authentic’ participation in a given profession, workplace or real-world context
- Students’ expectations of their supervisor
- Inability of host supervisors to provide the level of supervision that the student expects or requires due to conflicting demands and workload
- Time pressures
- Resource limitations

The supervisor or mentor evidently plays an essential and critical part in any form of learning through participation. The very nature of the task of mentoring is multifaceted and complex (Rowe et al., 2012). It is thus important to realise the important role the mentor will play in a simulated working environment on campus. Mentoring should be one of the focus points in the development of a framework or model for the implementation of such a simulated environment.

2.15 Peer learning and mentoring

One of the requirements of running a virtual company (i.e. simulated environment) on campus is the mentoring of students in the programme, which immediately leads to a manpower challenge. Lecturers who are fully committed to their academic duties will not be able to allocate additional hours for mentoring the WIL students. Student or peer mentors provide an ideal opportunity to address this issue. Peer mentoring is defined as a relationship where two individuals of similar age and or/experience work together. This can take on the form of a formal or informal relationship where one member in the relationship assists the other (Douglass et al., 2013). Tenenbaum et al. (2014) found that personal, educational, and professional growth for peer mentors and the increased interest and commitment of students can be attributed to the process of mentoring. Peer mentor programmes can also provide opportunities for both mentors and mentees to reflect on the learning process. In particular, this is one of the goals in the WIL programme (CHE, 2011). Peer mentors, however, must be able to think about how students learn and apply this to their interactions with the mentees (Douglass et al., 2013). This skill thus needs to be incorporated into the training programme of peer mentors. Peer mentoring also has the potential to provide emotional support, which, in turn, may enhance the WIL students’ academic success (Douglass et al., 2013), especially because the WIL component is totally different from other undergraduate modules, which may be stressful to students. When implementing or using a peer mentoring model, structured opportunities for mentorship based on the students’ career interest should be

provided (Olson et al., 2016). Olson et al. (2016) state that peer group-based, specialty-focused mentorship holds promise as a method for enhancing student learning.

Studies on the implementation and use of peer mentoring and the benefits thereof focus mostly on first year students to assist them with integrating into university life (Collings et al., 2014). It is however different than the intent of this study, where the mentees are students in their final year module of undergraduate studies. Principles of mentoring are however similar, independent of the stage of the students or how far they have progressed with their studies, as this last WIL module is completely different in approach to the rest of the ICT course. Here they are viewed as employees of the virtual company, and they need to complete tasks as employees and not as students any more.

When choosing students as peer mentors, there are certain personality traits proven to yield the best results with mentees. These characteristics include extraversion or being outgoing in personality, agreeableness, conscientiousness, emotional stability and openness. Added to the benefit of the mentee, these characteristics also make it easier for the peer mentor to manage the underachievers of academic programmes (Taha et al., 2014). Mentees should be introduced to the peer mentors by a person of authority such as a lecturer. This helps students to accept the authority of the peer mentor (Packard et al., 2014). Participation of students as peer mentors also have benefits, including increased knowledge of a subject, improved competitiveness for the world of work, and continued interest and diligence in their field of study (Packard et al., 2014). Three mentoring styles were identified by Leidenfrost et al. (2011), namely motivating mentoring, informatory mentoring, and negative mentoring. Motivating mentors were shown to have a positive influence on the success of the mentoring programme among most of the mentees.

In the context of higher education, peer mentoring has proven to be an effective way to support both undergraduate and graduate students (Leidenfrost et al., 2011). When introducing peer mentoring or peer learning programmes into a simulated environment on campus, key operational features for the programme should be specified. These include characteristics of the mentors and mentees, what is expected of the mentoring role, the number of mentees each mentor needs to manage, how many times and how long the mentoring meetings are expected to be, the types and level of training and other support, whether there will be compensation or rewards offered, and whether the programme is mandatory or voluntary (Gershenfeld, 2014). There are however disadvantages of introducing a peer mentoring programme to the WIL students in a simulated environment on campus. From a study done by Colvin & Ashman (2010), it showed that students can either become too dependent on the mentor or, conversely, not accept the mentor. The benefits of peer mentors are highlighted by Schwartz (2012), who suggests that programmes relying

entirely on lecturing staff, acting in a one-on-one model to mentor students, is not necessarily representative of typical teams at workplaces, and could present a labour-intensive undertaking for the university and the staff in particular. Peer mentors can also draw on their own recent experiences and offer direction and guidance to the mentees in a relatable manner (Parker et al., 2008). An added benefit in peer mentoring relationships is that they are more apt to include emotional support, friendship, and a personal connection than supervisory mentors, such as a student-lecturer relationship (Terrion & Leonard, 2007). In addition, university students mentored by peers have reported that they feel more comfortable in their abilities and they demonstrated enhanced retention (Packard et al., 2014). The use of peer mentors should thus be considered in a virtual company scenario on campus for WIL students.

2.16 Conclusion

The literature review was done by reviewing research conducted on the topic of WIL and simulated environments in various parts of the world. It started off by looking at what creative pedagogies are and where it is used. The focus then shifted to WIL to frame what it is, and what it is not. Different approaches of WIL have been presented, together with the different types of WIL currently in use by higher education institutions throughout the world. Other aspects of WIL have been investigated, such as how WIL aligns with a curriculum and how WIL is assessed. The way learning styles are accommodated in WIL, and how virtual labs can be used to conduct WIL, has been looked at. Lastly, the role and importance of mentorship and coaching, together with peer learning, have been outlined in a WIL context.

CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY

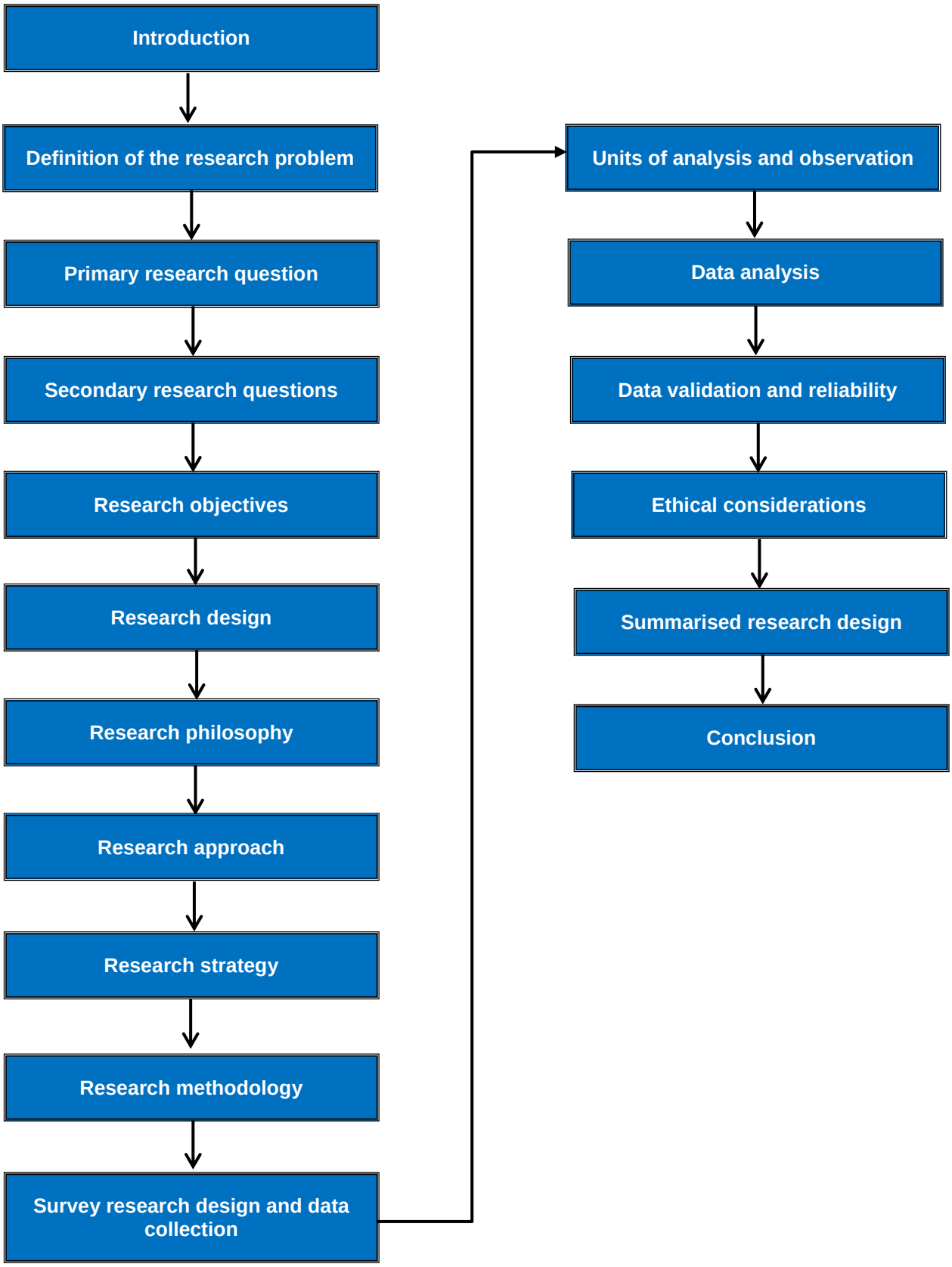

Figure 3.1: Outline of Chapter 3

3.1 Introduction

This chapter discusses existing research philosophies, as the way in which research is conducted is viewed in terms of the research philosophy subscribed to. This is followed by a section on how the current study's philosophy is aligned with the other philosophies. The research strategy followed is discussed together with a description of the research instrument used in this study. The focus is directed to defining the research problem, explaining and clarifying the purpose of the study, and the data collection methods followed.

The research problem and purpose of this study together with the objectives are presented. A discussion on the data collection methods follows. Questionnaires (one for each group of respondents) were used as the research instrument. The population sampling and principles relating to reliability, validity in relation to the five population groups selected for this study, is preceded by the conclusion of the chapter.

3.2 Research problem

The research problem as identified in Chapter 1 is set out below and aligned with the purpose of the study.

3.2.1 Defining the problem

Currently at VUT, students entering their final semester of undergraduate studies have the choice of finding placement at a company or completing a project on campus for their WIL module. The on-campus projects are done in a group setting and require of students to identify a real-world user (businesses surrounding the university). They then develop software systems to either address a specific problem the businesses face, or improve the systems currently used by the businesses. It has been observed that when WIL students develop systems during their final semester, they lack a basic understanding of how these businesses operate. Suspicions have been raised that some of the systems presented are bought from third parties and are not the students' own work (Da Rocha, 2016; Nduwamungu, 2016). This remains a serious challenge to the academic Institution. The issue with group work is also that one or two students in the group may carry the largest part of work load whilst the others are merely 'tagging' along. A project is assessed as group work, meaning all the group members either pass or fail the project although the 'real work' might actually be done by a small minority within the group.

Currently, higher education requires setting strategies and specific action plans to guarantee learners a place in the highly competitive and demanding world of work (Laverde et al., 2007), especially within the area of information system development.

3.2.2 Purpose of the study

This research study proposes an approach to a creative pedagogy in tertiary ICT education in South Africa to enhance learner-content relation. The approach introduces a simulated environment in the form of a virtual company for WIL students on campus, instead of students merely completing a group project. Factors and skills that may influence the success of creative learning in WIL, on campus in a simulated company environment, are identified and incorporated into the approach (see Chapter 6 for the proposed approach).

3.3 Primary research question

The primary research question guiding this study is:

PRQ: What approach to a creative pedagogy will contribute to enhancing the learner-content relation of WIL students in tertiary ICT education in South Africa, thereby improving the perception of readiness of ICT graduates to enter the world of work?

3.4 Secondary research questions

The secondary research questions guiding this study are:

SRQ1: Why are creative pedagogies increasingly needed in education?

SRQ2: What characteristics should be incorporated into a creative pedagogical approach?

SRQ3: How is WIL applied in tertiary education?

SRQ4: What are the perceptions of tertiary learners, lecturers and employers in accepting a creative pedagogical approach in the learning experience to prepare learners for the world of work?

SRQ5: What skills should a creative learning pedagogical approach address for WIL, on campus in a simulated company environment?

SRQ6: What factors can influence the success of creative learning in WIL, on campus in a simulated company environment?

SRQ7: How can these factors be incorporated into an approach to a creative pedagogy for WIL, on campus in a simulated company environment, to adequately prepare students for the world of work?

3.5 Research design

According to Saunders et al. (2012), the framework or the logical research process used to ultimately design the research methodology for a study is identified as the research design. The research design provides a guideline on how all the main parts of the research is assembled. This includes the research philosophy, the research approach, strategies, data collection techniques, choice of participants, population and analysis, and how it relates to and answers the research questions. The research onion model, developed by Saunders et al. (2012), is used as a scientific guideline and baseline for the research design for this study. Figure 3.2 illustrates this model onion.

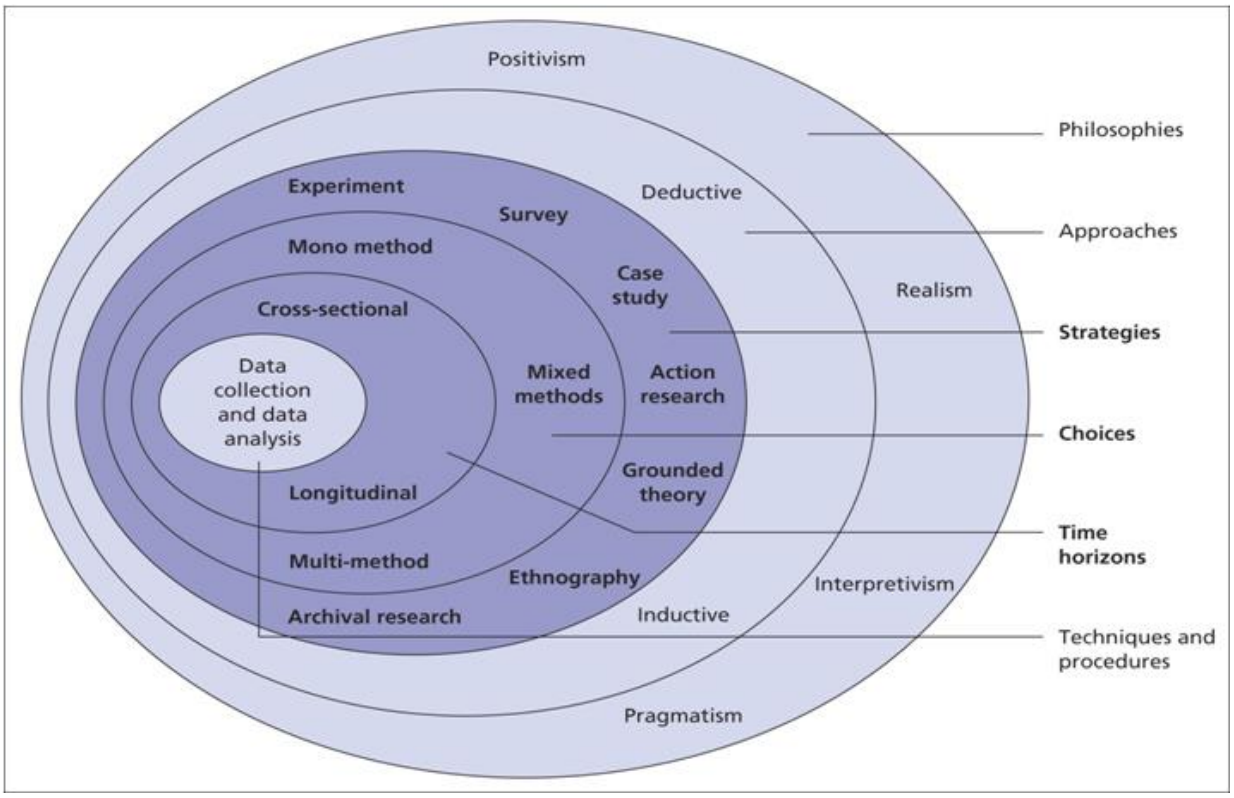

Figure 3.2: Research Onion
(Source: Saunders et al., 2012)

The layers of the research onion start with the philosophy chosen for the study. Based on the philosophy, a specific approach or paradigm is then adopted. The various research strategies and choices are then presented, followed by the data collection and data analysis methods (Saunders et al., 2012).

3.6 Research philosophy

Mkansi & Acheampong (2012) mention that research philosophy classifications such as ontology and epistemology and their conflicting applications to the 'quantitative-qualitative'

debates might be a source of confusion to research students in establishing their relevance to subject areas and disciplines. However, the research onion model of Saunders et al. (2012) has proven to be sound in numerous studies and will therefore be used in the description of the research design followed in this study.

It is important to reflect on the two elements of research philosophy, namely ontology and epistemology, when conducting any form of research. These elements shape the way in which research is conducted, from the point where the research is designed, to where the conclusions are reached in a specific study (Saunders et al., 2012). It is essential to understand these two concepts in order to comprehend the suitable methodologies chosen for this study.

3.6.1 Ontology

Ontology is defined as:

> *"The science or study of being and develops this description for the social sciences to encompass claims about what exists, what it looks like, what units make it up and how these units interact with each other"* (Blaikie, 1993).

Hasan et al. (2014) opine that ontology focuses on objects, the categories in which these objects exist, and the relationships between them. They further argue that ontologies represent the conceptualisation of a specific field of study. Hence, the notion of ontology studies reality and its nature, and it is questioning any assumptions made by a researcher regarding the way the world operates (Saunders et al., 2012). Ontology is sub-divided into two views, namely objectivism and subjectivism.

3.6.1.1 Objectivism

The objectivist view of the world posits that knowledge of this world or reality can increase through the accumulation of more complete information and knowledge, but it starts with the assumption that the world exists and is real (Saunders et al., 2012). The epistemology (see section 3.6.2) of objectivism accepts the ontology of objectivism, that in order for a more comprehensive knowledge to be obtained, a real and definitive world or reality must first exist. The philosophy of critical realism (see section 3.6.2.3), which suggests that the world and reality is too complex to be known only through the senses and must be objectified on a conceptual level through the use of scientific theories, fits in well with the ontology and epistemology encourage by objectivism (Bunge, 2004, 2006).

3.6.1.2 Subjectivism

According to Bhattacherjee (2012), subjectivism is when a researcher views the world as a subjective structure of our subjective minds rather than as an objective reality. Ratner (2002) posits that the subjectivity of the researcher is closely involved in scientific research. It therefore affects everything from the choice of research area, how hypotheses are formulated and methodologies chosen, to how a researcher interprets the data from a study (Ratner, 2002). This is in contrast to objectivity as discussed in section 3.6.1.1, which aims to disprove the effect of subjectivity to reduce the researcher into a passive and objective recipient of information. The subjective outlook suggests that one never really experiences the world discussed in an objective manner. Rather, it is shaped by one's values or norms. The ontology and epistemology encouraged by subjectivity suggest that the world or reality cannot be known in totality, as our value systems shape and guide our knowledge of the world or reality (Ratner, 2002). Subjectivism is usually classified under the banner of post-modernism (Gergen, 2001). Gergen (2001), in conclusion, states that interpretation should still be strived for to be as objective as possible, by attempting to guide researchers' subjective processes to objectively study the psychology of subjects in the qualitative methodology.

The current study adopts subjectivist ontology, as the researcher is part of the world or reality under investigation; however, interpretations made from the responses of the participants are as objective as possible.

3.6.2 Epistemology

Ontology, as seen in the previous section, concerns itself with reality and its nature and the way that the world functions. In contrast to that, epistemology concerns itself with how knowledge is created by research, whether the knowledge created is good or bad, and how this can be distinguished and suitably and accurately represented (Hatch & Cunliffe, 2013). Thus, epistemology focuses on the tools, methods and techniques used for research and how research looks at the world. Furthermore, it concerns itself with how the knowledge is created rather than looking at the world itself. Four main epistemologies exist: interpretivism, positivism, critical realism, and pragmatism (Saunders et al., 2012).

3.6.2.1 Interpretivism

In the interpretive paradigm, the aim is to understand the subjective meanings of persons in the studied domains (Goldkuhl, 2012). Interpretivists argue that reality can only be fully understood through the intervention and interpretation of the occurrence of reality. Goldkuhl (2012) further states that the core idea of interpretivism is to work with the subjective

meanings already present in the social world, to acknowledge their existence, to reconstruct them, to understand them, to avoid distorting them and to use them as building blocks in creating theories. The investigation cannot be separated from the researcher studying the environment and the multiple ways in which the researcher interprets reality (Lee, 1991). Lee (1991) further states that it is agreed that the numerous explanations of reality are part of the scientific knowledge being pursued. A re-emergence of interpretivism in information technology research, especially in the field of information systems, has been noted (Walsham, 1995; Johari, 2006; Goldkuhl, 2012).

3.6.2.2 Positivism (and post-positivism)

Positivism presumes that the reality under investigation is a constant and stable phenomenon that can be studied from an objective outlook without interfering with the phenomena being studied (Levin, 1988; Mackenzie, 2011). It is argued that the phenomena being studied should be isolated and any observations made should be repeatable. According to O'Leary (2017), positivists use observations and measurements to make forecasts and control forces around us, and to test theories or describe a particular understanding of what is being studied. Post-positivism replaced positivism after World War II (Mertens, 1998) and concentrates on the hypothesis that research is influenced by a number of well-developed theories. Kuhn (1962) argues that new understandings of a field of study may challenge the theoretical framework as a whole. Positivist and post-positivist research is most commonly used with quantitative methods of data collection and analysis (Mackenzie & Knipe, 2006). Hirschheim (1985) state that positivism is rooted so well into our society, that knowledge claims not grounded in the positivist paradigm are simply dismissed as not being scientific and therefore invalid. Alavi & Carlson (1992) support this view of positivism. They reviewed 902 information system research articles and found that all these empirical studies were positivist in their approach. The positivist paradigm has been successfully associated with the physical and natural sciences.

3.6.2.3 Critical realism

According to Morton (2006:2) the core idea of critical realism is "that the natural and social reality should be understood as an open stratified system of objects with casual powers". The epistemological point of view of critical realism claims that the *theory of knowledge* of reality is unlike the *theory of being* of reality. Neuman (2003) argues that through critical realism the real world is experienced through images and sensations by using the five physical senses, rather than focusing on the nature of the object being studied or by directly experiencing the object being studied. According to Morton (2006), there are three layers present in critical realism, namely the empirical, actual and real domains. The empirical domain includes all

observable experiences that can be measured in some way. The actual domain includes actual measures that have been generated by mechanisms, while the real domain explains the mechanisms that generated the measures in the actual domain. This makes the critical realism paradigm appropriate to both the natural sciences and the social sciences. This however is on the condition that the natural sciences have fundamental laws that govern it, while the social sciences are governed by the actions and activities of humans, culture and society.

3.6.2.4 Pragmatism

The core of the pragmatism epistemology is actions and the change these actions bring; it is also seen as humans acting in a world that is in a continual state of change (Goldkuhl, 2012). According to Goldkuhl (2012), any organisation of associations between people is meaningless unless it accompanied by some action. In the areas of work-integrated learning and reflective practice there is a larger focus on action and pragmatism with an important focus shift to the question of what students can do, rather than what they know (Kirkpatrick & Garrick, 2001). This causes the focus of research in these areas to shift to problem solving activities and observable outcomes. Action is seen as the way to change existence (Goldkuhl, 2012). According to Siemens (2014), pragmatism states that the reality is interpreted, and knowledge is negotiated through experience and thinking. Mkansi & Acheampong (2012) found that the use and the importance of pragmatism information systems research has been rising in recent years.

From the above, the epistemology adopted for this research study is interpretivism. The focus of the research is on interpreting the various questionnaires. Respondents were asked to complete a questionnaire and based on the responses, their intentions and thoughts around the topic were interpreted. Furthermore, based on the context of the interpretive methodology and the outcome of the study, recommendations are proposed to form the basis of future research and action.

3.7 Research approach

According to the research onion of Saunders et al. (2012), there are two research approach categories for scientific research, namely the deductive and inductive approach. The inductive approach to conducting scientific research comprises of the collection of empirical evidence and then building a theory around the evidence collected. A deductive approach encompasses the development of a hypothesis based on a theory and an existing body of knowledge and then performing validity testing on this existing body of knowledge (Beiske, 2007). The deductive approach focuses on specific observations and interpreting these

observations, in contrast to the inductive approach that rather focuses on broader theories and overviews (Hevner & Chatterjee, 2004; Saunders et al., 2012).

This study follows an inductive research approach, as empirical evidence in the form of analysed questionnaire responses are used to propose a workable simulated environment for WIL students to prepare them for the world of work in a similar fashion than WIL students are placed at companies for their in-service training. This conforms to research that is building theories (Bhattacherjee, 2012).

3.8 Research strategy

Research strategies, according to Saunders et al. (2012), include action research, surveys, experiments, ethnography, archival research, grounded theory and case study. All of these are briefly discussed below, and the appropriate research strategies for this study are expanded upon.

3.8.1 Action research

Action research can be defined as an investigation into a person's actions and the effects these actions have on a person's environment, from a work or organisational context, in a reflective, systematic way. The way these actions and practices align to a value system is also examined**.** Action research is seen as a collaborative process and implies that multifaceted social systems are required to be examined and understood (Stringer, 2010; Riel, 2016).

Action research delivers a path of learning from and through one's practical steps, by working through a series of reflective stages that enable the development of advanced problem solving.

The objective of action research is to make a positive personal and professional change. This usually starts with an individual; however, over time the process of change becomes social and begins to spread to an ever-broadening group of participants and stakeholders (Riel, 2016).

3.8.2 Surveys

Surveys are designed to produce statistics on a target population by inferring the characteristics of the target population from the answers provided by a sample of respondents (Fowler, 2013). Surveys are the umbrella term used for many data collection

methods and measurement processes (Saunders et al., 2012; De Vaus, 2013; Fowler, 2013).

De Vaus (2013) maintains that a survey is not only a particular technique for collecting data, it can also be seen as collecting data through interviews and using paper questionnaires for the maximum benefit. The most used technique is questionnaires. Other widely used techniques include in-depth interviews, observations and content analysis (Saunders et al., 2012). The distinguishing feature of a survey is the form of the data and the method of analysis.

According to Fowler (2013), surveys normally have the following characteristics: The survey is used to produce statistics in the form of quantitative, numerical data about some aspects of the study population. Qualitative data may also be collected (Saunders et al., 2012; De Vaus, 2013). In this form of research, data are collected in the form of answers received to questions that were posed to research subjects. The answers provided are then used for analysis. Information is normally collected from only a fraction of the population (the sample) rather than from every member of the population (Saunders et al., 2012).

Using a survey for data collection provides three potential properties of the data from a properly designed survey that make them preferable to data collected from other sources:

- The researcher can have confidence that the sample is not biased. Data from a properly chosen sample is better than data collected from other more 'loosely designed' data collection methods
- There is a standardised measurement across all respondents, which ensures that comparable information is obtained from everyone who participates
- A specialised survey can be designed to meet analysis needs, so that data can be paired for specific analysis (Fowler, 2013).

According to Fowler (2013), the procedures used to conduct a survey have a major effect on the likelihood that the data will describe accurately what is intended to be described. A survey brings together aspects of sampling, designing questions and the method of data collection. The combination of these three aspects is essential to good survey design. The key to good sampling is finding a way for each of the members of the population to have the same chance or probability to be chosen (Fowler, 2013). Using questions as a measuring tool is an essential part of the survey process. The major advance in question design over the last 20 years focused on improving strategies for evaluating questions (Fowler, 2013). Questions should be evaluated to ensure they are well understood. The mode of data collection for surveys may be in-person interviews, telephone interviews or on-line interviews. Questionnaires may be mailed or handed personally to respondents for completion, or

respondents may complete questionnaires online (Fowler, 2013). Data should be collected from the respondents using the same variable or characteristic with the goal of ending up with a data grid (De Vaus, 2013). For this study, questionnaires were both mailed and physically handed to respondents in person to complete.

3.8.3 Experiment

Saunders et al. (2012) posit that the experimental research strategy is a form of research that owes much to the natural sciences although it used frequently in social science research. The purpose of an experiment is to study causal links, investigate whether a change in one independent variable will bring forth a change in another variable, and whether there is a link between the two variables. This research study has not adopted experimental design, as there are no variables that need to be manipulated. The study comprises an interpretation of the current state of conducting in-service training projects (i.e. WIL) at VUT, as well as how respondents perceive these activities.

3.8.4 Ethnography

Ethnography emanated from the field of anthropology. The purpose is to describe and explain the social world that the subjects in the research inhabit, and the way they describe and explain it. This research strategy is time consuming and takes place over an extended period. The researcher also needs to immerse him/herself as completely as possible in the social world being investigated (Saunders et al., 2012).

3.8.5 Archival research

This research method makes use of administrative records and documents as the principal source of data. Although archival research may give the impression that historical (archived) documents will be used, it can also refer to recent documents. The archival research strategy focuses on the past and on changes over time that should be explored. The results of an archival research study depend on what data are present in the documents. It may be that the research question cannot be answered adequately because all the information needed is not contained in the documents (Saunders et al., 2012).

3.8.6 Grounded theory

The grounded theory research strategy is particularly helpful for research to predict and explain behaviour, with the emphasis on developing and building theories. The data collection starts with an initial theoretical framework. A theory is then developed from data generated by a series of data collection techniques. The data lead to the development of a

theory, which will be tested through further observations. The predictions are then either confirmed or shown as not true (Saunders et al., 2012)

3.8.6.1 Grounded theory as inductive approach

The exploration of new topics and providing insights into these topics to explain a phenomenon, which is developed from data obtained, is the goal of grounded theory (Flick, 2014). An overview of grounded theory is presented and thereafter the approach is justified as appropriate for this research study.

Glaser & Strauss (1967) argue that theories which are emerging and grounded in a systematic discovery process are intimately linked to data that cannot be reformulated and modified. This narrates closely to the thoroughness of qualitative studies that require the observer to be closely involved with the data and instead of testing hypotheses and preconceived theories it draws conclusions from gathered data (Flick, 2014). Glaser and Strauss in their preliminary study did not test a hypothesis but used a recurrently comparative analysis of data (Ke & Wenglensky, 2010). The theory obtained by this method is grounded in the data; therefore it is called “grounded theory” (Corbin & Strauss, 2015; Glaser & Strauss, 1967; Merriam, 2002). Grounded theory aims to develop a conceptually abstract theory from the data it is grounded in and from which it was derived. Grounded theory provides a methodical process for the conceptualisation of hidden patterns within a social reality (Holton, 2007). Grounded theory’s objective is to develop a theory from data, which is different from traditional approaches where research is done, starting with an existing theory or hypothesis to test. This supports an inductive reasoning approach. Grounded theory is an inductive approach, which is different from the qualitative and quantitative research methodologies (Holton, 2008). Therefore, theories are derived inductively from the phenomenon represented (Merriam, 2002).

For the purpose of this research study the inductive nature of grounded theory is suitable, as it offers a means to develop a theory (or theoretical inductive approach) appropriate to the investigation of a creative pedagogy to enhance the learner-content relation of ICT students. For the development of a theory using grounded theory, data may be collected from a variety of sources to recognise links or associations within a phenomenon. The researcher takes part in the data analysis and concept development. This development of concepts refers to patterns in the data (Glaser, 2002). Categories may also be identified in the data (see section 5.1; Table 5.1). Categories are associated with the primary objective of the research that represents the main theme of the research outcomes (Glaser & Strauss, 1967). Grounded theory therefore, according to Pham (2016), is the study of a concept where the core category describes the main problem of the research and associates all sub-categories. The

main category of the theory refers to what is important about the concept, linking it to all the other concepts as well as to the completion of the open coding stage (Bryant & Charmaz, 2007; Hood, 2007). Breaking down the data into distinct parts such as words, phrases, sentences or paragraphs is known as open coding (Whiting & Sines, 2012) (see Figure 5.2). With categories created from the data and relationships between them identified, the researcher is enabled to create an explanatory theory, which is grounded in the data collected, which in turn increases the knowledge base about the phenomenon.

When research is conducted, it is essential to guarantee that strategies used are consistent with the method chosen. Glaser & Strauss (2009) and Charmaz (2014) propose that the use of grounded theory could be flexible. Charmaz (2014) also argues that grounded theory is a set of flexible guidelines and principles and is not bound to rules or requirements. Characteristics related to grounded theory are discussed next.

An essential characteristic of grounded theory is 'theoretical sensitivity'. According to Glaser & Strauss (1967), this speaks of a personal quality the researcher must possess and relates to understanding the meaning of data. Furthermore, it also requires the researcher to work in the field of investigation without a predetermined opinion about the results, which permits the researcher to stay sensitive to the data (Glaser, 1978). Theoretical sensitivity enables the researcher to develop concepts and a theory that is grounded in the data.

The focus of this research study is to propose an approach to a creative pedagogy in the form of a simulated working environment on campus in a tertiary educational setting to contribute to enhancing the learner-content relation of WIL training, in order to address student readiness for the world of work in an IT environment by providing the on-campus group project students with an equal opportunity to those going into industry for their in-service training. This is done through adopting principles of the grounded theory strategy to understand the learner-content relation and the possible enhancement of the employability of graduates. Grounded theory is suitable for exploring whether a creative pedagogy can improve the employability of IT graduates, and to determine what needs be included in a creative pedagogy to make it as effective as possible. Grounded theory allows the development of a theory (or theoretical inductive approach as with this research study), grounded in the views of participants (Creswell, 2012). Various role players in the IT field and the IT qualification at VUT were approached for their viewpoints, and the grounded theory strategy of studying the experiences from the viewpoints of those who lived it, was applied (Charmaz, 2014).

This study used grounded theory to discover the main concern of the IT graduates not possessing the skills needed to make them employable in industry. Comparisons of

questionnaire data between different role-players in the IT qualification with different perspectives in the subject under study were made. These comparisons allowed for refinement of the theoretical approach to a creative pedagogy as presented in the data.

3.8.7 Case study

The case study is a method that involves an empirical investigation into a current situation within its real-life context. According to Johari (2006), a case study is a research strategy used when the researcher focuses on understanding the changing aspects present within a single setting. The case study strategy will be of interest to a study where the researcher wishes to understand the context of the research and the processes being enacted in the real-life situation. It can generate answers to the question ‘why?’, ‘what?’ and ‘how?’ Different data collection techniques are normally used within this research strategy, to confirm results (Saunders et al., 2012).

The case study strategy enables the interpretivist researcher to obtain an all-inclusive understanding of the meaning and nature of the relationships that exist between the data in the situation under study. Maree (2010) indicates that a multi-perspective view is offered by case study research, where the researcher takes into account the views of other relevant participants and not just the perspectives of one participant. According to Nieuwenhuis (2010), case study research allows the researcher to gain greater insight and understanding of the dynamics of a specific phenomenon.

The research strategy followed in this study is survey strategy in the form of questionnaires, with Vaal University of Technology as the case, in order to build and propose a theoretical inductive approach to a creative pedagogy, grounded in the data collected and analysed. The study focuses on a single setting, namely the IT WIL students at VUT. Surveys were given to five distinct groups of respondents, and the responses were interpreted through the process of coding (which will be discussed in detail in section 3.13). The survey design is discussed in section 3.10.

3.9 Research methodology

Research methodology can be classified into quantitative, qualitative and mixed-methods methodology. Each of these methodologies is briefly discussed below.

3.9.1 Quantitative research

Different definitions have been assigned to the term ‘quantitative research’. Most researchers however, agree that quantitative research presents a realistic account of what the world or

reality is like at the time that the research takes place, rather than what the world or the reality should be (Cohen et al., 2007). Measurements are collected through the use of empirical methods which are usually numerical in nature. These are used to describe and explain the phenomena observed during the course of a study (Saunders et al., 2012). Normally, correlations between the observed data regarding the phenomenon being investigated are studied, and the validity and reliability of data collected are ensured.

3.9.2 Qualitative research

As with quantitative research, many definitions (Creswell, 2012; Saunders et al., 2012) have been assigned to qualitative research by different researchers. In most definitions, qualitative research focuses on the use of techniques that create a narrative, description or an account about a particular setting. Such techniques include case studies, participant observation or questionnaires that use open-ended questions. When choosing a qualitative methodology, researchers are usually interested in understanding the meaning that participants assign to an event. The qualitative research methodology focuses on the interpretations and experiences of events as narrated by the people or participants in the study (Creswell, 2012; Saunders et al., 2012).

Table 3.1 summarises the differences between quantitative and qualitative research (Neill, 2007; Yilmaz, 2013):

Table 3.1: Summarised key differences between quantitative and qualitative research (Adapted from Neill, 2007; Yilmaz, 2013)

Qualitative	Quantitative
The purpose is to produce a complete, detailed description.	The purpose is to classify features, count them, and use statistical methods in an effort to explain what is observed.
The researcher may only partly know in advance what he/she is looking for.	The researcher knows in advance what he/she is looking for.
Might be useful to use during earlier phases of research projects.	Recommended during later phases of research projects.
The design may emerge and change as the study progress.	All facets of the study are carefully designed before data are collected.
The researcher is the data-gathering instrument to collect interpretive rich data.	The researcher uses tools such as questionnaires or equipment to collect numerical data.
Data are in the form of words, pictures or objects.	Data are in the form of numbers and statistics.
Subjective – individuals' interpretation of events is important, e.g. uses participant observation, in-depth interviews, etc.	Objective – seeks precise measurement and analysis of target concepts, e.g. uses surveys, questionnaires, etc.
Qualitative data are more 'rich', time consuming, and less able to be generalised.	Quantitative data are more efficient, able to test hypotheses, but may miss contextual detail.

Qualitative	Quantitative
Researcher tends to become subjectively immersed in the subject matter.	Researcher tends to remain objectively separated from the subject matter.
Multiple realities can be measured through investigation of experiences.	A single reality can be measured by an instrument.
In-depth, context-based generalisations.	Worldwide, context-free generalisations.

3.9.3 Mixed-methods research

A combination of the quantitative and qualitative methodologies is referred to as a mixed-methods approach (Saunders et al., 2012). This methodology is usually chosen when parts of one approach are found lacking or where a shortcoming in the chosen approach is identified (Creswell, 2012). A research methodology could evolve during the course of a study, where a qualitative-based or quantitative-based study results in the emergence of the other methodology. This could occur when the initial batch of data is gathered, analysed and found to be not descriptive enough (Creswell, 2012). Saunders et al. (2012) assert that a research method and design may also be both quantitative and qualitative in nature, to better support mutual themes identified within a study (Sale et al., 2002).

The nature of this study warrants the use of both quantitative and qualitative methodologies and tools for the measurement and analysis of the questionnaires given to respondents. The aim is to determine if a simulated environment in the form of a virtual company can be a viable option to be implemented on campus for students to complete their WIL module. Consequently, a mixed-methods approach has been adopted for this study.

3.10 Survey research design and data collection

In this section, the design of each the surveys given to the respective groups is described, together with a description of how the data were collected for each of the questionnaires.

3.10.1 Survey research design

Currently, students may complete the final semester of their undergraduate qualification in IT at VUT by either finding an in-service placement at an IT company or completing a ‘real-world’ project as part of a group on campus. Students are given the choice because the final module of the IT qualification is not formally registered as WIL.

There are various stakeholders involved in this choice (project vs. in-service): employers of the students who find placement at companies, students who find placement at companies,

and students who remain on campus to engage in a group project. Course lecturers mentor the project students.

Respondents were divided into five groups, namely:

- Employers
- In-service students (i.e. students who found placement in a company)
- Project students (i.e. students who remained on campus to do a group project)
- Graduates (i.e. students who already completed WIL and graduated)
- Lecturers

A separate questionnaire was designed for each group.

The abilities identified and used in the questionnaires were derived from a similar study conducted by Koppi et al. (2010). These abilities were used to determine what the students, employers and lecturers perceive as important to learn, and which of these abilities should be included in a simulated environment. A broad layout of each of the five questionnaires is provided next.

Each questionnaire is broadly divided into sections, with the first section focusing on demographics. The other sections are customised per questionnaire.

Employers (Annexure B)
This questionnaire consists of four sections. Firstly, questions focus on the demographics and position of the respondent in the company. Questions are formulated to keep the respondent anonymous. Questions in the second section concentrate on the skills that students require to become successful employees and the deemed importance of these skills. Section three focuses on employers' perceptions of how prepared WIL students are for work in a company when they arrive for their in-service experience, and on the aspects to emphasise in a university environment that will prepare students better for the workplace. In the final section, the idea of a simulated virtual environment is explained to the employer, as his/her opinion on what is viewed as important to implement within a virtual company context and his/her perception of the success that can be reached in such an environment is crucial. All sections contain open-ended questions, and the respondent is free to elaborate or explain answers if he/she wishes so.

In-service students (Annexure F)
The questionnaire designed for WIL students doing their in-service training at companies focuses on their experience in the workplace. Questions are directed to elicit students' perception of their experience in the company, on the skills and qualities they feel have been

adequately taught to them and on the areas they feel their training was insufficient to prepare them to become valuable employees.

Project students (Annexure E)
This questionnaire focuses on understanding the perceptions of the students undertaking projects on campus. Questions were formulated to determine whether these students feel they were adequately prepared to be employable. The goal of the questionnaire is further to determine how fair students divide the project work among their group members.

Students who graduated previously (Annexure D)
This group of respondents were selected to include opinions of past students looking back at the way in which the WIL module in the final semester was completed. This WIL group includes both on-campus project students and in-service training students placed at a company.

Lecturers (Annexure C)
Questions directed to the lecturers were designed to determine their perceptions and impressions as to whether students who completed a project are adequately prepared to be employable.

3.10.2 Data collection

This study followed a mixed-methods approach to data collection, using a questionnaire containing both quantitative and qualitative questions. A discussion regarding the methods of data collection used follows next.

The delivery of questionnaires to employers and lecturers were mainly done by means of e-mail. The questionnaire was only mailed to the employers who agreed in advance to complete the questionnaire. Upon receiving the completed questionnaire from the employer, the questionnaire was filed in a folder on hard drive storage and the email was deleted to ensure that the specific questionnaire could not be traced back to the employer. Working students' email addresses were found from the WIL co-ordinator in the ICT department, and the questionnaires were emailed to them with the request to complete it. The same procedure as above was followed to ensure the anonymity of the respondents.

The questionnaires for the students who were doing projects were printed and handed out to them for completion on the day they presented their projects for examination. Before they went to the venues to present their projects, they had to complete a few administrative tasks, and the questionnaire was added as one of these tasks to complete. A closed box was provided in which they could deposit the questionnaire, which ensured their anonymity.

Students who already graduated were found from the group of students who were registered for their BTech (postgraduate) qualification. Their email addresses were found from their lecturers and the questionnaires were mailed to them. Again the same procedure as above was followed to ensure anonymity.

3.11 Unit of analysis

The unit of analysis for this study has been identified as the WIL module in the current IT qualification of VUT. The analysis is to determine whether an alternative method of offering WIL at VUT can be found to adequately prepare students for the world of work.

3.12 Unit of observation

For this study, the unit of observation has been identified as the VUT students registered for their final (WIL) module of the IT qualification (at the time of this research) engaged in a group project on campus, students registered for their final (WIL) module of the IT qualification who found placement at a company for in-service training, VUT students who already completed the final (WIL) module (i.e. graduates), the employers of the VUT students doing their in-service training, and the lecturers at VUT who were part of the evaluation of the on-campus group projects.

3.12.1 Population

The full set of cases from which samples are taken is known as the population of a research case (Saunders et al., 2012). Three distinct populations were identified for this study for data collection, together with some sub-populations. The first population of this research case is the employers of the WIL students at VUT, where a representative was identified from each company in which the students found in-service placement. For 2016, the WIL students found placement in a total of six (6) companies.

The second population is the students who were registered for the Business Analysis (BA) 3.2 module in 2016 and prior, i.e. final year students of their IT qualification at Vaal University of Technology, which is a higher education institution (HEI) in South Africa, and students who completed their IT undergraduate qualification previously (prior to 2016) at VUT. For the student group, the sub-populations were investigated as follows: Students currently registered (i.e. registered at the time the data collection took place) and students previously registered (i.e. students who completed their WIL module at VUT who already graduated at the time the data collection took place). The *students currently registered* group differentiates between students registered for WIL who remained on campus for a group project and students placed at companies for in-service training.

The third population is the lecturers in the ICT department at VUT. Figure 3.3 shows a graphical representation of the population.

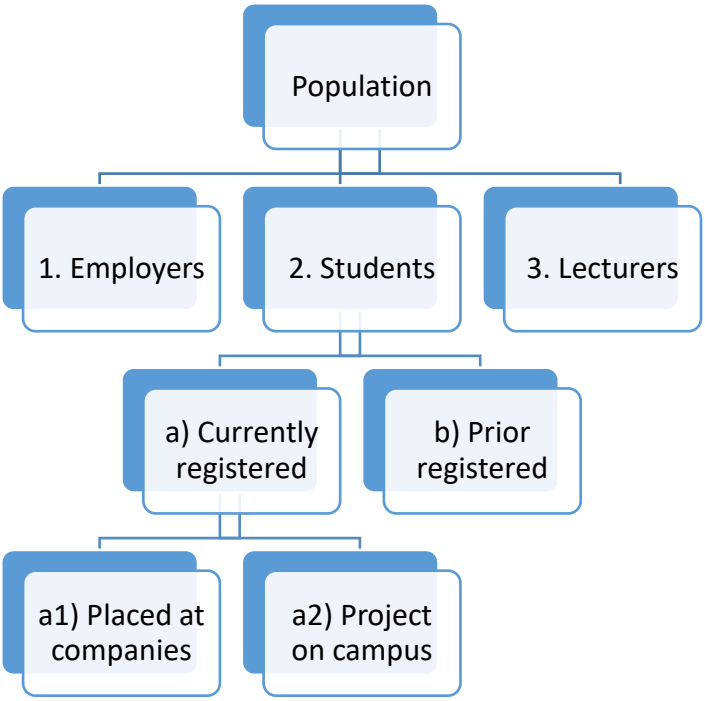

Figure 3.3: Graphical representation of population

Derived from Figure 3.3, the five questionnaires were designed for the following five groups:

i) Employers
ii) Students registered for WIL and placed at companies for their in-service training
iii) Students registered for WIL who remained on campus for their group project
iv) Students previously registered for WIL who already graduated
v) Lecturers

3.12.2 Sample

Sampling is described by Fowler (2013) as choosing a small subset of the population to be representative of the population. Sampling is crucial to the success of behavioural research. It is generally regarded that it is nearly impossible, or at least impractical, to collect data for the total population of any study. This is made challenging by time and cost factors that influence the collection of data. The main purpose of sampling is to make the process of data collection precise and cost-effective (Marshall, 1996; Sandelowski, 2000; Teddlie & Yu, 2007; Olivier, 2009). Sampling from a total population implies statistical inference between the sample and the total population. This means that the results received from the sample can be inferred onto the total population as a whole with relatively few outliers.

Various sampling techniques can be used when sampling from a total population, however, most sampling techniques fall in one of two broad categories:

i) Probability or representative sampling
ii) Non-probability or judgemental sampling

With probability sampling, all cases in the total population have an equal chance to be selected. For non-probability sampling, the chance of each case being selected from the total population is not known (Saunders et al., 2012).

For the purpose of this study, non-probability sampling was selected due to the objectives of the study and the nature of the population. This sampling method focuses on particular sub-groups of the population where all the members of the sample are similar. The chance of the respondent in the sample group to be chosen is known, as specifically chosen respondents were selected to complete the questionnaire, i.e. non-random sampling. This is true for all the sub-groups in the study, based on their similarity in experience and their position or purpose in the WIL process. Non-probability sampling enables the researcher to study a specific group in great depth. As explained by Saunders et al. (2012), this method is chosen when the researcher has confidence in the data and is certain that the characteristics of the collected data will represent the characteristics of the total population, which is true for this study as the samples are representative of the population.

The different sample groups identified from the population are: the employers of the WIL students, the students currently registered for BA3.2 placed at various companies for in-service training, the students currently registered for BA3.2 doing a group project on campus, students who completed BA3.2 and who graduated, and the WIL lecturers at VUT. To find respondents for the graduate students group, students registered for their BTech in IT (postgraduate) qualification were selected as they would have completed the BA3.2 module.

3.12.3 Sample size

Saunders et al. (2012:233), state that for most non-probability sampling techniques, the issue of sample size is ambiguous and there are no rules. The logical relationship between the sample selections and the purpose and focus of the research is more important here than the actual size of the sample. Generalisations should be made to theory rather than about population. The sample size is dependent on the research questions and objectives (Saunders et al., 2012).

3.13 Data analysis

When quantitative data are collected and analysed, and the outcome of this analysis is then used to inform the qualitative data collection process, it is known as explanatory sequential design (Ivankova et al., 2006).

This study made use of concurrent design. In concurrent design, quantitative and qualitative data are collected and analysed simultaneously (Fetters et al., 2013). In practice, the quantitative and qualitative data are collected in parallel and analysed after the data have been collected. The two forms of data are separately analysed and then merged.

Both quantitative and qualitative data collected were converted into qualitative narratives to be analysed qualitatively (Prince, 2015).

Tables and graphs, where applicable, were used to draw relevant conclusions from the analysed data.

According to Flick (2009), the aim of qualitative data analysis is to search for meaningful information among the huge amount of data generated through qualitative data collection methods.

For information generated through the open-end questions of surveys, hermeneutics can be used to make sense of an object of a study for interpretation and analysis through thematic analysis (Flick, 2009). This, combined with a qualitative thematic coding framework as presented by Saldana (2009) in Figure 3.4, was chosen as an interpretive and descriptive tool for analysing the information generated through the use of the surveys to determine employer, lecturer and past and present student perceptions towards the implementation of a simulated working environment.

This combination of thematic analysis and hermeneutics for this research case can be summarised as follows:

- Read through and compile the responses provided by respondents on the open-ended questions during the survey
- Summarise the data and identify existing similarities in the information
- Group the data according to categories
- From the relationships between the categories, identify any patterns
- Interpret and convert these patterns into a theme and theory

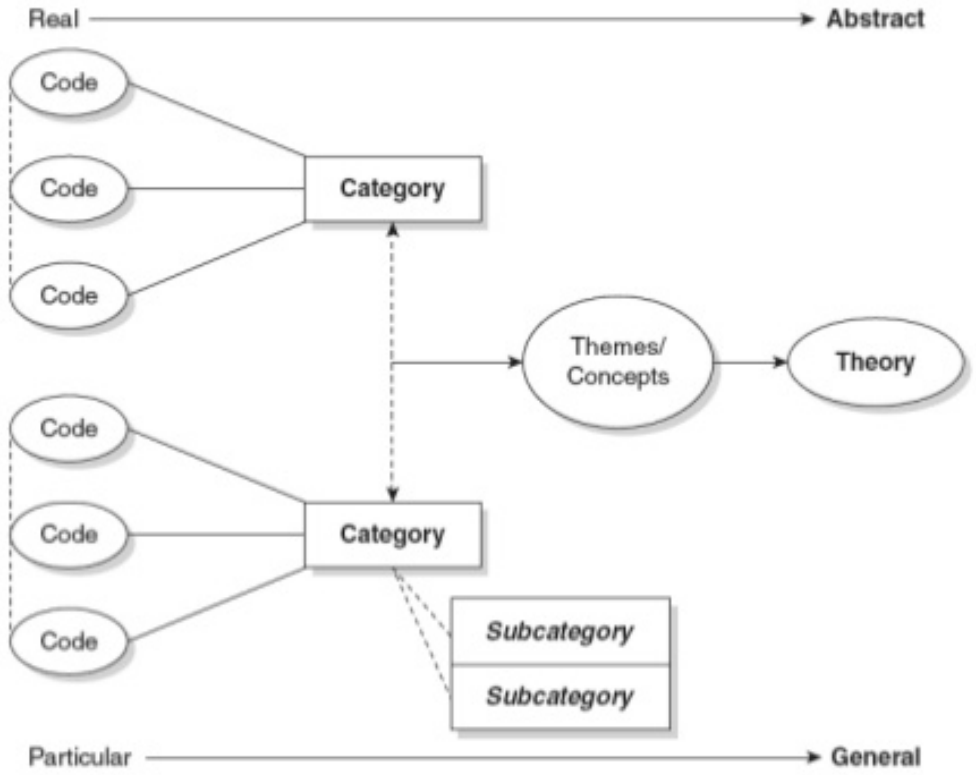

Figure 3.4: Codes-to-Theory model for qualitative inquiry (Source: Saldana, 2009)

According to Miles & Huberman (1994), the strength of qualitative data relies specifically on the competence with which the analysis of the data is carried out; therefore, it is crucially important to select the correct data analysis methodology in any research (Miles & Huberman, 1994). Hasan et al. (2014) indicate that qualitative and quantitative data have to be synthesised into a big picture by using the data to describe the phenomenon and what it means (Elo & Kyngäs, 2008).

The researcher, carrying out qualitative research, most often does not have a system for pre-coding. Content analysis is a method of analysing written, verbal or visual communication messages (Elo & Kyngäs, 2008). Content analysis is used when the qualitative data have been collected through focus groups, interviews, observations or document analysis (Elo & Kyngäs, 2008). Another method of qualitative data analysis, called thematic analysis, is also widely used. Thematic analysis is a useful and flexible research tool that offers a comprehensive yet multifaceted interpretation of the data (Braun & Clarke, 2008). In thematic analysis, common themes are searched for and common threads extending across an entire interview or set of interviews or questionnaires are identified (Vaismoradi et al., 2013).

Vaismoradi et al. (2013) explain that content analysis is used to define the characteristics of a document's content by examining what was said, to whom it was said, and to what effect,

while thematic analysis is described as another qualitative descriptive approach mainly used for classifying, analysing and reporting patterns or themes within the data. Furthermore, content analysis makes use of a descriptive approach to code its data, as well as interpreting quantitative counts of the codes (Vaismoradi et al., 2013). Thematic analysis on the other hand only offers a qualitative, all-inclusive justification of data (Vaismoradi et al. 2013).

Some advantages as stated by Braun & Clarke (2008) and Guest et al. (2011) continue to prove the thematic analysis methodology as most ideal. Advantages include:

- Flexibility
- A quick and easy method to learn and do
- Available to researchers with little experience of qualitative research
- A useful method for working within the participatory research paradigm
- Where participants acts as collaborators
- A large body of data can be usefully summarised by its key features
- Can be used to highlight similarities and differences across the data set
- Can produce unanticipated insights

Based on the relevance of the study and above comparisons, the current research makes use of thematic analysis. The research incorporated the six phases below as outlined by Braun & Clarke (2008).

Phase 1: Getting to know your data

This includes transcribing data if necessary, reading and re-reading the data, noting down initial ideas.

Phase 2: Generating initial codes

In this phase, interesting features of the data are coded in a systematic way across the entire data set, ordering data relevant to each code.

Phase 3: Searching for themes

Codes are collated into possible themes, gathering all data relevant to each potential theme.

Phase 4: Reviewing themes

This phase focuses on ensuring that the themes make sense in relation to the coded extracts and the entire data set, producing a thematic ‘map’ of the analysis.

Phase 5: Defining and naming themes

Analysis is on-going to improve the specifics of each theme, and the overall story the analysis tells, generating clear definitions and names for each theme.

Phase 6: Producing the report

The final phase focuses on producing the final analysis of selected extracts, aligning the analysis to the research questions and the literature, and producing a report of the analysis.

The data collected through the questionnaires were transcribed into Microsoft Word and *Atlas.ti* to enable a comprehensive analysis. The data were coded by being particularly observant of specific words and meanings related to the topic under study, and from these specific words, six (6) code groups were developed, each group referring to specific questions in the questionnaire. The six (6) groups were then summarised into four (4) main categories, which assisted in answering the research questions.

3.14 Data validation and reliability

Repeating qualitative research in terms of validation is impossible due to the constant change in the social world and human nature, which causes each study to be unique (Riege, 2003; Saunders et al., 2012). It is thus important that the explanation the researcher gives of the phenomena matches reality. For this study, the researcher requested the lecturers in the ICT department to review the questions in order to ensure that questions are understood, and that the correct responses were provided as intended by the question.

Each questionnaire had an explanatory information page attached. The information sheet explained the purpose of the research and emphasised voluntary participation, including a withdrawal clause.

As described by Coll et al. (2009), credibility was enhanced by giving the questionnaires to lecturers in the department for scrutiny, persistent observation, peer debriefing, and progressive subjectivity. Confirmability (Coll et al., 2009) was applied to ensure that the results of the study have not been influenced by the investigators, but emerged solely from the data itself. Hence, the raw data are made available in this report for scrutiny (see Annexures G, H, I, J, K).

3.15 Ethical considerations

The aim and purpose of this study was explained to the participants in the various populations. Anonymity of all participants has been guaranteed before the commencement of the questionnaire. Participants were assured that any information gathered would only be for research purposes and would in no way influence them directly or used against them. On the questionnaires that were completed by the participants, no personal information such as the student number or name of the participant was recorded. All ethical considerations were

taken into account and guided by the Vaal University of Technology's Research Ethics Policy.

3.15.1 Research ethics

To ensure the maintenance of the ethical integrity of this study, several ethical principles as discussed in the following sections were considered.

Aligned with the autonomy principle (Bender et al., 2017, Morrow, 2015; Norris et al., 2012), special measure was taken to ensure that participation in the study was voluntary. Participants were provided with adequate information about the risk, benefits, duration and the purpose of the study. The role of the participants was also explained to them. The participants were informed of their rights to voluntary participate or decline to participate or withdraw from participation at any time, thus allowing them to voluntarily choose to participate or not. Informed consent is an important part of research participation to inform potential participants through documents and discussion of the purpose, risks, potential benefits and the voluntary nature of the research.

Confidentiality as explained by Norris et al. (2012) was also adhered to. Participants were not expected to provide their details on the questionnaires, and therefore the responses cannot be traced back to a specific participant.

Considering the benefits Norris et al. (2012) of the study, it may be beneficial for the institution to implement the virtual company on campus. Participants were informed that there was no direct benefit for them in participating in the study.

3.15.2 Participants consideration

All participants received the explanation of the research as set out in section 3.14 together with the questionnaire they needed to complete. All participants gave informed consent before participating in the study.

3.15.3 Researcher consideration

The researcher collected data in a way that was not harmful to anybody. The collected data were not manipulated or altered in any way that could impact of falsely influence the results. There are no conflicting interests that could interfere with the ability to conduct the study objectively.

3.15.4 Institutional consideration

Ethical clearance of the study was obtained from the Higher Degrees Committee of the Vaal University of Technology where the research was conducted (Annexure L).

3.16 Summarised research design

Table 3.2 contains a summary of the research framework used to explore what approach to a creative pedagogy will contribute to enhancing the learner-content relation of WIL students in tertiary ICT education in South Africa, thereby improving the perception of readiness of ICT graduates to enter the world of work. The research method is summarised into the following components: philosophy, approach, strategy, methodology, design and data collection, unit of analysis, unit of observation, data analysis and ethics. A corresponding action is proposed for each component.

Table 3.2: Summarised research framework for research case

Research design components		Proposed action
Research Philosophy	*Ontology*	Subjectivist stance
	Epistemology	Interpretivist stance
Research Approach		Inductive
Research Strategy		Survey, Principles of Grounded Theory, Case research
Research Methodology		**Mixed-Methods, namely:** **Quantitative** • All quantitative data have been converted to qualitative narratives, to present them together with the qualitative data. **Qualitative** • Qualitative thematic analysis
Survey research design and data collection techniques		**Data Collection:** • Student Surveys (3 sub-groups) • Employee Survey • Employer Survey
Unit of Analysis		• *WIL module in the current IT qualification*
Unit of Observation		• Students registered currently (on-campus group project and in-service placement at company) and in previous years (graduates) for the HEI third year Business Analysis 3.2 module • Employers of WIL students • Lecturers of the WIL module

Research design components		Proposed action
Data Analysis	*Population*	Students registered currently and previously for Information Technology, specifically for the module Business Analysis 3.2, at a specified HEI (VUT) in Gauteng Staff lecturing Information Technology at a specified HEI (VUT) in Gauteng. Employers of WIL students
	Sampling technique	Non-probability, purposive
	Sample size	Number of students doing a project on campus: 56 Number of students doing WIL at a company: 15 Number of staff: 10 Number of employers of WIL students: 6 Number of working students: 40
Ethics		As per Vaal University of Technology's Research Ethics Policy

3.17 Conclusion

This chapter is an outline of the comprehensive research design followed during this study, including the research questions and research objectives to provide perspective.

A research philosophy with subjectivism as the ontology and an interpretivist epistemology was discussed. An inductive research approach has been adopted and a research strategy of survey research was followed. The design of the survey research in terms of the kind of information needed from the different categories of respondents was expanded on, and the data collection techniques of the surveys were discussed in detail. The unit of analysis and unit of observation were elaborated on. The data analysis, including population, sampling and sample size, were discussed. All ethical considerations were guided by Vaal University of Technology's Research Ethics Policy.

In Chapter 4, the results and the findings drawn from the data analysis of the qualitative and quantitative collected during the course of the study are discussed in detail.

CHAPTER 4: ANALYSIS AND FINDINGS

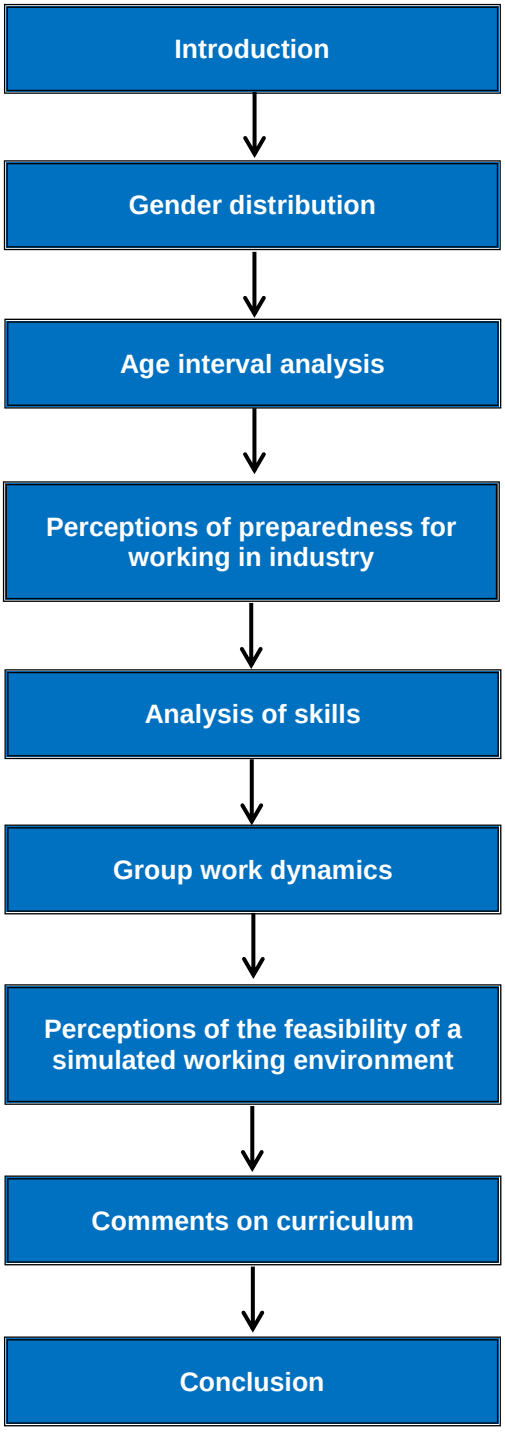

Figure 4.1: Outline of Chapter 4

4.1 Introduction

In this chapter, SRQ4 and SRQ5 are answered (see sections 7.3.4 and 7.3.5). Data were collected using five different questionnaires given to five different groups of respondents to complete. The groups are: WIL students undertaking projects on campus, WIL students who found in-service training at companies, students who previously graduated with a qualification in IT, lecturers teaching the WIL module, and the employers of the in-service training students. All five groups were associated with Vaal University of Technology, which is the case of this research (see sections 1.6.3 and 3.8.7). The responses of the participants as well as the results of the questionnaires are presented in this chapter in the form of grouped responses with qualifying comments (WIL) provided by the respondents. Results presented in this chapter are discussed per section in order to understand the significance of the relevant findings.

Fifty-Six (56) students were registered for their final semester (WIL) module when the data were collected. Forty-seven (47) students returned the questionnaire, resulting in a response rate of 84%. This cohort of students remained on campus to do a group project.

The questionnaire for the in-service training students was completed by students who found placement for training at different companies. Of the 15 students participating in the in-service training at various companies, 12 completed the questionnaire, resulting in a response rate of 80%. The sampling method used was non-probability, purposive sampling, as the WIL students placed in industry were targeted to form the sample.

The purpose of the questionnaire given to recent ICT graduates at VUT was to obtain their view on the final (WIL) module of their IT qualification. Sixty-two (62) students were registered for the BTech (postgraduate) IT qualification at VUT at the time of the research. Of the 62, a sample of 40 was selected by means of purposive sampling from the students registered for one of the BTech IT subjects. Questionnaires were distributed to this group of students while they attended one of their classes. Only 21 students were in attendance for that specific class. All 21 students completed the questionnaire. The response rate from the sample of 40 students who could potentially answer the question was thus 53%.

Lecturers who were actively involved in the final (WIL) module of the IT qualification at VUT were given a questionnaire aimed at obtaining their perceptions of work-integrated learning in terms of: the possibility of implementing a virtual company on campus, the way group work is done, the skills that students possess and acquire, and issues related to the current curriculum. Ten (10) of the 12 lecturers in the ICT department participated in this study,

resulting in a response rate of 83%. Sampling was not done as the entire population was requested to complete the questionnaire.

During the time of the research, six (6) companies provided in-service training to the WIL students of VUT. Five (5) of the employers (mentors) completed the questionnaire, resulting in a response rate of 83%. The research population, sample size and response rates are summarised in Table 4.1 below. (The respective research groups represent the entire focused population of the case.)

Table 4.1: Research population, sample size and response rates

Research group	Population size	Sample size	Sampling method	Number responded	Response rate
Students registered for the final (WIL) module who found placement in industry	15	15	All students registered for the final (WIL) module who was placed in industry for in-service training	12	80%
Students registered for the final (WIL) module who remained on campus	56	56	All students registered for the final (WIL) module who remained on campus for a group project	47	84%
Students (graduates) who completed the final (WIL) module, busy with BTech or employed	62	40	Purposive - One specific class group from the BTech IT qualification was chosen	21	53%
Employers	6	6	All employers associated with WIL training of VUT students	5	83%
Lecturers	12	12	All VUT lecturers associated with the final (WIL) module of the IT qualification	10	83%

4.2 Gender distributions

The gender comparisons of all five groups are indicated in table 4.2.

Table 4.2: Gender comparison across groups

Responses per sub-group	Male	Percentage	Female	Percentage
Students conducting projects on campus	25	53%	22	47%
Students doing in-service training	9	75%	3	25%
Graduates	11	52%	10	48%
Lecturers	9	90%	1	10%
Employers	5	100%	0	0%

Table 4.2 is depicted graphically in the graph below (Figure 4.2).

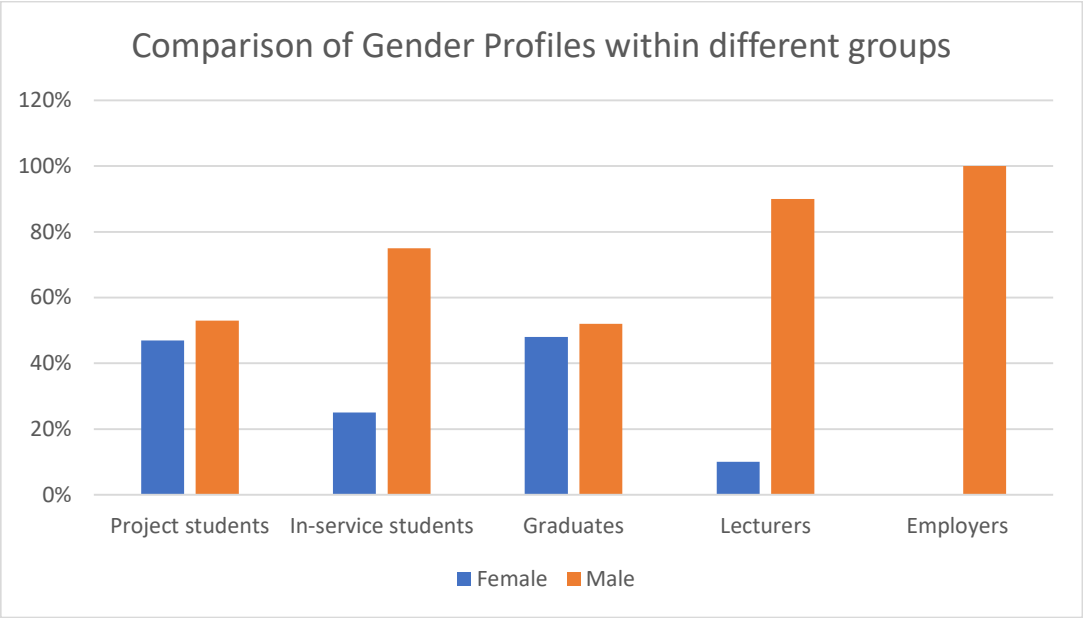

Figure 4.2: Comparison of gender profiles within different groups

Questionnaires firstly focused on gender. The group of students who undertook project work on campus had a near 50:50 percent distribution of male to female (47% female and 53% male). This is also reflected in graduates who completed WIL (48% female and 52% male). The male-female ratio of the in-service training students placed at companies is 75% male and 25% female, which differs significantly from the project and graduate students.

It is interesting to note that the number of female students is very low in both the lecturer and employer groups (10% of lecturers were female while there was no female representation in the employer group) (Table 4.2; Figure 4.2). Of the 12 lecturers who taught a component in this (WIL) module, 10 completed the questionnaire. There are only two (2) females in the lecturer group. As one (1) of these two is the investigator of this study, the gender aspect reflects the response of the other female representative. The gender distribution for the lecturer group is heavily focused on males with only one (1) female in the sample. This is merely a reflection of the number of male vs. female employees in the department rather than any gender bias in the responses of participants.

4.3 Age interval analysis

4.3.1 Student groups (Project students, In-service students, Graduates)

Table 4.3 provides data on the age ranges of the various groups of students. The majority of students who undertook projects at VUT or had the opportunity to engage in in-service

training were in the age group 22-25 years. Of the 31 students in the 22-25 year age range who engaged in projects, 45% (14 of 31) were male and 55% (17 of 31) were female. In this same age range, only 9 students were able to engage in in-service training at companies and of these, 66.66% were male. With only three (3) graduate students in this age range, a third was male and two-thirds male.

Table 4.3: Age intervals of all student respondent groups

Age interval	Project students	Male/ Female	In-service students	Male/ Female	Graduate students	Male/ Female
<22	-		1	Male	-	
22-25	14	Male	6	Male	2	Male
	17	Female	3	Female	1	Female
>25	11	Male	2	Male	7	Male
	5	Female	0	Female	8	Female
>30	-		-		2	Male
	-		-		1	Female

The data also demonstrates that of the 16 students undertaking projects in the older than 25 age range, 68.75% were male, while the gender ratio of those in in-service training and those who graduated previously, was almost the same.

A large proportion of students who undertook projects on campus as well as those who found in-service placement at companies for in-service training were in the 22-25 year range. These students were registered for the final (WIL) module at the time of the research, and upon successful completion, they would graduate with a national qualification in IT. If they started their studies immediately after matriculation, and taking into account that this is a three-year qualification (four years if they undertook the extended course), most students should have been 21 years of age when they started this final module.

It is interesting to note that in the older than 25 age range there are more male students than females represented in the final module of the IT qualification, suggesting the possibility that male students take longer than female students to obtain their qualification, at least with the students from this data set (Table 4.3). Further research is however needed before such a claim can be made with confidence.

4.3.2 Employers

Table 4.4: Age, mentoring status, and management level distribution of employers

Age	Number of respondents
<30	0
30-45	1
>45	4

Mentoring status	Number of respondents
Mentoring	5
Not mentoring	0

Management level	Number of respondents
Senior Management	3
Middle management	2
Not in management	0

In the employer group, four (4) of the five (5) respondents were above 45 years of age. All the respondents were mentors to students engaged in service-training at the respective companies. All respondents were also in management positions, whether it is senior or middle management (Table 4.4).

4.4 Perceptions of WIL preparedness to be employable in industry

4.4.1 Students remaining on campus

Table 4.5: Project student perceptions of their preparedness through group projects

Adequate preparation through group work?	Number of students	Percentage
Yes	40	85%
No	7	15%

The majority (85%) of the project students felt confident that remaining on campus and engaging in a group project prepared them sufficiently to be employable graduates (Annexure J, question 3) (Table 4.5). Seventy percent (70%) of respondents indicated that working in groups was most useful in preparing students for employment. Comments to illustrate this include (Annexure J):

> *"It showed me how to work with people. I've also learnt how to analyse the existing business."*

> *"Having a group mate helps a student understand and work efficiently. It helps a student learn how to interact with corporate people."*

> *"I have learnt to work as a group. I learnt different types of methods of problem solving, how to analyse information and implement solutions."*

"I have learnt a lot from my team, something I did not understand or know but with their help I do now."

"It helped me to communicate with other students and also how to work together as one group".

Fifteen percent (15%) of the students, however, felt that this method of completing the final module did not prepare them well enough (Table 4.5). The overall sentiment in this case was that working in a company could be significantly different than what they had to do with implementing a project. Examples of responses in this regard include (Annexure J):

"I'm not sure, but it doesn't feel like industry work. It's like we have been given a project for a subject we might be doing."

"When you get to the working industry [it] is [a] completely new environment and how things are done".

This point is further exemplified by the view of many students who remained on campus and completed a software database system in groups. Two opposing views were offered by the project students.

For the question whether project students felt they would have had the same experience in learning certain abilities and skills if they worked in a company for in-service training (Annexure J, question 4b), 70% of the respondents opined that they would have learnt these abilities at the same level – or equally as well – if they worked in a company (Table 4.6).

Table 4.6: Project student perceptions of preparedness if they had the opportunity of in-service training

Preparedness the same with in-service training?	Number of students	Percentage
Yes	32	70%
No	14	30%

Some responses indicating that project students felt they received the same exposure to the said abilities, which include the ability to speak to groups of people effectively, communicate effectively in writing, communicate in visual or graphical form, contribute positively to team based projects, synthesise information into appropriate formats, identify the core issue in any situation from a mass of detail, to understand, appreciate and meet the needs of clients, and to gain theoretical and academic knowledge, are as follows (Annexure J):

"Because while we were doing the project, most of it focused on working on what the clients need."

"Because what the institution is teaching us is what most companies need."

"In most companies people work in groups and I believe it would have been the same but the school project was much better."

The remaining 30% of the project students opined that they would not have learnt these abilities if they were in a company (Table 4.6). However, some of the positive responses (i.e. similar levels of preparedness) suggest that students misinterpreted the question and actually meant they would have learnt more in a company. Examples of these include (Annexure J):

"I am currently working as a software developer and applying all the skills acquired during the course."

"We get more exposed to the realities of corporate world, how to face challenges."

"Because it would have given me a job experience."

"Because at work we are exposed to programming if it is a programming internship."

"Provides experience for which ever field we have been hired for at work."

By further analysing the responses of the students who answered 'Yes' on the above question in the project student questionnaire (Annexure J), these votes were added to the 'No' tally, as the responses provided by the students actually contradict their 'Yes' response. Adjusting the 'Yes' count to 24 and adding these to the 'No' responses result in a tally where almost half of the students felt that if they actually worked in a company for their in-service training, they would have learnt the mentioned abilities better (Table 4.7).

Table 4.7: Adjusted tally based on student comments

Yes/No	Number of students	Percentage
Yes	24	52%
No	22	48%

This adjusted table reflects the responses to question 4c in Annexure J, namely whether project students felt they would have had the same experience in learning the mentioned abilities and skills if they worked in a company for in-service training. The comments of the project students seem to reflect their perceptions clearer than the 'Yes' or 'No' answers they provided.

Table 4.8: Perceived preparedness of project students vs. in-service students

Preparedness	Number of students	Percentage
Project more prepared	22	48%
In-service more prepared	24	52%

More than half of the students (52%) who undertook projects on campus felt that students exposed to in-service training would be better prepared for the world of work after graduation (Annexure J, question 6) (Table 4.8). The results of the responses of this question correlate to the adjusted tally as explained in the previous paragraph.

4.4.2 Students doing in-service training at companies

Eleven of the 12 in-service training students (92%) felt they enjoyed more relevant experience from their exposure to industry compared to their counterparts who remained on campus doing group projects (Annexure K, question 3) (Table 4.9).

Table 4.9: Perceptions of students on relevance of experience during in-service training

More relevant experience working at companies?	Number of students	Percentage
Yes	11	92%
No	1	8%

This sentiment is shared by 52% of the project students who indicated that they felt their fellow students in industry were better prepared than those who remained on campus (Table 4.8).

Some of the comments made by the participants on their views of the opportunity afforded to them to enhance their experiences through in-service placement include (Annexure K):

> *"Working in a company gives a student a broader view of the field they studied, and helps students learn how to operate in the industry they have chosen. This helps improve skills like professionalism and work ethics in a workplace."*

> *"The people I have met and worked with while working at the current company, carry more knowledge and experience of what is required in the industry."*

> *"In a workplace everything comes to reality. There is more pressure and real-time thinking. You get to grow a lot more than you do through research. In a workplace you build it and make it work."*

"Working in a company gave me more experience as we work on real company solutions and we work with people who have experience in the work environment."

"Even though we are doing the same thing, because of the different approach of handling problems (programming) and advance programming, we get a vivid understanding."

Only one respondent opined that more valuable experience is not gained by working in industry. However, no explanation for this view was offered by the student.

Another question on the in-service student questionnaire (Annexure K, question 4b) was whether they felt they would have gained the same level of experience if they did not go into industry to complete WIL but remained on campus to complete a group project.

Table 4.10: In-service student perceptions of experience gained if they remained

Same level of experience if on-campus project was conducted?	Number of students
Yes	1
No	11

Only one (1) student felt that there was no more gain by working in industry, while 11 of the 12 students felt they would not have learnt as much if they remained on campus to work in groups on a project (Table 4.10). The responses to this question correlate with the responses in Table 4.9 where 11 of the 12 students indicated they felt they gained more relevant experience than what they would have if they remained on campus.

Some comments made by the students indicating the reasons as to why they thought they would not have had the same learning experience if they remained on campus include (Annexure K):

"Workplace experience teaches students better communication skills, participation, problem-solving skills, and gives students better knowledge because they interact with real customers and employees who occupy a certain career."

"Some of the knowledge provided on campus is either limited or out dated compared to what is being done in industry."

"I think on campus they only focus on basics whereas in the workplace they go into details in what we do."

"At school you can easily copy someone's work and claim it as yours, but here you are given different duties."

One student indicated that he/she would have had the same learning experience if he/she stayed on campus, but commented ambivalently by stating:

> *"What we do it's the same, just different approach. Everything is easy to grasp with too much practical implementation."*

The sentiment of both project and in-service training students is that in-service training is more valuable in preparing them for the real world of work after graduation.

4.4.2.1 Graduate students comparing project and in-service training experiences on their perceptions of preparedness for the world of work

Table 4.11: Student perceptions of their preparedness to work in industry after graduation

Question posed in questionnaire		Number of responses	Percentage
All 17 graduates who answered question 5 in Annexure D (Project and in-service)	Yes, other option would have prepared me better	14	82%
	No, other option would not have prepared me better	3	18%
The 14 graduates who did a project in their final module	Yes, in-service would have prepared me better	14	100%
The 3 graduates who did in-service in their final module	Yes, project would have prepared me better	0	0%

Only 17 of 21 graduate students answered the question where they were asked to reflect on their experience during the final (WIL) module they successfully completed. They were asked whether they feel the other option would have been better for them (Annexure I, question 5). Of these, 82% indicated they felt that they would have been better prepared if they had the option of completing their final module using the other option than what they were registered for. For example, a student who undertook a project had to reflect on whether doing in-service training would have prepared him/her better, while an in-service student had to reflect on whether a project would have prepared him/her better for the world of work. Interestingly, none of the students who worked at a company felt that they would have been better prepared if they remained on campus, while all students who answered 'Yes' (i.e. *in-service would have prepared me better*), were project students (Table 4.11).

Students who felt they were well-prepared by undertaking a project on campus, commented as follows (Annexure I):

> *"The companies are using different products and the school approach is broad and theoretically correct."*

"Doing the group project helped me get a voice and helped me in being confident. Extra knowledge was obtained and helped me in my workplace".

Some comments on why the project students felt they would have been better prepared if they had the opportunity to be placed at a company for their in-service training, are (Annexure I):

"Well, experiential learning has great advantage. For a person who will be new to an organisation they will have less advantage compared to one who is within. Both methodologies work better if you have the correct mindset."

"I would have experience of the company environment."

"Because BA3.2 only focuses on one field of IT. What about the technical part and other specialities."

"Practising in the real world is better than being subjected to a project that will be long forgotten after months of doing it."

"Being in an environment and performing real work could have given me more opportunity to learn."

These comments suggest that students feel placement at a company for in-service training is beneficial as it provides the advantage of exposure to real-world experiences.

4.4.2.2 Preparedness in terms of the feeling of belonging in a company offering in-service training

It is important that in-service training students feel useful and part of the company they work at, to make the experience beneficial for them. To focus on this issue, students were canvassed as to their perceptions of feeling 'part of the company' in which they had exposure to WIL (Annexure K, questions 7b and 7c).

Table 4.12: In-service student perceptions of a feeling of belonging in the company

Yes/ No	Number of students feeling part of the company	Number of students having a feeling of alienation
Yes	10	1
No	2	11

Student responses suggest they felt at ease at the companies they worked at. Host companies were reported to be accommodating by involving the students and not viewing them as 'cheap labour'. Students worked together with company employees and had a feeling of belonging (Table 4.12). Such feelings of belonging suggest that students acquired

an adequate level of preparedness for the world of work upon graduation through doing in-service training for their last module. Some responses demonstrating this view include (Annexure K):

> *"They actively involved me in all their day-to-day activities, and helped me go through them when I was facing difficulties."*
>
> *"I was actively involved in the daily operations of the company, I was assigned to a position that was fully required by the company."*
>
> *"I was involved in the company's day-to-day activities, which sometimes took me over my career scope and I enjoy that a lot."*
>
> *"The company does contribute in building your career as we have live sessions in entrepreneurs, finance skills, business process and other life skills besides programming."*

Some of the most positive experiences in-service students reported are exemplified by (Annexure K):

> *"They helped me with my monthly reports and understood when I had to work on my reports instead of doing my day-to-day activities."*
>
> *"I was given an opportunity to be part of the trainers. I was given an opportunity to consult to another company. I was appointed as a leader of my fellow interns."*
>
> *"Finishing a task fast, each member in a group is assigned a task to complete for a project."*

All negative experiences reported on by in-service students point to the pressures of getting work done and meeting deadlines, among others. Comments from the respondents include (Annexure K):

> *"Not having enough time to grasp new knowledge before feedback was required, or meeting a deadline."*
>
> *"Having to be around a lot of people, since I am introverted."*
>
> *"Being put under pressure by my team leader as we have to meet the deadlines."*

4.4.3 Graduates

Nineteen (19) of the 21 students (graduates) (90%) remained on campus and undertook projects to complete their last module (Annexure I, question 3) (Table 4.13).

Table 4.13: Format of WIL module of the IT qualification completed by graduates

Format of final (WIL) module	Manner in which final (WIL) module was completed		Perception of adequate preparedness		
	Number of responses	Percentage		Number of responses	Percentage
In-service training at a company	2	10%	Yes	0	0%
			No	2	10%
Group project on campus	19	90%	Yes	15	75%
			No	3	15%

Students feeling they were adequately prepared for the workplace were those who undertook projects on campus (Annexure I, question 4) (Table 4.13). Two students placed for WIL at a company indicated that they did not feel adequately prepared. One student did not answer question 4 and indicated that he/she was not employed at the time and was therefore unable to answer the question.

Some of the responses from graduates indicating that they were adequately prepared include (Annexure I):

> *"Yes it taught me a lot of project management and building relationships with clients. I have currently been involved with six projects and due to my knowledge and trust from clients, two of them are being managed by me."*
>
> *"I was always ready for any challenge."*
>
> *"Everything taught during my diploma I manage to apply at the workplace."*

Some responses from graduates who felt they were not adequately prepared include (Annexure I):

> *"More could have been done. Our courses need to start modelling more what we're going to confront in the workplace. We need to take our subjects in a way to prepare students for work, not exams" (stated by a student who conducted group work on campus).*
>
> *"I don't have any experience, I have to get [an] internship first to get experience" (stated by a student who worked at a company for in-service training).*
>
> *"I have learnt theory, but [I] was never exposed to practicals, but 50% of what I have learnt in theory is still part of my job, still today" (stated by a student who took part in the group project).*
>
> *"I was not sure of what I was doing, I completed 3.2 by getting most help from friends, not doing it by my own" (stated by a student who took part in the group project).*

4.4.4 Lecturers

Table 4.14: Lecturer perceptions of the value of group work vs. in-service company work

Students are better prepared in industry	Number of responses	Percentage
Agree	4	40%
Somewhat Agree	5	50%
Not Sure	1	10%
Disagree	0	0%

No lecturer disagreed with the statement that students are better prepared in industry, even if it is not directly aligned to the curriculum outcomes (Annexure H, question 3). Nine (9) of the ten (10) lecturers agreed (agree + somewhat agree) that the statement is true (Table 4.14). Some of the responses of the respondents who agreed with the statement include (Annexure H):

> *"Students get an idea of the work environment."*
>
> *"My reason to the choice above is that, even if the WIL was not fully aligned to the curriculum, the students will still learn other skills, e.g. working in a team, time management, etc."*
>
> *"Experience can be gained through various channels and in various ways."*
>
> *"It all depends on his/her involvement in the project."*

4.4.5 Employers

Table 4.15: Employer perceptions of the value of WIL

With some industry experience students are more prepared for employment	Number of responses	Percentage
Agree	3	60%
Somewhat agree	1	20%
Not Sure	1	20%
Disagree	0	0%

Four (4) of the five (5) employers agreed that students who have some industry experience are more prepared for employment, while one was undecided about this statement (Annexure G, question 8) (Table 4.15). Some comments in this regard include (Annexure G):

"By being subjected via a program such as 'WIL' the student starts living the actual business culture in the market place. A student is learnt in a controlled environment how to support various types of businesses depending on the business placement. Types of businesses range from manufacturing (plant and associated client support), small businesses that support niche markets, businesses that support as a sub-contractor, to bigger engineering and construction businesses and how to support various clients as a service provider business."

"It must be noted that 'WIL' will not teach the student everything of the business and that it is only a starting point. Common sense, fault finding abilities are essentials that a student should possess to make a success of the initial and later phases of a career."

"Exposure to new people outside of their class mates and staff, exposure to the 'real world' of real customers, real deadlines and real pressures. The development of the understanding of the consequence of their actions and the realisation of their role in a professional organisation and project team where project delivery, project profitability and client satisfaction are the core items – and not passing a test or assignment!"

"The academic world and the commercial world have always had a gap. I believe WIL helps bridge that gap."

"Students doing WIL is normally more mature than those who only did a project. In the case of a project we do have 'passengers' not really participating."

4.5 Analysis of skills

In the following sections, the perceptions of the different groups of respondents on the skills *acquired* and skills *required* are discussed.

4.5.1 Perceptions of skills acquired by project students

Table 4.16: Project student perceptions of skills acquired on campus

Aspects learnt	Average score	Minimum score	Maximum score
1. Ability to speak to groups of people effectively	6	2	8
2. Ability to communicate effectively in writing	6.32	2	8
3. Ability to communicate in visual or graphical form	6.13	2	8
4. Ability to contribute positively to team-based projects	6.62	4	8
5. Ability to synthesise information into appropriate formats	6.35	3	8
6. Ability to identify the core issue in any situation from a mass of detail	6.29	3	8
7. Ability to understand, appreciate and meet the needs of your clients	6.4	2	8
8. Theoretical and academic knowledge	6.8	5	8

The average scores reflected in Table 4.16 fall within a narrow range, leaning close to the maximum scores. The findings for this question (Annexure J, question 4) suggest that project students felt they have learnt all aspects similarly well by completing a group project. Included in this view is their opinion of having gained theoretical and academic knowledge (Table 4.16, point 8). Of interest is that the mean (average) score of point 8 is slightly higher than all other questions in this section. Furthermore, the minimum score recorded for this aspect of student perceptions is higher (5 as opposed to the 2.57 minimum mean score of questions 1 to 7).

While the maximum scores are all recorded as 8, the minimum scores, however, reflect a different picture. Student responses highlight four aspects encapsulating the notion that following the project route have not provided adequately for the acquisition of certain skills, namely the ability to speak to groups of people effectively (Table 4.16, point 1), the ability to communicate effectively in writing (Table 4.16, point 2), the ability to communicate in visual or graphical form (Table 4.16, point 3), and the ability to understand, appreciate and meet the needs of clients (Table 4.16, point 7). Students noted two aspects where they felt they learnt the most by working on a project as part of a group, namely the opportunity to contribute positively to team-based projects (Table 4.16, point 4) and gaining theoretical and academic knowledge (Table 4.16, point 8).

4.5.2 Perceptions of skills acquired by in-service students

Table 4.17: In-service student perceptions of skills acquired in a company

Aspects learnt	Average score	Minimum score	Maximum score
1. Ability to speak to groups of people effectively	6.4	4	8
2. Ability to communicate effectively in writing	6.8	5	8
3. Ability to communicate in visual or graphical form	6.6	4	8
4. Ability to contribute positively to team based projects	7.1	6	8
5. Ability to synthesise information into appropriate formats	6.9	5	8
6. Ability to identify the core issue in any situation from a mass of detail	6.8	5	8
7. Ability to understand, appreciate and meet the needs of your clients	7.3	6	8
8. Theoretical and academic knowledge	6.6	5	8

The mean scores of the responses by in-service students for the eight areas probed (Annexure K, question 4) are reflected in Table 4.17. The scores range from 6.4 to 7.3. The range of minimum to maximum scoring is from 4 and 8 as stated by the respondents. The minimum score increases from 2 in Table 4.16 (project student cohort) to 4 in Table 4.17 (in-

service student cohort). This higher scoring indicates the in-service students' view of having learnt all the aspects of their training. The lowest scores (just below average) were assigned to the ability to speak to groups of people effectively (Table 4.17, point 1) and the ability to communicate in visual or graphical form (Table 4.17, point 3). The two skills that scored above 7 were the ability to contribute positively to team-based projects (Table 4.17, point 4), and the ability to understand and appreciate and meet the needs of our clients (Table 4.17, point 7). These reflections are in contrast with the students remaining on campus, who indicated that some skills are lacking (Table 4.17).

In-service students perceived their competence in the eight skills to be adequate, and felt that the experience they have gained in their respective companies is an acceptable form of training.

4.5.3 Perceptions of skills acquired by graduate students

Table 4.18: Graduate student perceptions of skills acquired in final (WIL) module

Posed skill	Average score	Minimum score	Maximum score
1. Ability to speak to groups of people effectively	6.3	5	8
2. Ability to communicate effectively in writing	7	5	8
3. Ability to communicate in visual or graphical form	6	4	8
4. Ability to contribute positively to team-based projects	6.8	5	8
5. Ability to synthesise information into appropriate formats	6.5	5	8
6. Ability to identify the core issue in any situation from a mass of detail	6.9	3	8
7. Ability to understand, appreciate and meet the needs of your clients	6.6	4	8
8. Theoretical and academic knowledge	7	4	8

For this question (Annexure I, question 6), some graduates felt they were ill-equipped in the final (WIL) module to learn the ability to identify core issues from a mass of detail in any situation, as reflected in the minimum score of 3 for this skill (Table 4.18, point 6), compared to the scores of all other skills, which are between 4 and 5 (close to mid-point). Although the average score for this skill (Table 4.18, point 6) scored the second highest in the group of questions, the results suggest that some respondents perceived this skill as not met. Skills such as the ability to speak to groups of people (Table 4.18, point 1), the ability to communicate effectively in writing (Table 4.18, point 2), the ability to contribute positively to team-based projects (Table 4.18, point 4), and the ability to synthesise information into appropriate formats (Table 4.18, point 5) were perceived to be merely one point higher (5) than the mid-point of 4.

4.5.4 Lecturer perceptions of skills acquired by project students

Table 4.19: Lecturer perceptions of skills acquired by project students

Skill obtained	Average score	Minimum score	Maximum score
1. Ability to speak to groups of people effectively	4.1	1	6
2. Ability to communicate effectively in writing	4.3	1	6
3. Ability to communicate in visual or graphical form	4.3	2	7
4. Ability to contribute positively to team-based projects	4	1	6
5. Ability to synthesise information into appropriate formats	4.3	2	6
6. Ability to identify the core issue in any situation from a mass of detail	4.2	2	6
7. Ability to understand, appreciate and meet the needs of your clients	4	1	7
8. Theoretical and academic knowledge	4	1	7

For this question (Annexure H, question 2), lecturers appeared unsure as to whether project students were learning any of the skills described in Table 4.19. This is evidenced by all responses that were scored on average below 5. The ability to communicate effectively in writing, to communicate in visual or graphical form, and to synthesise information into appropriate formats were scored the highest on average. It is interesting to note that the ability to communicate in visual or graphical form was also scored the highest in terms of minimum and maximum scores (Min 2; Max 7).

Lecturers listed some skills or areas they deemed as non-negotiable, and opined that these 'non-negotiables' require incorporation into a simulated business environment on campus. Some of the comments in this regard (focusing on the soft skills acquired when working in a business environment) include (Annexure H):

> *"Complete all projects / homework / assignments thoroughly, test and verify that all work handed in are working 100%."*
>
> *"Adhering to deadlines, punctuality, listening, adhering to specifications."*
>
> *"Discipline, time-management, better communication skills, more applicable knowledge."*
>
> *"Business requirements gathering, system testing and implementation processes."*
>
> *"Should have adequate infrastructure to implement simulated business environment, trained staff and also support from industry."*

"Practical knowledge, repetition of the work until they UNDERSTAND it. Knowing about something without understanding it does not help. They must be interested in what they are doing and learning. Don't play games; make the environment as close the 'real world' as possible."

"A professional environment, i.e. agree on the hours that need to be done a day, timelines need to be adhered to, agree on the quality of the documentation and all products that need to be produced, etc."

4.5.5 Employer perceptions of skills acquired by in-service students

Table 4.20: Employer perceptions of required skills for students to be employable

Posed skills	Average score	Minimum score	Maximum score
1. Ability to speak to groups of people effectively	6.4	5	8
2. Ability to communicate effectively in writing	6.8	5	8
3. Ability to communicate in visual or graphical form	6.2	5	7
4. Ability to contribute positively to team based projects	7.4	7	8
5. Ability to synthesise information into appropriate formats	6.6	5	8
6. Ability to identify the core issue in any situation from a mass of detail	7	6	8
7. Ability to understand, appreciate and meet the needs of your clients	7.2	6	8
8. Theoretical and academic knowledge	5.8	3	8

For this question (Annexure G, question 4), all of the skills ranked relatively high in terms of what the employers felt a student should possess to be employable upon graduation (Table 4.20). The two skills ranking the highest are the ability to contribute positively to team-based projects and the ability to understand, appreciate and meet the needs of clients. Theoretical and academic knowledge, according to this group, do not rank as high as the soft skills of communicating verbally and in writing and being able to contribute and work in a group (Table 4.20).

Table 4.21: Skills seen by employers as important to achieve success in the workplace

Skill	Score (8 very important, 1- not so important)	Type of skill
Self-discipline	8	Soft Skill
Negotiating skills	7	Soft Skill
Technical mediation skills for contracted scope of work / area of responsibility	7	Academic Knowledge

Skill	Score (8 very important, 1- not so important)	Type of skill
Ability to summarise Technical issues and document such issues	8	Academic Knowledge
General problem solving	8	Soft Skill
Project domain knowledge – working in project teams – who does what in the project team, what the other team members will expect and demand, what the person can expect and demand in return	7	Soft Skill
Software development lifecycle knowledge – what the stages in a SDLC are, what they mean, what is required of each stage, typical artefacts and documents of each	7	Academic Knowledge
Testing – a good understanding of types of testing, when and why these are done, test plans, test cases and reporting	7	Academic Knowledge
Frameworks, processes and the "beyond UML" approach to modelling, data flow and process flow modelling – ask if you want more info?	7	Academic Knowledge
Creative ideation	8	Soft Skill
Time keeping	7	Soft Skill
Be prepared to go the extra mile	6	Soft Skill

Of the skills employers thought to be important in the workplace (Annexure B, question 4b), 58% were soft skills, including self-discipline, time management and problem-solving, while 42% fell into the academic knowledge category (Table 4.21). All of these skills were perceived to be very important, as indicated by scores of 6 and more (1 – not important to 8 – very important). When employers indicated a skill to be important, they rated this within the highest range of importance (Table 4.21). Some of the factors or skills that the employers deemed as 'non-negotiables' are presented below (Annexure G). Again, it is interesting to note the emphasis on soft skills.

> *"Working as a team / knowledge share / innovative ideas / problem solving."*

> *"For this simulated business to be successful, adequate knowledge from the market place, processes and procedures, etc. need to be incorporated. If the business developers are highly dynamic and all the support is there, it will take an estimate of two years for this business to be developed and function optimally to ensure that sound knowledge and experience is instilled in the students. The aim should be to make the simulated business exposure a one year period to know both sides of the market place (demand and supply)."*

> *"A full range solution delivery from Discovery (what the potential customer wants) through Definition, Design, Development, Delivery and Delight (support and maintenance after going live). What I refer to as the 6D lifecycle."*

"Working to tight deadlines, being held accountable, solving their own problems."

"UNDERSTAND the theory. Know how to apply. Know the implication of their work on the company. We cannot afford 'passengers'. Communicate. Listen to the client, understand their needs and expectations. During their internship training, we usually rotate them between the computer room, desktop technicians, server technicians, helpdesk, etc., in order to give them exposure. Unfortunately, some of them have an attitude, because they have a qualification, they know everything, and are not prepared to dirty their hands and listen to advice."

It is evident that the majority of the skills are soft skills. The fact that both the academics and the employers felt a simulated environment can be beneficial, might be because ICT academics engage with practical as well as industry related content.

Table 4.22: Employer perceptions of students' skills when placed for in-service training

Posed skill	Average Score	Minimum score	Maximum score
1. Ability to speak to groups of people effectively	4.6	3	7
2. Ability to communicate effectively in writing	3.8	1	7
3. Ability to communicate in visual or graphical form	4.8	3	7
4. Ability to contribute positively to team based projects	5.8	4	7
5. Ability to synthesise information into appropriate formats	4.8	3	7
6. Ability to identify the core issue in any situation from a mass of detail	5	4	7
7. Ability to understand, appreciate and meet the needs of your clients	4	1	7
8. Theoretical and academic knowledge	6	4	7

For this question (Annexure G, question 6), the employer group viewed in-service students as being well-prepared in terms of academic and theoretical knowledge. Of these, the soft skills issues such as being able to speak up and contribute were at the forefront (Table 4.22). Some comments in this regard include (Annexure G):

"Very well trained and eager to learn."

"Theoretically they might meet the standard, but most of them fail when it comes to application. In some cases they have the ability but [are] scared to contribute."

"Mixed – we've had some great students and some who seemed unprepared for the course."

Figure 4.3 is a graphical depiction of tables 4.20 and 4.22.

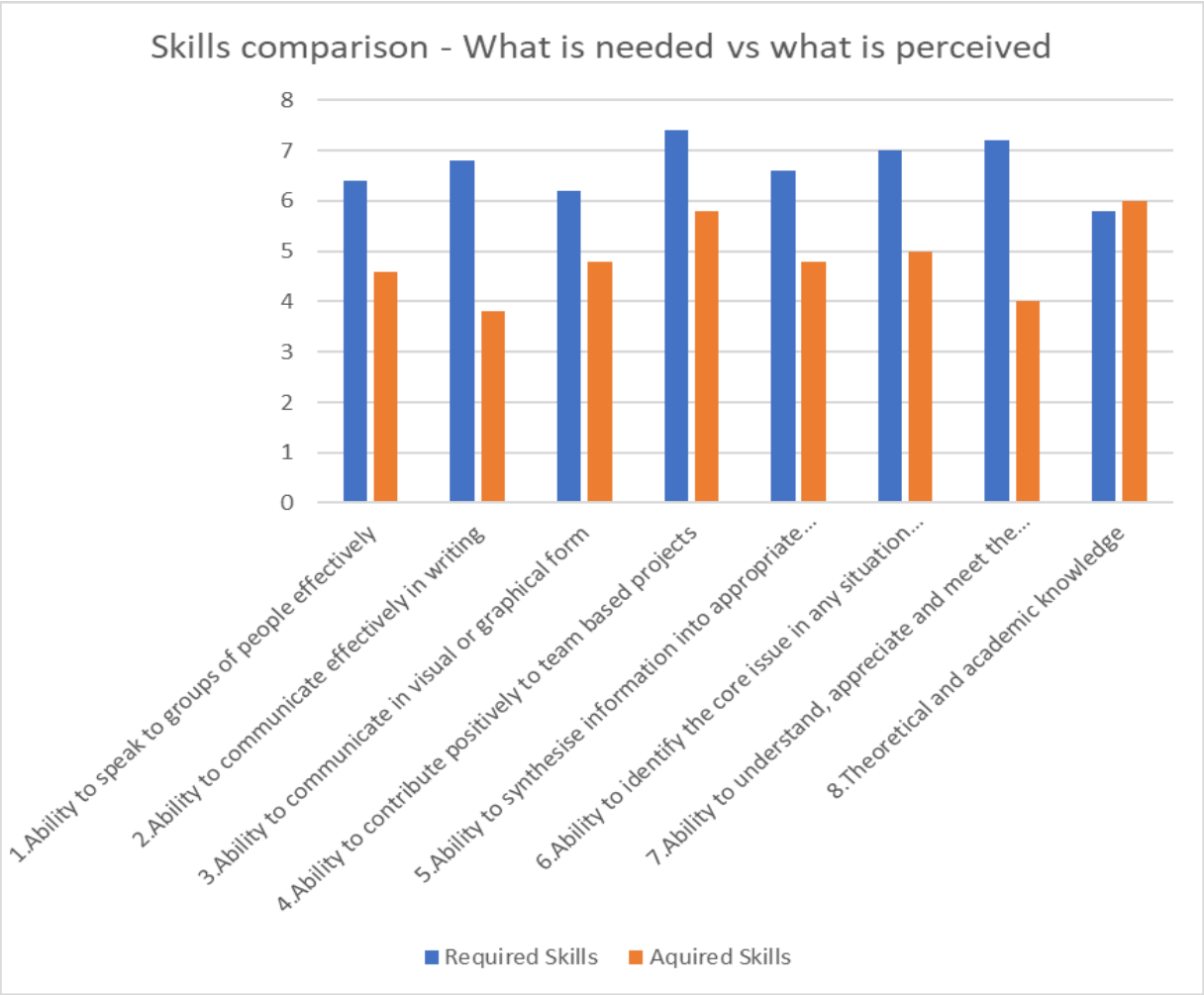

Figure 4.3: Comparison of skills required vs. skills acquired

When comparing the skills that employers felt are needed for students to be successful in industry with the perceived skills students have when starting work in industry, it is interesting to note that the scores for all the skills, except academic and theoretical knowledge, were lower that what was expected (Figure 4.3). Employers indicated that students are adequately prepared in terms of theoretical knowledge, but the other skills are lacking.

From the comments made by the employers, this sentiment is further confirmed that it is mostly in the soft skills areas that the students are lacking. Some of the comments are presented below (Annexure G):

> *"There is a lack of knowledge on business processes, technical skills in the practical application, lack of self-trust and esteem / self-confidence due to not understanding the business world (market place)."*

> *"Ability to communicate verbally and in writing – clearly state the issue or problem."*

"Self-confidence – in that they are not scared to admit they do not know or to ask questions."

"Inability to think and problem solve – this takes much of the time when I work with Intern/WIL groups – getting them to ask questions, to engage and to say what they think, know or do not know."

"Maybe it is a culture thing but I push the only one culture – the formal work / business culture."

"Confidence, problem solving and creative thinking."

"As said, they might have the theoretical knowledge but they a struggle to apply in practice. This results in an extra burden on other employees, because they have to hold their hands, which has an effect on their normal workload."

Only one (1) employer commented on academic shortcomings in terms of business process knowledge. All the other comments touched on the soft skills students are lacking.

In general, employers perceived students to have the adequate amount of theoretical and academic knowledge. This is thought to be conducive to students making a meaningful contribution to the workplace. However, their view reiterates the perception of a lack of 'soft skills' training for students entering a company to do WIL.

4.5.6 Comparison of lecturer and employer perceptions of skills acquired by project students

Table 4.23 provides a comparison of the perceptions of skills acquired by students:

- Lecturers on skills acquired by project students (Annexure H, question 2)
- Employers on skills acquired by in-service students (Annexure G, question 6)

Table 4.23: Lecturer-employer perception comparison of skills acquired by students

Skill obtained	Lecturers			Employers		
	Average score(L)	Minimum score(l)	Maximum score(L)	Average score(E)	Minimum score(E)	Maximum score(E)
1. Ability to speak to groups of people effectively	4.1	1	6	4.6	3	7
2. Ability to communicate effectively in writing	4.3	1	6	3.8	1	7
3. Ability to communicate in visual or graphical form	4.3	2	7	4.8	3	7
4. Ability to contribute positively to team-based projects	4	1	6	5.8	4	7

Skill obtained	Lecturers			Employers		
	Average score(L)	Minimum score(l)	Maximum score(L)	Average score(E)	Minimum score(E)	Maximum score(E)
5. Ability to synthesise information into appropriate formats	4.3	2	6	4.8	3	7
6. Ability to identify the core issue in any situation from a mass of detail	4.2	2	6	5	4	7
7. Ability to understand, appreciate and meet the needs of your clients	4	1	7	4	1	7
8. Theoretical and academic knowledge	4	1	7	6	4	7

Figure 4.4 is a graphical depiction of Table 4.23.

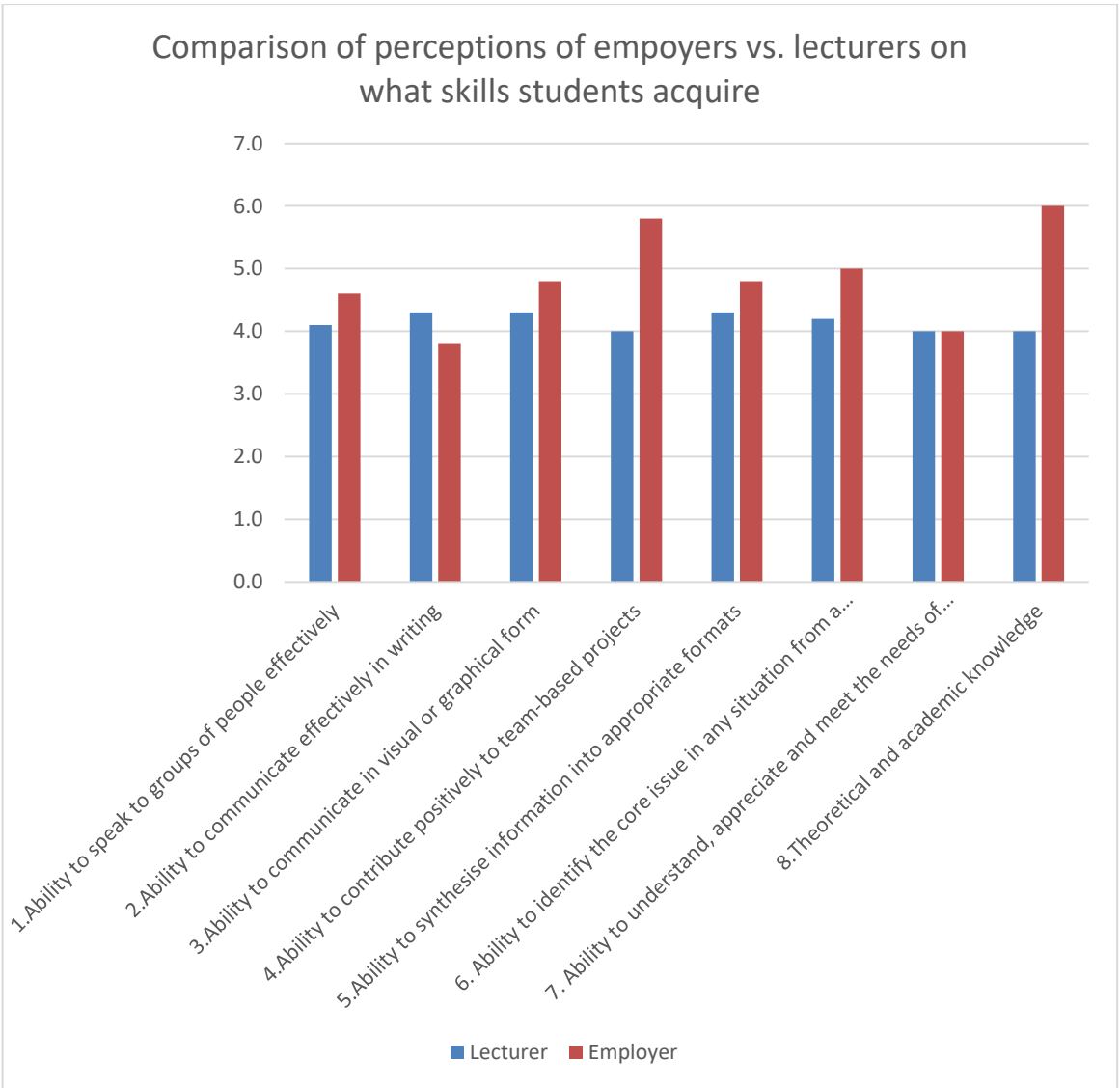

Figure 4.4: Comparison of lecturer and employer skills responses

It interesting to note the discrepancy in the perception of lecturers and employers on the skills students have acquired. Lecturers overall scored the skills of students much lower than the employers did (Table 4.23; Figure 4.4).

4.5.7 Comparison of skills data across groups

Table 4.24 provides a comparison of the perceptions of:

- Project students on the skills they acquired (Annexure J, question 4a)
- In-service students on the skills they acquired (Annexure K, question 4a)
- Graduate students on the skills they acquired (Annexure I, question 6a)
- Lecturers on the skills project students acquired (Annexure H, question 2)
- Employers on the skills in-service students acquired (Annexure G, question 6)

Table 4.24: Groups comparison of the perception of skills acquired by students

Skill	Project Students	In-service students	Graduates	Lecturers	Employers
1. Ability to speak to groups of people effectively	6	6.4	6.3	4.1	4.6
2. Ability to communicate effectively in writing	6.32	6.8	7	4.3	3.8
3. Ability to communicate in visual or graphical form	6.13	6.6	6	4.3	4.8
4. Ability to contribute positively to team based projects	6.62	7.1	6.8	4	5.8
5. Ability to synthesise information into appropriate formats	6.35	6.9	6.5	4.3	4.8
6. Ability to identify the core issue in any situation from a mass of detail	6.29	6.8	6.9	4.2	5
7. Ability to understand, appreciate and meet the needs of your clients	6.4	7.3	6.6	4	4
8. Theoretical and academic knowledge	6.8	6.6	7	4	6

Figure 4.5 is a graphical depiction of the data in Table 4.24.

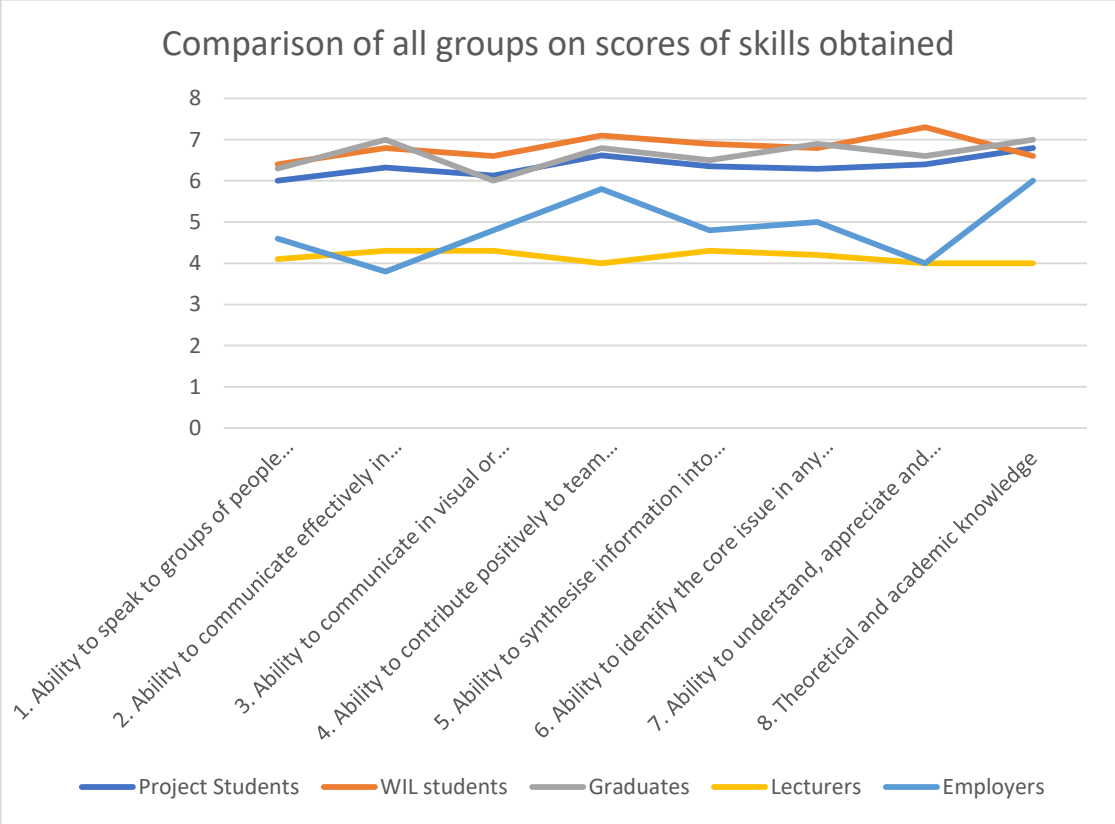

Figure 4.5: Comparison of student perceptions of skills acquired during their studies

It is evident that the WIL student cohort (students remaining on campus conducting group work, students going into industry to do in-service training, and students who already graduated) have a much higher perception of how well they acquired the various skills. The lecturers and employees perceived the students to have acquired a much lower level of competence of these skills than what the students themselves believed. Of all five groups, the lecturers had the lowest perception of how well students acquired these skills.

4.6 Group work dynamics

4.6.1 Project student perceptions of contribution to group work

Table 4.25: Preferences of project students working in groups

Group preference	Number of students	Percentage
Prefer working in a group	38	81%
Prefer working alone	9	19%

For this question (Annexure J, question 5), a preference for working in groups was expressed by 81% of the project students (Table 4.25).

Further exploration of this preference is shown in Table 4.26.

Table 4.26: Project student perceptions of own and others members' project participation

Individual participation	No. of students within the 81% who prefer working in a group	Percentage	No. of students within the 19% who prefer working alone	Percentage
I contributed the same as everybody else	31	81%	5	56%
I did more than the rest of the group	4	11%	3	33%
I did very little	3	8%	1	11%
Perceived contribution of group members according to same respondents:				
Everybody worked equally hard	32	84%	5	56%
Some group members work harder	4	11%	2	22%
Some group members did very little	2	5%	2	22%

Within the 81% group of students who expressed a preference for group work, 81% indicated they worked just a hard as everybody in the group, 8% percent admitted to contributing very little while the others were engaged in various activities in the group, and 11% felt they worked harder than the rest of the group (Table 4.26). Of the 19% of students who preferred to work alone, only 56% indicated that everybody in the group contributed equally to their project, a total of 33% indicated that work was not equally distributed between the members of the group and that they worked harder than the rest, and 11% admitted they did very little (Table 4.26) (Annexure J, question 7a).

In terms of reflecting on the work the other members of the group contributed (Annexure J, question 7b), the results are similar. Of the students who indicated that they prefer working in a group, 84% said everyone worked equally hard, while 16% admitted there were group members who either worked harder than the rest or did not contribute as much as the rest of the group (Table 4.26). Of the students preferring to work alone, 56% indicated that everybody in the group contributed equally to their project, while 44% indicated that some students in the group worked harder than the rest or contributed very little (Table 4.26).

The combined results in Table 4.26 suggest that the students who preferred working in groups felt that all participants worked equally hard with no one simply 'going along' with the group activities. In contrast, students who indicated a preference for working individually felt that there was an unequal contribution from other students in the group, or from themselves, if they worked in the group format.

4.6.2 In-service student perceptions of contribution to group work

Table 4.27: In-service student responses on frequency of group work in the workplace

How regular was group work expected?	Number of students	Percentage
Every day	9	75%
Once a week	1	8.3%
Once a month	1	8.3%
Not often	1	8.3%

For this question (Annexure K, question 5), the results indicate that companies expect WIL students to work in groups, thus, the emphasis on group work is constant regardless of in-service training or remaining on campus to engage in the equivalent level of practical training (Table 4.27). In-service students indicated that when they worked in groups, the sizes of the groups were an average of four (4) people per group, which, in their opinion, worked well and should not be adjusted. All respondents opined that working in groups was conducive to their learning. None indicated that they have not learnt anything by working in a group.

Some comments in this regard include (Annexure K):

> *"Having a group mate helps a student understand and work efficiently. It helps a student learn how to interact with corporate people."*
>
> *"Being part of a group with not so many people can be easily managed, work can be delegated fairly, and more work can be covered."*
>
> *"I have learnt a lot from my team, something I did not understand or know but with their help I do now."*
>
> *"Learning as a group helps solve problems much easier and you also learn other things that you did not know from your fellow group members as well as teach what you know."*

These comments indicate that students feel valued and safe in a group setting.

Table 4.28: In-service student perceptions of individual contribution to group work

Individual cooperation	Number of students	Percentage
I did nothing	0	0%
I did very little	0	0%
I contributed the same	8	67%
I did a little bit more	3	25%
I did everything	1	8%
Perceived contribution of group members according to same respondents:		
They did nothing	0	0%
They did very little	1	8.33%
Everyone worked equally hard	10	83.33%
Some did a little bit more than the others	1	8.33%

Table 4.29: Perception of group members not contributing during in-service training

Anyone specific contributed very little?	Number of students	Percentage
No	9	75%
Yes	3	25%

For the question (Annexure K, question 6e) portrayed in table 4.28, most (91%) of the in-service training students (83% – *Everyone who worked equally hard* + 8% – *Some did a little more than the others*) indicated that all students in the group worked equally well, implying that they themselves also cooperated fully (83%). Sixty-seven percent (67%) of students indicated that they contributed as individual the same as others in the group. This correlates with the perception that 83% of group members worked equally hard.

There were individuals who indicated that some members in the group were not completely committed to working in a group setting (Table 4.28, 8% – *They did very little*). To clarify this perception, an additional question was asked to determine the respondents' views of non-contribution (Annexure F, question 6e3). Responses to this question (Table 4.29) show that 25% of students were perceived by their fellow group members to not engage in a group work setting.

Thirty-three percent (33%) of students also opined that they contributed more than the rest of the group members (Table 4.28, 25% – *I did a little bit more* + 8% – *I did everything*). The notion that there are some students admitting to fellow students not contributing equally, although it is a minority, implicates a problem with group work. Differentials in perceptions of

contributions to group work suggest a disharmony in such a setting – although this differential was expressed by a minority of students.

4.6.3 Project student experiences of group work

Students in the project category were requested to share their experiences in undertaking group work. The positive responses elicited by the question (Annexure J, question 8) focused on co-operation within the group. In addition, the experiences of group dynamics and learning from each other were explored. Some responses include (Annexure J):

> *"The positive experience we had was able to work with other people without conflict and completing on time and perfect system."*
>
> *"Getting to learn more about working together as a group."*
>
> *"I realised that we achieved more in doing a project as a group and everyone was welcoming to each group member's views or opinions."*
>
> *"Discovering that any good idea can come to reality, by putting effort dedication and hard work."*

Students expressed concern over difficulties in implementing the software system they were expected to produce for small businesses, including issues such as their programming coding not working optimally, non-contribution by some group members, disagreements, conflicts over meeting times, and a lack of contributions by individuals on the tasks allotted to them (Annexure J, question 8).

4.6.4 Lecturer perceptions of group work

Table 4.30: Lecturer perceptions of group work dynamics between students

Project group member participation	Number of responses	Percentage
Everyone in the group work equally hard	0	0%
There is one person in the group that does not contribute at all	0	0%
There are only one or two persons in the group that work	10	100%

For this question (Annexure H, question 6), all the respondents in their group work on campus felt that there were generally only a few (one or two) group members who actually undertook the assignments, while other members did not participate (Table 4.30). Yet, all members in a group were awarded the same semester marks, as the system awards group scores.

From this group of respondents, comments and suggestions on how group work may be conducted include (Annexure H):

> *"I presume there must be clear boundaries for each group member. All group members must evaluate each other's performance."*
>
> *"That's the million dollar question, and I'm genuinely not sure. A simulated work environment could help, where a student's individual contributions are logged."*
>
> *"If specific tasks could be allocated to individuals."*
>
> *"Define each role on members clearly."*
>
> *"Split the work and they must prove that they did their part. Eliminate 'passengers'".*
>
> *Members of the group should feel free to point out the passenger as they go along. Implement a mechanism that can be used to do so, in order to stay anonymous."*
>
> *"This is not easy, because, even if the group members are aware that others are not contributing, they still won't let the lecturers know. The way that it is run should be effective if all the students were contributing towards making sure that the tasks are completed. The only other thing would be to advise all the lecturers to always run the projects through Turnitin because there is a lot of plagiarism."*
>
> *"My honest opinion of group projects is that it does not work at all."*

4.6.5 Comparison of group work perceptions

Table 4.31: Comparison of the perception of group dynamics

Perception of contribution	Project students	In-service students	Lecturers
Not contributing equally	21%	17%	100%
Equally contributing	79%	83%	0%

It is evident that the perception of the student cohorts (on-campus project students creating systems in a group (Annexure J, question 6a) and in-service training students (Annexure K, question 6e2) placed at companies) is that everyone in each group contributed equally (79% of the project students and 83% of the in-service students indicated that everyone in the group contributed equally). This, however, is in total contrast with the lecturers' perception (Annexure H, question 6) where 100% opined that everyone in the group did not contribute equally (Table 4.31). This is graphically represented in Figure 4.6.

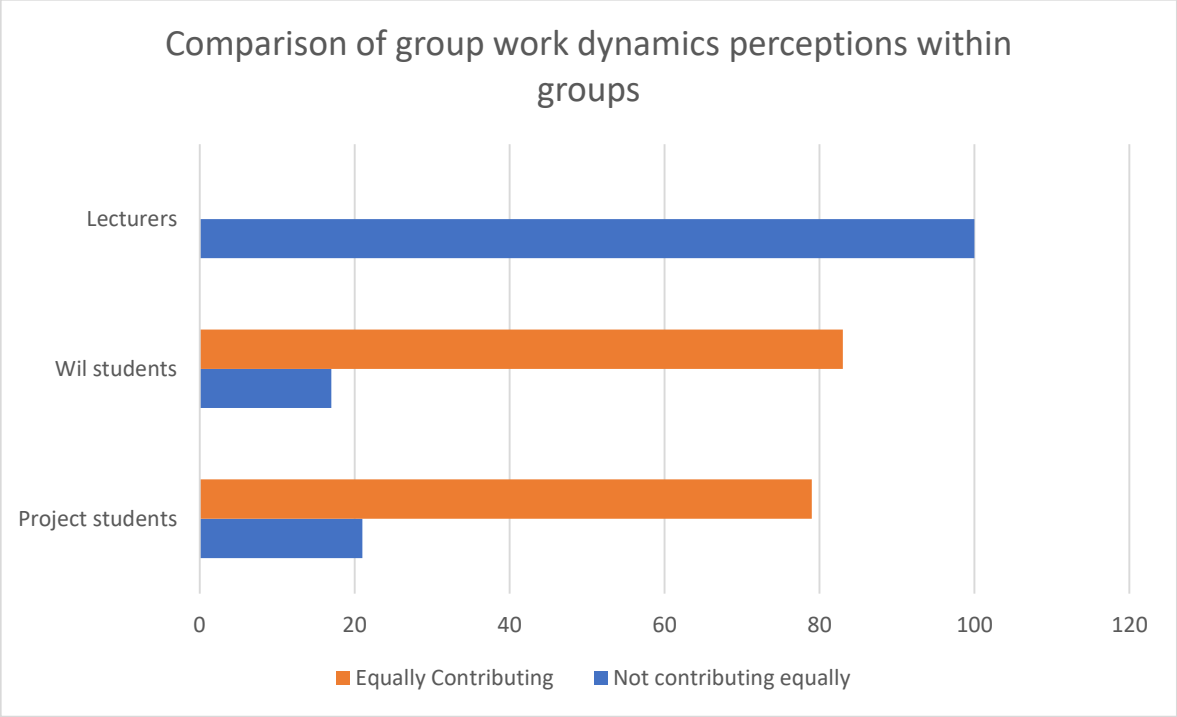

Figure 4.6: Comparison of group work dynamics perceptions within different groups

4.6.6 Employer perceptions on in-service student autonomy in the workplace

Employers were asked how much individual work were the in-service students expected to do while working at the companies (Annexure G, question 9).

Table 4.32: Employer perceptions of in-service students' autonomy for group work

Work done by in-service students	0%-25%	25%-50%	50%-75%	More than 75%
1. With no supervision	4	0	1	0
2. With some supervision	1	2	2	0
3. With full supervision	4	0	0	1

Table 4.32 shows that for point 1 ("With no supervision") 4 employers indicated that in only 0%-25% of cases students work with no supervision, and 1 employer indicated that in his situation students work with no supervision 50%-75% of the time.

For Point 2 ("With some supervision") only 1 employer indicated that students work with some supervision in 0%-25% of the time, 2 employers indicated that students work with some supervision in 25%-50% of the time, and another 2 employers indicated that students work with some supervision in 50%-75% of the time.

For point 3 (“With full supervision), 4 employers indicated that students in their companies work under full supervision in 0%-25% of the time and one employer indicated that students in his company worked under full supervision in more than 75% of the time.

Companies manage their WIL students differently with variations in the manner that these students are afforded autonomy in the workplace. In general, it became apparent during the course of the study that students work under some supervision, with companies offering a range of supervision over students (Table 4.32).

4.7 Perceptions of the feasibility of a simulated working environment on campus

For this question, all the respondents from the lecturer group (Annexure H, question 4) and the employer group (Annexure G, question 10) felt that creating a simulated working environment for students on campus could become a workable solution (Table 4.33).

Table 4.33: Perception of the worth of a simulated business environment for students

Simulated working environment – feasible?	Number of responses by lecturers	Percentage	Number of responses by employers	Percentage
Yes	10	100%	5	100%
No	0	0%	0	0%

Some of the positive responses include (Annexure H):

> *“It will be really helpful for students who cannot get placement to gain work experience and use this experience to get employed at a later stage.”*

> *“This should be very helpful. They often land up in a working environment with theoretical knowledge, without practical experience. The people [who are] supposed to train them at the working place do not have the time to do so, seeing that they have their normal work to do. It then often happens that the students land up in an admin job, not getting the necessary exposure.”*

There were, however, points of concern raised. These include (Annexure H):

> *“More emphasis must be placed from 1st year level on completing all projects / homework / assignments. Students often hand in half completed work – and this is unacceptable in a work environment.”*

> *“Involve our business partners.”*

> *“This will expose them to a more disciplined environment with real consequences.”*

"This can work well if we partner with SMMEs as they'll give related business requirements."

"This simulation will work, provided it is run strictly as a business environment."

"Platform works if business sector is involved. Agreement needs to be reached."

"If it can be implemented as a real-world scenario, which will be extremely challenging, if possible as VUT".

All employers opined that students would be better prepared if they are exposed to some industry environment, even if it is a simulated business environment. In general, employers were very willing to assist in supporting a venture in this regard (Table 4.33). Some of the responses to this question include (Annexure G):

"Knowledge is power. Students could ensure they build a knowledge base which gives them the edge."

"This concept is very likely to be developed and made a success. Personal experience where I have started two businesses within existing corporates proves that this concept will be based on similar principles."

"With no disrespect to the academic staff intended at all and because of personal experience in this as a student, have as many industry people involved and assisting as possible. We are out there and many of us will help! Even though I'm based in the Cape I am willing to come onsite to assist if travel and accommodation costs are met. My company will allow me the time to assist with such."

"A reluctant yes. Provided those setting / running it have a commercial / industry focus and relevant experience."

"I think it is a very good project. It should, however be close to reality and not just an extension of the diploma."

4.8 Comments on curriculum

Table 4.34: Student perceptions on importance of subjects in the IT curriculum

	Subject usefulness in completing the group projects	
	Number (%) of student responses	
Subject in curriculum	**Subject useful**	**Subject not useful**
Business Analysis	35 (74%)	0 (0%)
Programming	22 (49%)	4 (9%)
Programming Logic	0 (0%)	3 (6%)
Information Systems	25 (53%)	0 (0%)

Subject in curriculum	Subject useful	Subject not useful
System Software	2 (4%)	5 (11%)
Communication	3 (6%)	7 (15%)
Cyber Law	0 (0%)	7 (15%)
Accounting skills	1 (2%)	10 (21%)
Entrepreneurship	3 (6%)	5 (11%)

For this question (Annexure J, question 10; Annexure K, question 10; Annexure I, question 8), the majority of students (project, in-service and graduate) (74%) were of the opinion that the subject Business Analysis was the most helpful to them, with Information systems (53%) and Programming (49%) also deemed important. Respondents felt that not contributing to project work was minor or not important to their learning. Subjects deemed as less important include Accounting Skills (21%), Communication (15%), Entrepreneurship (11%), System Software (11%) and Cyber Law (15%). Students did not make any significant suggestions for the final (WIL) module of the qualification, other than the day-to-day practical issues that could make life easier for them. These include suggestions such as mentoring by lecturers and dividing the work in sections to have all groups involved (Table 4.34).

In-service students perceived modules (subjects) from their qualification dealing with Programming, Information Systems and Business Analysis as important to preparing them for the world of work, whereas IT Law, Entrepreneurship, and Accounting were perceived as not helpful to in-service training expectations.

In keeping with the views of students in the project and the in-service cohorts, students from the graduate group also indicated that their major subjects (Business Analysis, Information Systems, Programming) were the most helpful in preparing them for work. Some comments in this regard include (Annexure I):

> *"BA, Project Management, Information Systems, basically everything because I work in HR and I have an understanding of how IT integrates with other divisions and the role it plays within the digitised value chain."*

> *"The core focus of DFDs and ERDs."*

> *"BA and Project Management."*

No suggestions were forthcoming from this group as to whether any further content should be added to or removed from the curriculum. Issues identified as matters of concern include some of the practical processes employed in the subjects offered. It was generally thought that this aspect can be streamlined. Examples of such concerns include (Annexure I):

"In terms of approvals of ERDs and DFDs there were those groups that were behind in terms of them being approved and again when they are in process of being approved, they must be approved by three individuals – junior, senior lecturer and the HOD. The reason being there were those ERDs that were approved but practically they don't make sense at all."

"More detailed practicals would be nice, to be exposed to the work environment."

"There should be a full-time class for practical based on the programming language that your system is going to be implemented on."

"Only that consultation time should not be once a week but twice or three times a week."

Table 4.35: Graduate student perceptions of shortcomings in the curriculum

Shortcomings in the curriculum?	Number of responses	Percentage
Yes	6	33%
No	12	67%

Eighteen (18) of the 21 graduate students answered this question (Annexure I, question 7). Twelve students (67%) felt that the curriculum as currently offered prepared them adequately (Table 4.35). Six students however felt that the curriculum was lacking. Of these six students, only three offered an explanation. The comments made by these students in this regard include (Annexure I):

"Conflict management was something that really impacted on our projects; people don't really come and contribute to the team and [it is] so difficult to manage them. If this can [be] iterated more then I will be much happy."

"More detailed practicals could have been of advantage to learn more about the module."

"Doing more practical than theoretical".

4.9 Conclusion

The results from the various questionnaires were presented in this chapter. An interesting trend in terms of the gender distribution in the separate groups was noticed. In the project student group, the male-female distribution is more equal than in the in-service, graduate, lecturers and employer groups, where the male numbers are far more than the female numbers. All students, lecturers and employers felt that students who were exposure to the world of work were better prepared for industry when they graduate. Employers and lecturers felt that a simulated work environment on campus has potential to be used as a model for

gaining work experience for students who cannot find in-service training. On the subject of group work, it was interesting to note that students did not want to admit that some students are ‘carried’ by fellow group members. This was pointed out by the lecturer and employer groups, who indicated that this definitely happens with group work. Comments made by students and lecturers regarding the curriculum include that they are comfortable with the content of the curriculum and that it prepares students adequately. Employers were impressed with the academic level of the students arriving at their companies for in-service training but felt that students’ soft skills require attention.

Collective discussions between the various research groups to draw conclusions and correlations are discussed in Chapter 5. The discussion contributes to proposing an approach to a pedagogy for the introduction and implementation of the WIL programme at VUT, which will be presented in Chapter 6.

CHAPTER 5: DISCUSSION OF RESULTS

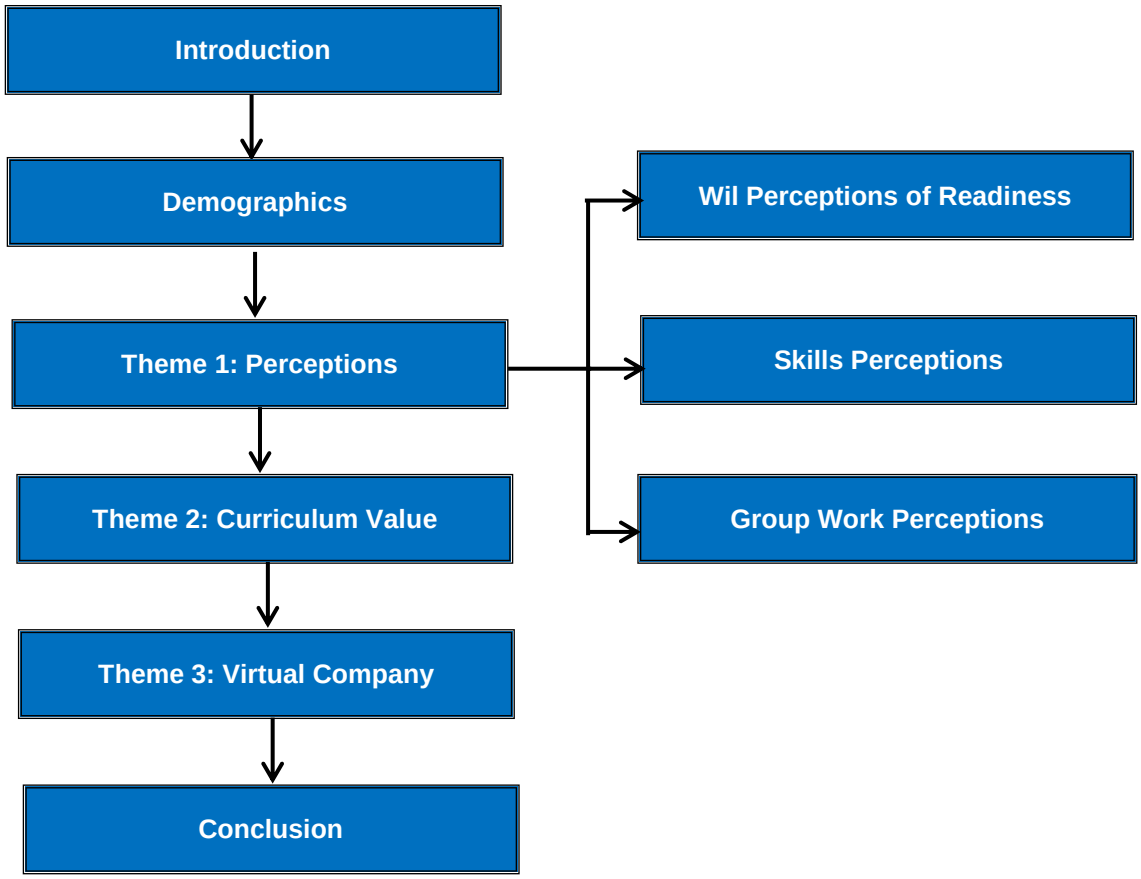

Figure 5.1: Outline of Chapter 5

5.1 Introduction

The aim of this research is to propose an approach to a creative pedagogy in the form of a simulated working environment on campus for ICT students in a tertiary educational setting. The purpose of such an approach is to contribute towards enhancing the learner-content relation of WIL students at Vaal University of Technology in order to address student readiness for the world of work in an IT environment. By providing a simulated working environment in the form of a virtual company on campus, the project students will be afforded an appropriate opportunity equal to those placed at companies for their in-service training. The objectives include analysing the perceptions expressed in the questionnaires by the different research groups to derive findings and then formulate this approach to a creative pedagogy in order to realise a virtual company on-campus to enhance the learner-content relationship of WIL students.

Analysis on the questionnaire data was done sequentially. Coding of the quantitative statements presented in the survey questionnaires took place after collecting the data. Coding of the qualitative data took the form of in-depth reading through the responses of the participants and segmenting the data into corresponding themes. The codes presented in Figure 5.2 were derived using *Atlas.ti* to analyse the responses obtained from the various questionnaires.

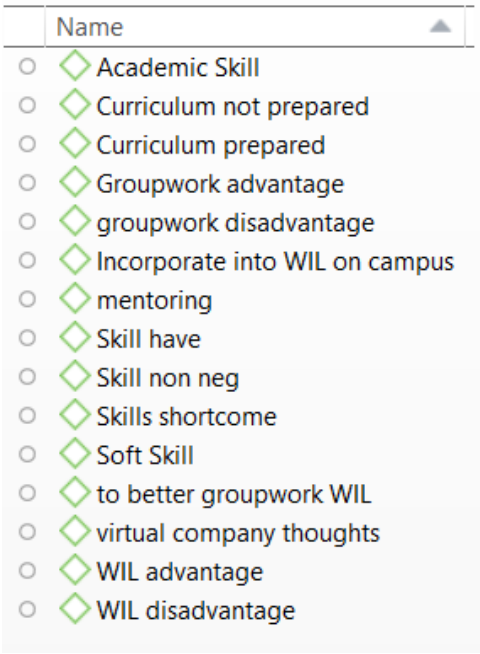

Figure 5.2: Codes derived from questionnaire responses using Atlas.ti

Next, categories were developed by grouping the codes that share similar topics, for example, all the codes dealing with skills were grouped together into a 'Skills Perceptions' category (Table 5.1).

Table 5.1: Categories developed from codes using Atlas.ti

Category	Code group
Curriculum	Curriculum not prepared Curriculum prepared
Group Work Perceptions	Group work advantage Group work disadvantage To better group work for WIL
Mentoring	No sub-groups
Skills Perceptions	Academic skill Skills that students have Skill viewed non-negotiable Skill shortcome Soft skill

Category	Code group
Virtual Company	Incorporate into WIL on campus Virtual company thoughts
WIL Perceptions	WIL advantage WIL disadvantage

As suggested by McMillan & Schumacher (2010), three (3) main themes were created (Table 5.2). These are:

i) Theme 1: Perceptions
   a) WIL Perceptions (perceptions of readiness)
   b) Skills Perceptions
   c) Group Work Perceptions

ii) Theme 2: Curriculum Value (curriculum)

iii) Theme 3: Virtual Company (mentoring and virtual company thoughts)

Quantitative and qualitative data were collected simultaneously, where after the quantitative data were converted into qualitative narratives that can be interpreted and analysed qualitatively by the researcher (Saunders et al., 2012, cited by Prince, 2015). The following groups were identified: Age, gender and management level were grouped under biological information. However, these were not included as a theme, but were used to better understand student progression, employability and activities. The decision to not include this group as a theme is based on the notion that it does not bear any relevance to pedagogy. Additional quantitative data including skills rankings and group work were added to the Skills and Group Work Perceptions themes, respectively (Table 5.2).

Table 5.2: Themes derived from coding system in Atlas.ti

Theme	Groups that makes up the theme
Perceptions	Group work perceptions Skills perceptions (including skills rankings) WIL perceptions
Curriculum Value	Curriculum
Virtual Company	Mentoring and virtual company thoughts

Biographical information has been included to appreciate the demographic spread of students entering the ICT employment arena. All other pertinent results are discussed using thematic analysis.

5.2 Demographics

5.2.1 Gender

Data were extracted from the VUT ITS system (Malope, 2017), where the gender distribution within the undergraduate and BTech IT qualification is indicated (Table 5.3). This data were used to compare the trend of the gender distribution with individual responses obtained in this study. In 2017, 39.89% of students in the IT undergraduate and BTech IT qualification were female and 64.15 % were male.

Table 5.3: VUT student headcount by gender enrolments over five years

Student Headcount Enrolments Over 5 Years Drill Down by Own Group

Report Parameters

Campus	VANDERBIJL (before Integrator), VANDERBIJLPARK
Qualification code	206010, 306017
Measure	Qualification headcount enrolments (Last down loaded on Tuesday, 22 August 2017)

Qualification code -> Gender description	2013 N	2014 N	2015 N	2016 N	2017 N	Growth: 13 - 17 %	Change: 16 - 17 %	Trend
206010	1,105	961	937	884	632	-13.04%	-28.51%	
Female	393	340	334	312	232	-12.35%	-25.64%	
Male	712	621	603	572	400	-13.42%	-30.07%	
306017	166	143	153	131	110	-9.78%	-16.03%	
Female	57	60	57	50	34	-12.12%	-32.00%	
Male	109	83	96	81	76	-8.62%	-6.17%	
Total	**1,271**	**1,104**	**1,090**	**1,015**	**742**	**-12.59%**	**-26.90%**	

Table 5.4: VUT registration statistics by gender*

Academic year	2013	2014	2015	2016	2017
Total Enrolments	1271	1104	1090	1015	742
Female	450	400	391	362	296
Percent (%) of total	35.41	36.23	35.87	35.66	39.89
Male	821	704	699	653	476
Percent (%) of total	64.59	63.67	64.12	64.33	64.15

*Numbers and percentages are derived from Table 5.3

The information provided in Table 5.3 and Table 5.4 was obtained from the VUT ITS system and was not included in Chapter 4 as it does not form part of the research survey data.

It is of interest to note that the average of female registration data for the undergraduate IT qualification over a five-year period (2013 – 2017) is 36.61%, ranging from 35.41% (2013) to 39.89% (2017) (Table 5.4). Conversely, male registrations remain steadily within the 64% range mark. This is not surprising, as the ICT field has been dominated historically by males,

as found by Elnaggar (2007), where women in Oman are not well-represented in today's knowledge-based economy due to an ICT sector that has been traditionally male-dominated. The study by Elnaggar (2007) also found that women had an unequal access to training and a lack of awareness of opportunities in the ICT sector. Andersson & Hatakka (2017), however, stress the fact that although a gender divide has been identified, ICT is perceived to be the instrument for women's empowerment and gender equality.

In contrast to the registration figures in Table 5.4, a significantly higher percentage of females from all three student groups responded to the questionnaire (Table 4.2) when compared to the number of females registered (Table 5.4). Several reasons and postulations may be put forward to explain the differences in gender ratios between initial registration for the degree and the ratio in the final year of study. These may include family responsibility, home income, part-time work, inadequate funding, lack of focus, and a host of psycho-social factors. It is also possible that female students progress at a faster pace to their third year of study.

Ogunbona et al. (2013) found that a gender imbalance exists in ICT in academia and industry, with female registration for ICT courses at 25% or less than that of male registrations for university ICT degrees. From a study done by Volman et al. (2005) in the Netherlands, the trend of having fewer females in the ICT fields starts in secondary education, where the attitude of girls regarding computer-related study fields appears to be less positive than that of boys. Girls and boys take on different tasks when working together on the computer and they approach ICT tasks differently (Volman et al., 2005). In another study, Lewis et al. (2006) detected low numbers of female enrolments at Australian universities, with a decline in registration noted in subsequent years. In contrast, the figures in Table 5.4 do not show a similar trend, but suggest that the number of female registrations remains constant. This could possibly be a result of the current political situation in South Africa, where women are encouraged to educate themselves and play a significant role in the country's economy.

The results presented in Table 5.4 and Figure 5.3 also suggest a greater percentage (75%) of male students securing WIL placements at companies for their in-service training. The fact that most lecturers and all employers who serve as mentors are male, may also be a contributing factor to the possible gender bias in in-service training. In a corroborating study by Nagarajan & Edwards (2015), evidence of male domination and some discrimination based on gender was found, together with gender imbalances surrounding their work environment. The data thus suggest that male students appear to have an advantage of obtaining employment over female students in the ICT industry. This is also confirmed by the groups already doing their in-service training. The data from the study have identified 90%

male lecturers against only 10% female lecturers. More pronounced is the employer section where 100% of the respondents were males in middle or senior management (Table 4.4; Figure 4.2). These findings are supported by the study of Suriya (2003), where the proportion of women in India in the software industry is in the order of only 19%. More recently, Ngila et al. (2017) found an underrepresentation of women participating in national science academies.

The findings of this research are in keeping with the above-mentioned situations, but are not the focus of the study and will therefore not be discussed further. It could, however, form the basis of future studies in this regard.

5.2.2 Age

The results demonstrate that the majority of graduate students are in the 22-25 year range (Table 4.3). The results further suggest that students remaining at VUT to engage in projects and the graduates are similar in their distribution by gender. However, more male than female students had the opportunity to obtain in-service training (9 males versus 3 females) (Table 4.2).

Assessment of the ages of registered WIL students (project and in-service) indicates that these two cohorts were categorised in the 22-25 year age group. Of the students in the older than 25 group (indicating 34% of the project students), only two (2) (17%) found company placement for their in-service training (Table 4.3). Age intervals for the separate groups show that younger students who progress through the curriculum faster are preferred by employers for in-service training. This age differential suggests that companies prefer students who complete their studies in minimal time. Anecdotally, it has been suggested that students who complete their qualifications over an extended period of time, may well have not been successful in passing their subjects. Such impressions, although not explored in the current study, are nevertheless a possible reason for fewer older students represented in the WIL in-service group. The possibility, however, exists that the two students older than 25 years of age who found in-service placement may have initiated their studies later than the average secondary school student who gain entrance to a university. Furthermore, a host of financial, psycho-social and other factors may also play a role in the ‘late’ graduation of students. Again, this avenue has not been explored further as it is not the focus of the study. However, the data revealed that there were 18 students older than 25 years of age who had not completed their studies yet at the time this research was conducted (Table 4.3). The highest percentage of graduate students are in the older than 25 years of age group, which is hardly surprising as this group embarked on a second qualification after obtaining their undergraduate qualification in IT.

The phenomena of students taking much longer than the allocated three or four years to complete their undergraduate qualification might be an interesting topic for further research to determine why this is the trend with IT students at VUT.

5.2.3 Management level

The data revealed that employers acting as student mentors in companies are all in middle or senior management. These findings suggest that companies consider in-service training as an important component for the ICT industry, as the mentoring task seems to have been taken up by the management teams rather than the colleagues of lower rank.

5.3 Theme 1: Perceptions

5.3.1 Perceptions of readiness

Wye et al. (2012) determined that a low level of perceived job readiness among students could be the attribute that causes the low rate of graduate job placements in Malaysia. These authors furthermore demonstrate that significant determinants in the perception of readiness for employment include the type of university such students attended as well as the amount and type of work experience they had been exposed to during their university career (Wye et al., 2012). Another more recent study by Cavanagh et al. (2015) found that university educators and curriculum designers alike should regularly monitor and review the progression of students towards desired employability skills. This approach confirms the position taken by Wye et al. (2012) who recommend that Malaysian universities can be improved by the inclusion of business internship programmes. Therefore readiness, together with the perception of readiness for employment by students, has been argued to be crucial for supplying the labour market with competent workers (Wye et al., 2012).

5.3.1.1 Students undertaking group work on campus

Fifteen percent (15%) of the students felt that remaining on campus and completing a group project for their WIL module did not prepare them adequately for employment. The overall sentiment of the project students was that working in a company would be different and rewarding compared to what they had to do in implementing a project. For these students, a simulated working environment in the form of a virtual company might provide a glimpse of expected activities when employed. The majority of project students expressed their learning of interacting with other students as adequate, although a minority (15%) felt that the reality of being employed would be vastly different, and that they, as project students, were not adequately prepared to enter the world of work after graduation (Table 4.5). Similarly, Gledson & Dawson (2017) found that architectural students felt a simulated work

environment prepared them adequately for future employment. Although a minority of students expressed a negative perception of training in a simulated environment, this perception should not go unnoticed and need to be followed through to understand the anxieties experienced by these students. Although this is not the focus of the study, it may pose an interesting research question to investigate in future research.

The results presented in Table 4.6 suggest that the majority of students felt they obtained specific abilities and skills, regardless of whether they had the opportunity to be placed in a company or participated in group work on campus. The remaining 30% believed they would have learnt these abilities at a different level or learnt other (and perhaps additional) abilities if they were placed in a company for their in-service training (Table 4.6). The expression of such perceptions by the WIL students who remained in a university environment may suggest they viewed their fellow in-service students who had the opportunity to be placed in industry to have an advantage over them. It was however found that students misinterpreted the question on whether they would have had better training if they selected the other option, i.e. if project students had the opportunity to go into industry and in-service students had the opportunity to do a group project on campus. Answers were adjusted according to the further explanations these students offered (Table 4.7), which indicated that 52% of students perceived working in a company as better preparation. The results of the responses to this question (Annexure J, question 4c) correlate with the answers to the question on which method they felt have prepared them better for industry (Annexure J, question 6) (Table 4.8), where 52% of students indicated that a work experience in a company prepared them better. This means the responses of the students to the question reflect their perceptions better than the ‘Yes’ or ‘No’ answers they gave. Thus, the student groups perceived that in-service training id more advantageous than a group project in a university setting.

A study by Gledson & Dawson (2017) found that the introduction of a simulated project in the final year of the Architectural Technology undergraduate degree programme enhanced learning in the discipline. Furthermore, the study demonstrated that the softer professional and communication skills as desired by industry were also achieved. It is therefore tempting to speculate that student morale as a consequence of unproven perceptions of differences in the environment and conditions for training could be enhanced should similar circumstances prevail.

5.3.1.2 In-service training students

Similar views were expressed by students placed at companies for an in-service experience, whereby they believed that they were better prepared for the world of work than those who remained on campus to undertake project work. This is similar to a report on student

teachers undergoing in-service training where students felt their experiences were beneficial in equipping them more than adequately for their chosen profession (Howley et al. 2016). This compliments the study of Dunlap (2005), who found that students exposed to authentic activities, collaboration and reflection were relatively more successful. Furthermore, Dunlap (2005) suggests that students exposed to learning and problem-solving activities reflecting the requirements of the workplace, felt better equipped to enter the world of work.

This research study not only confirms the views of Howley et al. (2016) and Dunlop (2005), but also lends further credibility to the importance of WIL, suggesting the need for company-like training within a university environment.

5.3.1.3 Graduates, lecturers and employers

Following a graduate survey and an employer survey, reported by Graduate Careers Australia (2012) and Cavanagh et al. (2015), employers appeared to require skill sets not defined by academic standards (soft skills). Prospective employers valued soft skills as an additional asset to academic qualifications. Furthermore, Pinto & Ramalheira (2017) who undertook a similar investigation in Portugal found that good academic performance, whilst an important factor for employability, but when combined with participation in extracurricular activities such as WIL, resulted in higher perceived employability. In an earlier report, Freudenberg et al. (2011) found an evolving breach of expectation between graduate attributes and skills, and what industry requires from newly appointed graduates. Such studies reflect on the lack of employment readiness of students together with a lack of basic skills.

Further evidence of this view is provided in the present study, where respondents from the graduate, lecturer and employer groups indicated that an in-service WIL experience prepare student better for employment compared to developing a software system as a group project on campus where project students might gain some, but not necessarily sufficient experience in a simulated environment.

5.3.1.4 Conclusion

This research, in its triangulation across all respondents, provides overwhelming support for the benefits and possible employability of students exposed to in-service training. This is not surprising and provides further evidence in support of the findings of several research groups to emphasise the real and perceived benefits of in-service training compared to simulated WIL opportunities provided by HEIs.

Studies in support of the findings of this research on the perceptions of readiness include:

- ICT students in Australia were exposed to WIL programmes. While time, cost and effort were recognised as problems in delivering WIL, the benefits for all participants engaged in such a programme were well-recognised (Armatas & Papadopoulos, 2013).
- A study by Fong & Sims (2010) on e-WIL, and following interviews with students and staff, revealed a number of perceived advantages as well as benefits for students in an e-WIL programme. The e-WIL programme featured communication media that provided rich support for review and reflection to students and academics. The substantial benefits of in-service training are recognised and emphasise the significant benefits to students and the university sector (Koppi et al., 2010; Pilgrim, 2011; Pilgrim & Koppi, 2012).

5.3.2 Perceptions of skills

In study done by John (2011), it was found that most of the recent university graduates are not adequately prepared to stand their ground and face the demands required in the workplace. The following skills were indicated as lacking in graduates: communication skills, computer skills, numeric competency, analytical skills, intrapersonal skills, leadership skills, interpersonal skills and skills to develop purpose and integrity (John, 2011). These graduates have not been proficiently trained to face the demands of industry, except for academic knowledge. Graduates reportedly found it challenging when beginning their employment in the workplace. The expectancy thus exists that graduates should be trained in the mentioned skills prior to entering employment in order to make them successful and confident employees in the workplace (John, 2011).

In agreement with John's (2011) findings, this study found that most of the skills indicated as lacking in the different groups of respondents resort in the soft skills category. Of these, communication and intrapersonal skills were highlighted. All the skills perceived as not adequately mastered (as reported by the project students), can be categorised as soft skills. In particular, the ability to communicate effectively and understanding the needs of clients are recognised by the students as lacking in their training.

Upon reflecting on their qualification experiences, the graduate group's perceptions differ from those still in training at a university. An interesting notion of these perceptions is the opposing views expressed. Some of the skills in-service students indicated as not being mastered well were reported by the graduates as well-mastered. It is possible that while students are still 'struggling' with the qualification they feel unsure or insecure, whereas after

completion, they perceive themselves as ‘accomplished’. However, verbal communication in the workplace was still thought to be lacking.

In a study conducted by Cavanagh et al. (2015), it was noted that some employers viewed graduates as immature in the sense that they are lacking, for example, mindfulness on how social media should be used at work and more significantly, an absence of work ethics. It was further pointed out that employers would like to see practical skills, soft skills and ‘real life’ development to be included into academic courses and curricula for a closer alignment between graduate and desired employability skills. In keeping with this view, Lim et al. (2016) found that the skills employers value the most are communication skills, analytical skills, and time management skills. Employers also indicated that they would prefer selecting well-versed and accountable individuals with positive job attitudes for employment. Some of the most regular early employment problems that employers encounter, according to Lim et al. (2016), include lack of technical knowledge, difficulty in applying knowledge, and lack of English skills. There is a conflict between the graduate attributes students possess and what is required by industry, which specifically points to the generic skills of students (Freudenberg et al., 2011). This view is also reflected in the current study where employers’ felt the skills that students arrive with at the respective companies are considerably lower than the expected level they require students to have. Most of the skills they scored as low are in the soft-skills category. The only adequately prepared skill students have, according to the employer respondents, is theoretical and academic knowledge.

A discrepancy has been noted in the study – lecturers scored students consistently lower than employers scored students (Table 4.23; Figure 4.4). This discordance may be attributed to the notion that lecturers are involved in various subjects and have different expectations of their students, resulting in a range of opinions. Students perceived themselves to have a higher achievement of skills than what lecturers and employers reported. Similarly, Watson et al. (2016) reports that when student perceptions were compared to those of their lecturers in an Open Online Course, the perceptions of the students and the lecturers contradicted each other. Of importance also is a study conducted by Fraser & Killen (2005) where students and lecturers at a contact and distance university in South Africa responded to questionnaires. One of the findings is that there is a strong tendency for lecturers to blame students for failure. It should however be noted that lecturers who believe students fail a course or task as a result of their own making, is a perception and not evidence of a reason for student failure. Failure may be attributed to several factors, including communication difficulties, lecturers not taking different learning styles into account or unwarranted assumptions made of student knowledge/previous learning, environments not conducive to learning, and lack of appropriate support.

Collectively, the results of this study together with other research reports strongly point to the introduction of a virtual company concept in qualifications that include the WIL component. Such an approach will require the acquisition of appropriate soft skills in addition to receiving the requisite academic instruction. This approach may adequately prepare students by instilling skills that include both academic and additional soft skills as sought by industry.

5.3.3 Perceptions of group work

In separate studies, Macgowan & Wong (2017) and Lee (2016) found that group work experiences are associated with greater competencies and demonstrate improved self-confidence of social work in students.

In this research, project student responses on the positive experiences of working in a group and participating in a project mostly pointed to the actual co-operation of the group, experiencing the group dynamic and learning more by being a member of a group. Overall, project students felt positively towards working in groups although there were a few who admitted to 'carrying' some of group members who did not contribute to the overall project. Dijkstra et al. (2016), in a study where medical students debated whether group work does justice to individual development and assessment, found that the individual grade is most often based on a group grade; it was suggested that clear criteria are required to avoid measuring only the effort of the individual and assigning that mark to the entire group. Decisions on how to weigh assessment of the product and peer assessments of individual contributions should be carefully designed and based on predetermined learning goals. Kear & Donelan (2016), in a study on ICT students found that the lecturers perceived the students not contributing to group work equally. This correlates with the current study, as 100% of the lecturers believed not all students in the groups contribute to the end product (i.e. the developed system).

There is clearly a discrepancy in the perceptions of group work. Although it is evident that not all students in a group contribute equally to the work done, advantages in conducting group work suggest that group work cannot simply be disposed of. Group work may require improved supervision and planning to ensure that all students participate. Therefore, when implementing a simulated environment on campus, careful consideration should be given to the group work concept in order to ensure that individuals are assessed. Thus, group work is flagged as one of the areas in a simulated working environment that should receive thorough planning to ensure that students are fairly assessed.

5.4 Theme 2: Curriculum Value

Ogunbona et al. (2013) found a correlation between teaching and industry, which is influenced by the real and intended value of a curriculum. Their study suggests that ensuring students of the relevance of their coursework in relation to what companies require of them may provide the incentive for them to do well with this type of training.

Business Analysis and Programming were indicated as subjects most valuable to students in doing their work, either in companies or in group projects. When implementing a virtual company on campus to ensure students' proficiency in business analysis and programming skills, real-life projects may still be offered to students, in groups given the advantages as stated by (Dunlap, 2005). However, WIL training should be managed more efficiently than is currently the case. The focus for Business Analysis should specifically be on documentation preparation (an employer named this as a shortcoming), to motivate students to prepare documents from templates and presenting it to the manager of this virtual company.

Although students felt that minor subjects such as Communication did not help them at all, this remains a shortcoming as indicated by employers. The focus of the proposed approach to a pedagogy (see Chapter 6) is on enhancing the soft skills and to ensuring that students are able to practice these skills. This may be achieved by setting deadlines with consequences should they fail to adhere to these.

In terms of the curriculum for the virtual company, one employer suggested that it should focus on the demand and supply components of a company. Half of the students could be focusing on the 'demand' where they will be required to complete a tender request for work to be undertaken, while the other half may work in the 'supply' component where they prepare a tender to be able to do the work requested. For the second half of the semester they will then switch the demand and supply functions to ensure full exposure to the business. It is therefore the contention of this research that a virtual company on campus is the ideal place where all aspects of learning towards the qualification can be 'pulled together' (as is the outcome of the WIL module). Thus, by affording students an opportunity to embark on real-life projects in the various fields followed by regular presentations of their work in progress – including their exposure and understanding of the soft skills required – will be advantageous. This will ensure that students exercise all academic skills acquired, but with a strong focus on developing their soft skills.

The specifics regarding the curriculum will be presented in the next chapter where an approach to a proposed pedagogy is discussed in detail.

5.5 Theme 3: Virtual Company

Work-based learning or WIL has been defined by Reeders (2000) as credit-bearing learning by students in the workplace or within the context of an institutional setting. The provision of a virtual company on campus fits this definition in terms of providing work-based experiences to students. The inclusion of WIL in a curriculum has been thought to be an important aspect of practical training (Reeders, 2000; Dunlap, 2005; Wye et al., 2012; Freudenberg et al., 2011). In support of this view, Reeders (2000) found that sixty percent (60%) of Australian university courses include some form of learning in the workplace, and that in the United Kingdom, approximately a quarter of a million students find placements in industry in any one year. The study furthermore reveals that students in this category indicated that the WIL experience WAS rewarding as it reflected an aspect of real work-based problems (Reeders, 2000). To this end, Dunlap (2005) found that specific instructional strategies incorporating WIL – which includes the use of authentic problems of practice, collaboration and reflection – became the catalyst for students' improved self-efficiency. In keeping with this, Freudenberg et al. (2011) present a WIL solution to bridge the skills-industry requirement gap, thereby contributing to improve students' development of generic/soft skills. Their suggestion revolves around developing a professional development programme designed to enhance students' theoretical knowledge systematically. In addition, the programme aims to develop students' learning, employment and generic skills (Freudenberg et al., 2011).

As WIL is viewed as a part of valued qualifications, it is important that this concept is not removed from the qualification. However, as not all students are placed in industry, it is appropriate that they be provided with an alternative that approximates the workplace experience. This sentiment is emphasised by Wye et al. (2012), who argue that controlled and strengthened WIL programmes should be compulsory at the undergraduate level. The WIL experience and work exposure of undergraduates would assist in bridging classroom learning and workplace practice (Wye et al., 2012).

A trend in previous years as well as during the time frame of this study is that only a few students obtained in-service training opportunities (Harmse, 2018). The fact that only a few students (10%) were placed in a company (Table 4.13) suggests that another approach to completing the final module (WIL) of the IT qualification should be investigated. An alternate approach could provide the remaining 90% of students with similar experiences and exposure.

Employers expressed enthusiasm for the prospect of a virtual company on campus. The success of a virtual company will primarily lie on the shoulders of the person charged with

this approach. In addition, the responsible trainer will be expected to be knowledgeable in the fields of business and IT.

Collectively, the data point to the importance of WIL students being provided with appropriate mentorship and supervision. For this study, the average time that in-service students worked with a mentor and under supervision in companies, is up to 50% (Table 4.32). It is thus important to note that in a virtual company, a mentor or supervisor should be available at all times to assist students with the same tasks they will be expected to perform in a particular company. Mentoring has been found to contribute to the retention and promotion of women in ICT (Logan & Crump, 2007).

5.6 Conclusion

It is important to note that WIL can contribute to developing generic skills in students, which has many benefits. It is however essential that for this approach to be successful, stakeholders must have the commitment and vision to realise these potentials (Freudenberg et al., 2011).

This chapter presented the themes derived from analysing the data. A discussion on the ages and gender discrepancies in the student numbers and those receiving employment was presented. Different perceptions of the various respondent groups on the readiness for work, skills required against what are exhibited, together with the value of group work, were presented as important components. The value of the current curriculum and what should be included in a curriculum for a virtual company were touched on. In the next chapter, an approach to a creative pedagogy is presented.

CHAPTER 6: PROPOSED APPROACH TO A PEDAGOGY FOR A VIRTUAL COMPANY ON CAMPUS

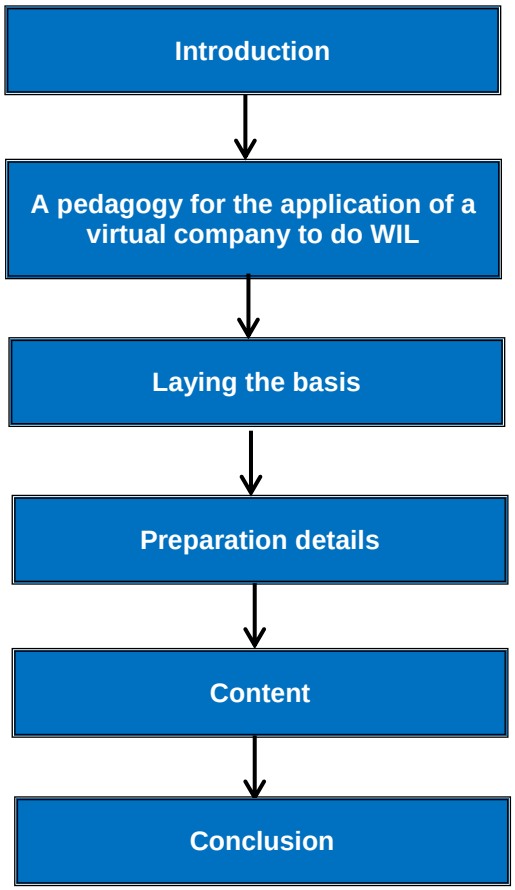

Figure 6.1: Outline of Chapter 6

6.1 Introduction

In this chapter, SRQ6 and SRQ7 are answered (see sections 7.3.6 and 7.3.7).

The aim of institutions of higher learning is to deliver graduates with an array of professional, social and personal capabilities (Jacobs, 2015). These skills should be adopted in the application of WIL practices, as these approaches have recently gained momentum in the higher education landscape. This includes the development of WIL from its earliest beginnings to the status of a new enterprise on campus (Swirski & Simpson, 2012). There is a growing interest in WIL and its likely impact on student development to deliver employable work-ready graduates with an ability to transfer the classroom knowledge and skills to the workplace (Freudenberg et al. 2010:42). Consequently, universities have introduced programmes to provide undergraduate students the opportunity to gain business and real-world experiences by undertaking WIL as part of their qualification (Leong & Kavanagh,

2013). The goal of offering WIL is to have graduates starting their journey at a workplace, ready to contribute fully to the company (Richardson et al., 2013). WIL also aims to eliminate the gap between the skills expectations that employers have of graduates and the actual skills that graduates possess when entering the world of work (Leong & Kavanagh, 2013). In the instance where students struggle to find company placement for WIL, as in this study, the introduction of a virtual company on campus where these same aims can be met as in a real company, may provide a solution to delivering employable graduates to the world of work.

WIL is considered an excellent tool to ensure graduate job-readiness as it is believed to increase self-confidence in students' capabilities towards success in industry (Billet 2011; Clinton & Thomas 2011). A WIL approach equips students with a better understanding of the nature and standard of the skills required in industry (Gamble et al., 2010) together with a comprehensive appreciation of the world of work (Wilton 2012). Specifically, WIL is perceived as enhancing the employability of graduates by developing appropriate skills (Yorke 2011). Any approach to a creative pedagogy used on campus should therefore focus on teaching students appropriate skills so that they are employable, regardless of not having worked in a real company for their final (WIL) module. The requirement an approach to a creative pedagogy will be expected to fulfil is that the approach, applied as a simulated environment in the form of a virtual company on campus for the Wil module, be used to deliver graduates who 'worked' in the virtual company with the same achieved skills as students who completed their in-service training at companies.

Expecting all students in the IT qualification to do in-service training at a company or making in-service training at a company a compulsory part of the qualification, is problematic. There are some students that simply cannot find placement at a company due to limitations in the availability of such positions in a particular semester. It is therefore of the utmost importance to offer students an alternative that will provide them with the same benefits as students who do find placement for WIL at a company.

The capacity of universities to deliver employable students has been reported to be advantageous to universities in terms of course demand, retention rates and reputations (Orrell, 2004). In support of this, Pilgrim (2012) suggests that WIL is inclusive of various activities and approaches that include industry placements, internships and industry projects. These activities aim at enhancing the professional practice capabilities of students. Students participating in a WIL programme have been viewed as having greater employment opportunities in a competitive labour market (Cameron, 2013). A caution expressed by Jackson (2013) points to the notion that WIL does not consistently produce enhanced skills outcomes. In the current study, placements, internships, industry projects and other methods will be implemented as part of the virtual company.

6.2 An approach to a pedagogy for the application of a virtual company for WIL

The three themes developed in the previous chapter (see section 5.1) will be used to answer or inform some of the aspects in the proposed approach. These themes are: Virtual Company (laying the basis), Perceptions (details), and Curriculum value (content).

The basis of the framework of the doctoral thesis of Jacobs (2015) was used and customised for the purposes of this study. The framework, as developed by Jacobs (2015) and adapted for this study, is presented in Figure 6.2.

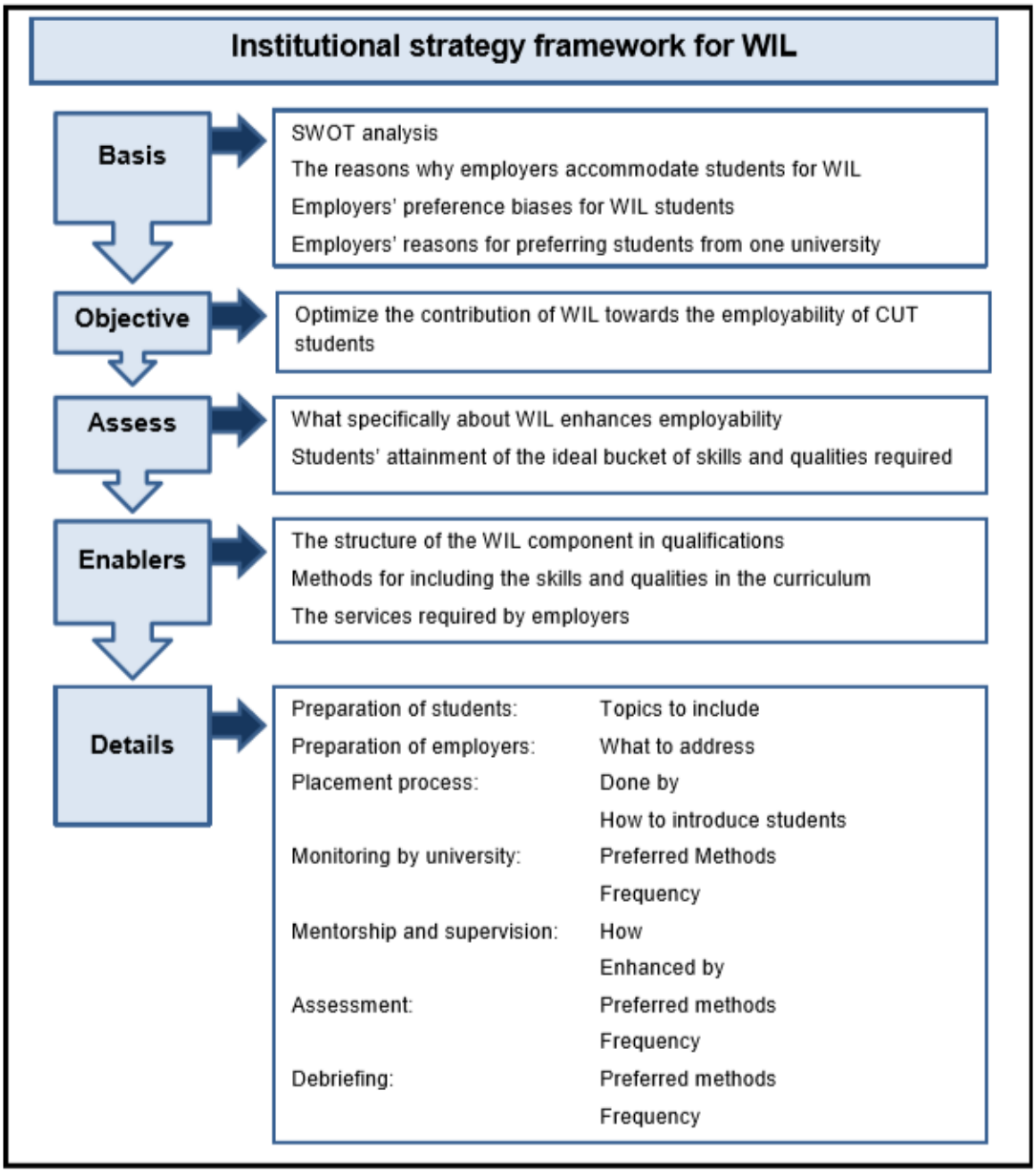

Figure 6.2: Institutional strategy framework for WIL (Jacobs, 2015:321)

Jacobs (2015) develop an institutional strategy framework for WIL around the principle of qualifications required to include a WIL component as part of the curriculum. This framework

was developed to provide the best possible dividends for Central University of Technology (CUT) where the study was conducted, as well as for the students and employers. The aim of this WIL framework is to use work-integrated learning to create a competitive advantage for CUT. To achieve this, the framework was developed to structure the WIL component in such a way that the employability of CUT students can be optimised through the inclusive and effective application of WIL. Jacobs (2015) presents the framework from the lowest level, the basis, where a SWOT analysis was done, to the objective of a WIL component in the curriculum, to an assessment of what makes students employable. The enablers of implementing a WIL component, and details such as the preparation of the students, monitoring by the university, and assessment strategies were then presented (Figure 6.2).

The proposed approach to a creative pedagogy will be presented as an inverted triangle (Figure 6.6). The approach focuses initially on general aspects, followed by detailed aspects of preparations that should be done and be in place for the approach to be implemented. The way educational content can be incorporated into the virtual company may then be introduced by building on the scaffolding provided with the first two layers. The first layer of the inverted triangle (Figure 6.3) deals with the rationale and theory of a virtual company. This would, of necessity, include important topics such as employer preferences and preferences of in-service company students as opposed to students who could not find company placement. In addition, the objectives of a virtual company require definition and clarity together with the skillset identified by potential employers.

After presenting this initial layer of the proposed approach to a pedagogy, the second layer (Figure 6.4) may be implemented. This layer contains the details of what should be in place for a virtual company to be successfully implemented in a higher education institution (Vaal University of Technology in this case). This practical layer in the implementation of the virtual company focuses on infrastructure, Finance, HR, legislative approval, and appropriate assessments. The third layer (Figure 6.5), in detail, follows when the second layer has been put into place. This layer deals with how academic content can be included in the proposed approach to a pedagogy.

The first layer of the proposed approach to developing a pedagogy (Figure 6.3) uses the Virtual Company theme to lay the basis for the rationale.

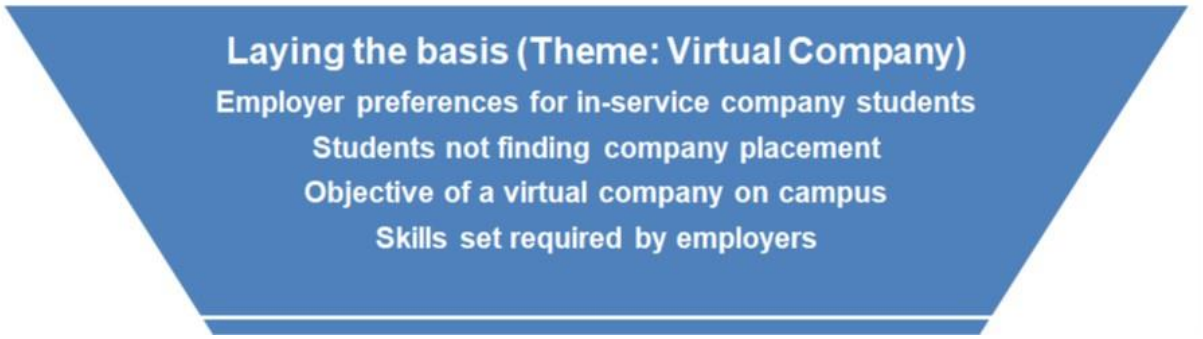

Figure 6.3: First layer of proposed approach to a pedagogy for a virtual company on campus

Each of the points as outlined in Figure 6.3 is discussed below.

6.2.1 Laying the basis

a) Employer preferences for in-service company students

It is important to note that the virtual company needs to address the reasons stated in the next few paragraphs so that employers will still be agreeable to take in students.

Reports by Gamble et al. (2010) and later by Gribble et al. (2014) suggest that many of the skills essential for graduates entering the workplace for the first time are not only learnt in the lecture room by covering academic content, but also through exploring a combination of intellectual reflection and critical thinking, and reaching cultural competence, which happens in any true working environment. According to Govender & Wait (2017), employers are particularly concerned about applying theory obtained at university to their employment requirements. Consequently, employers require higher educational institutions to provide a sound knowledge base to their graduates. Govender & Wait (2017) however also argue that the success of a graduate who are employed in any particular company or organisation is not necessarily guaranteed through a strong disciplinary content knowledge base. This challenge may be countered by in-service student placements, which is viewed as an approach to improve students' work readiness, employability and the ability to transfer theoretical knowledge into practical implementation. Such a view suggests that instruction in the classroom alone does not necessarily deliver graduates who are work ready. Encouraging students to learn for performance has therefore been proposed as crucial to developing graduates who have the desired work ready and employable profile (Govender & Wait, 2017).

The offering of work-based learning and WIL are becoming more popular within tertiary institutions, including South African higher education Institutions. The benefits of in-service company placements include work ethics and academic, career and personal benefits, in addition to encouraging HEI partnerships with business and industry (Matoti et al., 2011). Of

South Africa's population of approximately 50 million, almost 70% have been reported to be under the age of 35 (Govender & Wait, 2017). In their publication, Govender & Wait (2017) motivate the important role HEIs are required to play in delivering work-ready, employable graduates. In the same study, Govender & Wait (2017) report that students who partook in an in-service student placement programme indicated that the acquisition of enhanced knowledge and skills are needed for their respective disciplines. Students who were interviewed also rated their WIL experience as rewarding. This evidence points to the notion that knowledge of the environment and expectations gained through the unique experience in the workplace that in-service training offers, enhances the personal development of students. An additional factor that argues for in-service company placement is that the knowledge and skills gained by such employment opportunities result in graduates who are better prepared and equipped for the working world. For students who cannot find in-service company placement, an equivalent alternative should be provided on campus. This approach may serve to offer similar benefits to the on-campus group as those enjoyed by the in-service group.

Finally, Orrell (2018) found that universities perceive the inclusion of in-service company placement into their programmes as one way of attracting students who have the potential to complete their degrees and contribute effectively to industry. Thus, in-service training also implicitly becomes the vehicle for marketing strategies for graduate employability.

b) Students not finding company placement

The expectation of all WIL students finding in-service placement at any given company or having company placement as a compulsory component of the IT qualification is problematic. Some students are not placed at companies due to limited availability of such positions in a particular semester. International students are also deprived of an opportunity to engage in company placement, as study visas limit these students to employment of not more than twenty hours per week (SouthAfrica.info, 2016). Orrell (2018) suggests that a possible reason why employers are not always enthusiastic about in-service training may be the lack of a clear understanding of what WIL offers. In addition, employers expressed reservations about the possible return on investment of the cost of supporting in-service students, but more importantly, an unwillingness to employ students with low social capital or disabilities. This is effectively argued by Orrell (2018) in that the sentiment mirrors the difficulties students from disadvantaged backgrounds experience in finding graduate level employment. These challenges therefore place the obligation on HEIs to provide inclusiveness and equity (Orrell, 2018). It would thus be appropriate to suggest a partnership arrangement between HEIs and industry to counter the current situation and provide broader WIL opportunities.

c) Objective of a virtual company on campus

Sixsmith & Litchfield (2010) found that when WIL students are placed in companies for applicable work experiences, it improves their general skills development and understanding of business practice. As not all WIL students are able to find company placement, opportunities to develop their general skills should be provided in the curriculum. Simulating the work environment to enable students to experience aspects of the workplace within an educational framework may be an opportunity for these students (Sixsmith & Litchfield, 2010). A simulated working environment for mastering professional and graduate attributes, which arguably is not identical to in-service company placement, may not necessarily replace experiences obtained through these placements. It is, however, of importance to note that a virtual company is not only necessary, it also offers a valuable addition to the student group unable to find placement in appropriate companies (Sixsmith & Litchfield, 2010; Ferns et al. 2014). To this end, Coldwell-Nielson & Craig (2012) suggest that the (WIL) curriculum content developed for a simulated environment should cover the professional and graduate skills taught in exposure to in-service training at companies. The objective of a simulated environment is to facilitate learning comparable to in-service training to enable a larger number of employable students to graduate. Because not all WIL students find company placement, the proposed virtual company may be used as a 'stand-in' to provide all students with equal experiences and enable them to graduate with similar acquired skill sets.

d) Skills set required by employers

Jacobs (2015) describes an ideal list of qualities and skills as identified by employers, and which such employers deemed as important for placing students in companies. The skills set include:

- Attitude
- Subject matter expertise
- Work ethics
- Communication
- People skills
- Professional behaviour

This corresponds well with the results of this study where the skills identified by the employers as 'non-negotiables' resort in the soft skills category. These were mainly communication skills and professional behaviour, such as punctuality. Employers are thus perceived as valuing graduate students with positive attitudes, well-rounded business conduct skills and subject matter expertise. The data of the current study underline these skills as the sought-after skills. These are outlined in Table 6.1.

Table 6.1: Skills identified by employers as important to acquire (Section 4.5.5; Annexure G)

Skills description
Self-discipline
Negotiating skills
Technical mediation skills for contracted scope of work / area of responsibility
Ability to summarise technical issues and document such issues
General problem solving
Project domain knowledge – working in project teams – who does what in the project team, what the other team members will expect and demand, what the person can expect and demand in return
Software development lifecycle knowledge – what the stages in the SDLC are, what they mean, what is required of each stage, typical artefacts and documents of each
Testing – a good understanding of types of testing, when and why these are done, test plans, test cases and reporting
Frameworks, processes and the 'beyond UML' approach to modelling, data flow and process flow modelling – ask if you want more info
Creative ideation
Time keeping
Be prepared to go the extra mile

6.2.1.1 Guidelines to follow for "Laying the basis" layer

It is imperative to let institutions where this approach will be implemented understand why it is important for the students and the institution to have a virtual company on campus. By understanding that employers prefer students with some form of prior experience, and the skill set preferences employers have in the graduates they employ, institutions can contribute by delivering graduates who possess these attributes. The fact that not all students in a cohort can find placement should be emphasised as a major reason for implementing a virtual company on campus.

6.2.2 Preparation details

The next layer of the proposed pedagogy (Figure 6.4), is built from the theme that considered 'perceptions', together with aspects such as infrastructure, approval and assessment, which were adjusted from the framework of Jacobs (2015) (Figure 6.1).

Figure 6.4: Second layer of proposed approach to a creative pedagogy

a) Infrastructure

Physical infrastructural requirements dictate the need for a venue to accommodate at least 100 students per semester. This venue may be converted into open plan offices or closed cubicles simulating working spaces, as can be seen at Precision Group (2016a). Part of the present study included paying visits to IT companies in order to observe current trends. An open office design with easy collaboration between workers appears to be a preferred and appropriate approach in the IT environment. It is suggested that the simulated training venue is used for the exclusive use of WIL students undertaking this form of training, and may not be shared with other students. Of necessity, the venue will be used throughout the day, where students are considered to be employees of this virtual company. Students would be expected to maintain working hours as in any IT company. The most advanced computers and internet access will be non-negotiable. The current study reveals that the students, lecturer and employers perceived in-service training students to be more prepared for the world of work after graduation. It is therefore worthwhile to have a venue on campus where a similar experience can be offered to students who cannot find company placement, thereby enabling them to also to be more employable.

b) Finance and HR

Initial financial commitments for the proposed virtual company will include infrastructural costs, the costs of computer and other office resources and their maintenance, venue maintenance, and the servicing of equipment and personnel costs (Director and assistant). Thereafter, the daily maintenance and running costs per annum should be incorporated into a five-year plan. Furthermore, the virtual company will require seed funding to initiate this WIL programme inclusive of all costs. The virtual company will also be expected to develop a business plan over a five-year period with the aim of becoming a financially viable centre or entity on its own. An opportunity therefore exists for this virtual company to consider the creation of a centre of excellence.

Human Resource requirements will include the Director/lecturer (who should be an academic with business/industry experience) and an assistant as permanent staff. Their functioning will be exclusive to the virtual company and will not be part of any other subject offerings on campus. The Director/lecturer acts as the Manager (referred to as the Company Director) of the virtual company. The Company Manager/Director/lecturer will be solely responsible for all student activities including assignments and academic processes such as theory, practice and assessments. The Company Manager/Director/lecturer will serve as a mentor and supervisor for students in the virtual company and reports to a Governing Body chaired by the Head of (the ICT) Department.

c) Mentorship and supervision

Analysis of student responses in the in-service training group worked for up to 50% of the time under the supervision of the mentor in the company (Table 4.32). In addition, according to Olson et al. (2016), it has been shown, that peer group-based, specialty-focused mentorship holds promise as a method for enhancing student learning. It will therefore be appropriate for the virtual company to have a mentor/supervisor available for students at all times, and students will be taught and equipped to act as peer mentors for each other.

d) Assessment

The assessment of employability skills has been viewed as a difficult task, as behaviour patterns or actions cannot always be clearly specified (Knight, 2007). Assessment methods should therefore be carefully considered with leeway exercised to avoid strict measurement-based approaches. Academics are thought to be more comfortable in assessing academic course content with clearly defined norms in contrast to generic skills (Yorke, 2011). Yorke (2011) called for a paradigm shift in the assessment methodology used in WIL assessments, as WIL is viewed as part of a qualification. Consequently, this author has suggested an equivalent to formal structures within university training where assessments are well planned. Furthermore, Riebe & Jackson (2014) acknowledge the difficulties in measuring skills performances. However, they suggest that assessments should clearly outline the specific nature of the proposed ability, or behaviours, and the level of performance expected. Whilst Riebe & Jackson (2014) express support for the use of standardised rubrics in assessments, they caution the use of such tools due to the variation in skills assessments. A comparison was done by Jaekel et al. (2011) on assessment tools used in WIL across different disciplines. Jaekel et al confirm the importance of consciously aligning assessment activities to learning outcomes. This can effectively be achieved by using methods that focus on issues such as instilling a culture of self-reflection.

Additional criteria to be used may include aspects requiring peer assessments and feedback, reviews of portfolios, checklists, and self-assessments. To these, Martin et al. (2011) suggest

additions of blogs, e-journals, diaries, commentaries and emails. A study by Bandaranaike & Willison (2011) found that continued direct dialogue between the student and assessor is an important aspect of assessing WIL outcomes. The process of continued dialogue is defined as 'motivational interviewing', such that students are expected to reflect on their performance with the view to identifying their own strengths and weaknesses. Bandaranaike & Willison (2011) further suggest that the process has the ability to evoke lifelong learning through a continual cycle of change and improvement and in addition, improve student communication skills. In the virtual company scenario envisaged, students will undertake group work as is the current situation with WIL in the IT qualification. However, the group work activity will be performed within the simulated 'workplace', supervised and monitored by the Company Manager. Daily contributions/assessments will be required and will count towards the final mark.

This study reveals that lecturers perceived group work assessments alone to be inadequate as a form of student evaluation. It is however still important to include group work as part of the activities in the virtual company, as indicated by Šerić & Praničević (2018) who state that working in groups has become a crucial part of the success of every organisation operating in the global economy. Student responses elicited in the current study also show that group work cannot simply be abandoned. The business sector has started placing pressure on HEIs to align study programmes in such a way that it prepares students to become effective team players (Šerić & Praničević, 2018). To be able to teach students the skill of being an effective team player, as sought after by the business sector, group work still needs to be incorporated into the WIL curriculum and should be monitored closely so that all students contribute towards all activities. Furthermore, to facilitate good learning practices and specific learning objectives of the simulated environment, students will be expected to report on their progress, together with the preparation of documentation and the development of (part of) a system, on a regular basis. In assessing student performance, their participation in determining and development of aspects of the curriculum will be a requirement (defined as co-construction by Craft et al., 2014). The virtual company lends itself well to this concept where students can identify projects to suit their own interests, facilitated within the context of the simulated company. Student ownership of individual or group projects will be emphasised to enable a trusting, engaging environment. Thus, the expectation will be that students are in control of their own learning. Furthermore, to simulate the working environment, decision making controls may be entrusted to those participating in the simulated company with the important rider that they are responsible for any of the consequences of their decisions. Deliverables will be expected at the same level required with in-service company activities whereby an expectation for the virtual company group of students will be to engage in creative problem solving and exercising their skills of creative engagement, thereby rising to

the expectations (Craft et al., 2014). In addition, a portfolio of evidence will be required on a periodic basis. Evidence also points to limited potential for assessing individuals on soft skill competences and as such, the designing of WIL curricula will entail a focus on achieving these skills by employing a cohort model (Knight 2007). Quality assurance of the training in the simulated environment will, of necessity, be monitored by an Examinations Board, university and DHE structures, and the Board of Directors (discussed under point f below). These bodies will assess all theoretical and practical components, including an oral assessment focusing on communication skills, required by IT companies. All assessments will require the rigorous educational and learning specifications of a university.

A space for debriefing staff and students will be highly desirable as it allows for reflection on experiences by all involved (students, university personnel and industry expectations/ opinions/observations). The reflection will be on the involvement of industry in the formal assessments of student performance to provide feedback on the simulated WIL experiences and enable students and staff to learn from current and past experiences. The simulated environment approach will be an enabler to introduce adjustments or additional requirements/exposure, if necessary, through continuous monitoring of the programme and improving areas that may not be beneficial.

e) Preparation by working with employers

The success of a virtual company will depend largely on a solid working relationship between the HEI and IT companies. Of interest is the finding that IT company employers were positive in playing a significant role and contributing to training and support for students in the simulated environment (section 4.7). According to Smith et al. (2008), the quality of any WIL programme depends on the link between the virtual company who fills the needs of the academic discipline and industry who collectively contributes to the curriculum, thereby incorporating the expectations of both industry and the students. Cooperation between Industry and universities in creating a company that simulates real-world issues will ensure the success of this endeavour. Some comments made by employers who indicated their willingness to be part of the virtual company include:

> *"This concept is very likely to be developed and made a success. Personal experience where I have started two businesses within existing corporates proves that this concept will be based on similar principles."*

Some employer respondents indicated a willingness to assist in the start-up of a virtual company on campus. Such involvement will serve to focus closely on the virtual company efficiently simulating the in-service company experience. Other employers were in agreement with this a view. Two such comments serve to underscore the point. These are:

"I think it is a very good project. It should, however be close to reality and not just an extension of the diploma."

"With no disrespect to the academic staff intended at all and because of personal experience in this as a student, have as many industry people involved and assisting as possible. We are out there and many of us will help! Even though I'm based in the Cape I am willing to come onsite to assist if travel and accommodation costs are met. My company will allow me the time to assist with such."

f) Governance

The virtual company will be accountable to a Board of Directors that requires quarterly reporting. The Board of Directors will comprise representatives from the university, industry, users of IT services, and student and community representatives. The Board will be chaired by the academic Deputy Vice-Chancellor and oversees issues such as the academic enterprise and finance integration within university and business (industry) programmes, as well as ensuring that the virtual company students are adequately trained. Quality assurance of training in unison with the legislated educational structures will be a priority.

The adoption and implementation of the proposed approach for a virtual company within university structures will require all the necessary academic and legislative steps necessitated by statutory bodies, particularly with the Department of Education and industry.

6.2.2.2 Guidelines to follow for "Preparation details" layer

When this concept of a virtual company on campus is explained to institutions for consideration, the following should be considered: A venue on campus where a similar experience can be offered to students who cannot find company placement and thereby enabling them to also to be more employable, should be non-negotiable. Initial financial commitments for the proposed virtual company should include infrastructural costs, the costs of computer and other office resources and their maintenance, venue maintenance, and the servicing of equipment and personnel costs. In terms of human resource requirements, a Director/lecturer (who should be an academic with business/industry experience) and an assistant as permanent staff should be permanently assigned to the project. It will be appropriate for the virtual company to have a mentor/supervisor available for students at all times, and students will be taught and equipped to act as peer mentors for each other. In terms of assessment, the reflection method should be used on the involvement of industry in the formal assessments of student performance to provide feedback on the simulated WIL experiences and enable students and staff to learn from current and past experiences. Assessment should take place through continuous monitoring of the programme and improving areas that may not be beneficial. Management should be made aware that the success of a virtual company will depend largely on a solid working relationship between the

HEI and IT companies, and these relations should be nurtured. In terms of governance, the institution should understand and commit to the fact that the adoption and implementation of the proposed approach for a virtual company within university structures will require all the necessary academic and legislative steps necessitated by statutory bodies, particularly with DHET and industry.

6.2.3 Content

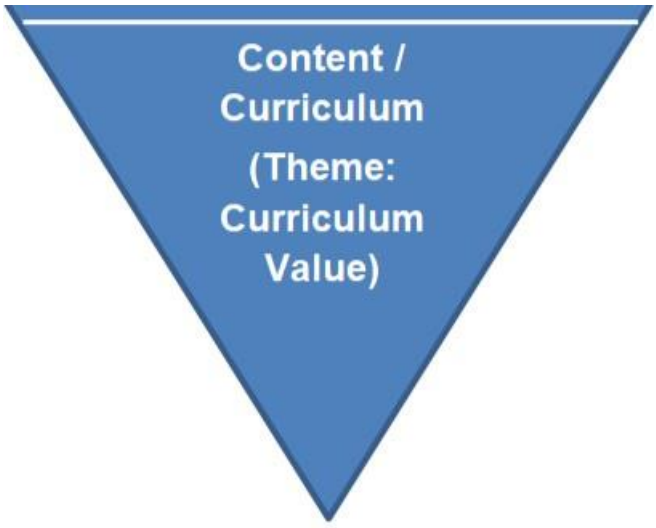

Figure 6.5: Third layer of proposed approach to a creative pedagogy

In general, the development of content for modules in a curriculum should focus on the current trends and developments in industry. The outcomes of modules need to be considered with these trend and developments as focal points.

Billet (2011) highlights the notion that learning in the workplace should be integrated with on-campus learning so that students become able to make associations between their theoretical learning on campus and their learning in the workplace, and to better understand the requirements of industry. This will enable students to effectively practice specific industry-related skills and knowledge (Billet, 2011). Billet (2011) identifies general principles for achieving this proposed integration, including the appropriate preparation of students prior to engaging in practice-based activities and the provision of opportunities to reflect on their experiences after each activity. According to Coll et al. (2009), to be able to foster integration there should be self-reflection prior to and post work-based activities. Coll et al. (2009) further maintain that institutions do not necessarily formally integrate workplace and on-campus learning, as institutions simply expect this to occur during the course of student training. In practices of reflection, however, learners are offered an opportunity to critically evaluate relevant learning activities, practice certain work-related procedures/behaviours, reflect on these activities, and actively understand how procedures work together to solve

work-related problems and shape workplace practice (Coll et al., 2009). There is however still uncertainty and limited understanding among practitioners on how best to achieve optimal learning transfer, with self-reflection as only one of the methods that has been explored (Eames & Coll, 2010). Emphasis is also placed on reflection as a tool to assist students in putting theory into practise (Bransford & Schwartz, 1999). Different reflection tools such as journals, portfolios, learning circles and critical incident analysis are viewed as important (Gray, 2007; Smith et al., 2010).

Paku & Lay (2008) suggest that the introduction of reflection tools may not guarantee student mastering of critical reflection, but the identification of strengths, weaknesses and future learning needs might be achieved (Boud, 2000). Yashin-Shaw et al. (2004) argue that reflection tools can assist students with transferring their skills successfully across different contexts. Cates & Jones (1999) suggest that for a successful WIL experience to take place, based on clearly defined expectations, the design of assessments and activities should consider the intended skills transfer, with formative assessments being part of the training approach. This view is supported by Jaekel et al. (2011), who undertook a multi-disciplinary review of WIL in the United States. Their study highlights the importance of assessable learning outcomes. In addition, Martin et al. (2011) identifies the importance of mentoring to achieve employability skills development in students. The authors furthermore found time management and autonomy to be the most profound.

More recently, Jacobs (2015) found that when students are exposed to the practical application of the theory, an enhanced understanding of the theory is noticed. Students also understand the implications of the application of theory. Three fields of learning were identified by Jacobs (2015):

a) practical application of theory learnt,
b) implications of theory application, and
c) abstract conceptualisation.

Jacobs (2015) emphasises that the goal of the three fields of learning being covered in the content is to ensure that students achieve deeper learning and a better understand of the subject matter covered throughout the qualification. In keeping with this approach, Pilgrim (2012) suggests that an outcomes-based approach to WIL with clear learning objectives needs to be adopted for WIL to be successful. In the evaluation of WIL programmes, Jackson (2015) found that evaluation methods remain predominantly outcomes-focused to enhance skills development, with little attention to the process of what, how and from whom students acquire essential skills during work placement in companies.

Opinions elicited from employers in this research suggest that some of the academic or theory components appeared to be unfocused. Their suggestions pointed to activity aspects that can be strengthened by implementing a virtual company (Table 4.21), including the ability to summarise and document technical issues, applying the software development lifecycle knowledge, a solid understanding of the types of testing, when and why testing done, test plans, test cases and reporting, as well as the ability to apply different frameworks and approaches. Employers were also of the view that for students to become employable, students should demonstrate an ability to produce quality documentation. This is exemplified in a quote from an employer who stated on the questionnaire that he:

> *"…agree(s) on the quality of the documentation and all products that need to be produced, etc."*

and

> *"They MUST be able to put their argument down logically, be able to report on something in a clear and logical manner and write technical and business centric documents. No one can better 'technical author' his or her code than the developer who wrote it…"*

In addition, employers also indicated a need for soft skills training (Table 4.21). It is therefore important that together with the implementation of content in proposed virtual company, a substantial focus should be on soft skills. The exit level outcomes (ELOs) of the qualification that relates to implementing a virtual company are specified on the South African Qualifications Authority's website (SAQA, 2018):

- "Communicate effectively with all role players related to the ICT field the learner will operate in
- Analyse the role of ICT and its ethical conduct in modern business environments
- Produce a suitable programming solution for a small business problem in a programming language of choice
- Solve problems and demonstrate creativity in the application of ICT concepts
- Demonstrate an understanding of project management principles; applying these principles in a project based or work-integrated learning modality within the specialisation
- Demonstrate knowledge and application of current technical concepts and practices in the ICT industry
- Demonstrate an understanding of security concepts applicable to the ICT industry in general

- Collaborate in teams to accomplish a common goal by integrating personal initiative and group cooperation in ICT projects
- Engage in a capstone project (independently or as part of a team) that demonstrates an understanding of the knowledge, techniques and skills covered in the relevant specialisation area of this qualification, producing a portfolio of evidence. The task chosen can be a project either in a simulated environment or as part of work-integrated learning
- Demonstrate an understanding of best practices and standards in the area of specialisation"

Consequently, all content and methods used in the virtual company will be required to adhere to the SAQA ELOs. By introducing students to 'work' in a virtual company, to participate in real-life issues, focusing on the development and production of documentation, and ensuring exposure to soft skills, all the stated ELOs are achievable. Through working with industry, real-life issues can be identified, which can then be explored by students in well-managed groups. The difference between working on projects in the virtual company and the project work currently done by on-campus by WIL students is that students will have specific guidelines linked to their responsibilities in the simulated environment. In this scenario, each student will receive a section of the problem to work on under the mentorship of a dedicated mentor available to manage the students' undertaking of projects. In addition to working on these problems, students will be expected to produce quality documentation (identified as a shortcoming in the current curriculum), as they progress. Some examples of how soft skills may be incorporated into the content include:

a) **Communication skills:** This can specifically be addressed by holding actual meetings with students in manageable groups and assessing them (together with mentoring) to ensure compliance with acceptable standards in terms of conducting themselves in meetings.
b) **Professional conduct, punctuality/timeliness, work ethics and team work:** Students can start with a mark of 100% and then be penalised when arriving late for 'work', submitting work late, or engaging in activities that are not acceptable in a real work situation. The scores obtained by each student for this component will then be included in the overall assessment.
c) **Setting up curriculum vitaes (CVs):** Workshops will be arranged to expose students to current trends in developing professional CVs. In this regard, a comment recorded from an employer is: "…when their CV is badly written, full of typing, spelling and grammatical errors then I despair…" This highlights the importance of assisting students in channelling them towards work readiness.

d) **Interview skills:** Mock interviews in 'fishbowl' environments will offer similar exposure to what students will encounter when seeking employment. This may be augmented by encouraging the use of on-line courses to enhance their interview skills. As suggested by Poppins & Singh (2005), students can apply for work in this virtual company, as for a real job. These students will then be assessed on their CVs and have actual job interviews, which will become part of their overall final assessment.

6.2.2.3 Guidelines to follow for the "Content" layer

In terms of content to implement in a virtual company, the focus should be on the soft skills as outlined above. Furthermore, the focus should be to give students relevant industry experience, which again emphasises the fact that there need be a continued relationship with IT companies.

The points raised contribute towards an approach to a creative pedagogy to improve the learner-content relation in ICT education in South Africa, in this case, the Vaal University of Technology in Gauteng, South Africa. The inverted triangle emphasises that the concepts of a virtual company should be put in place first before the details can be implemented. When the details of the first two layers are finalised, the third and final layer, Content/Curriculum, (which has the most detail) can be implemented.

Figure 6.6 shows the full inverted triangle with its three layers:

- **Layer 1:** Laying the basis (Theme: Virtual Company)
- **Layer 2:** Preparation details (Theme: Perceptions)
- **Layer 3:** Content Curriculum (Curriculum Value)

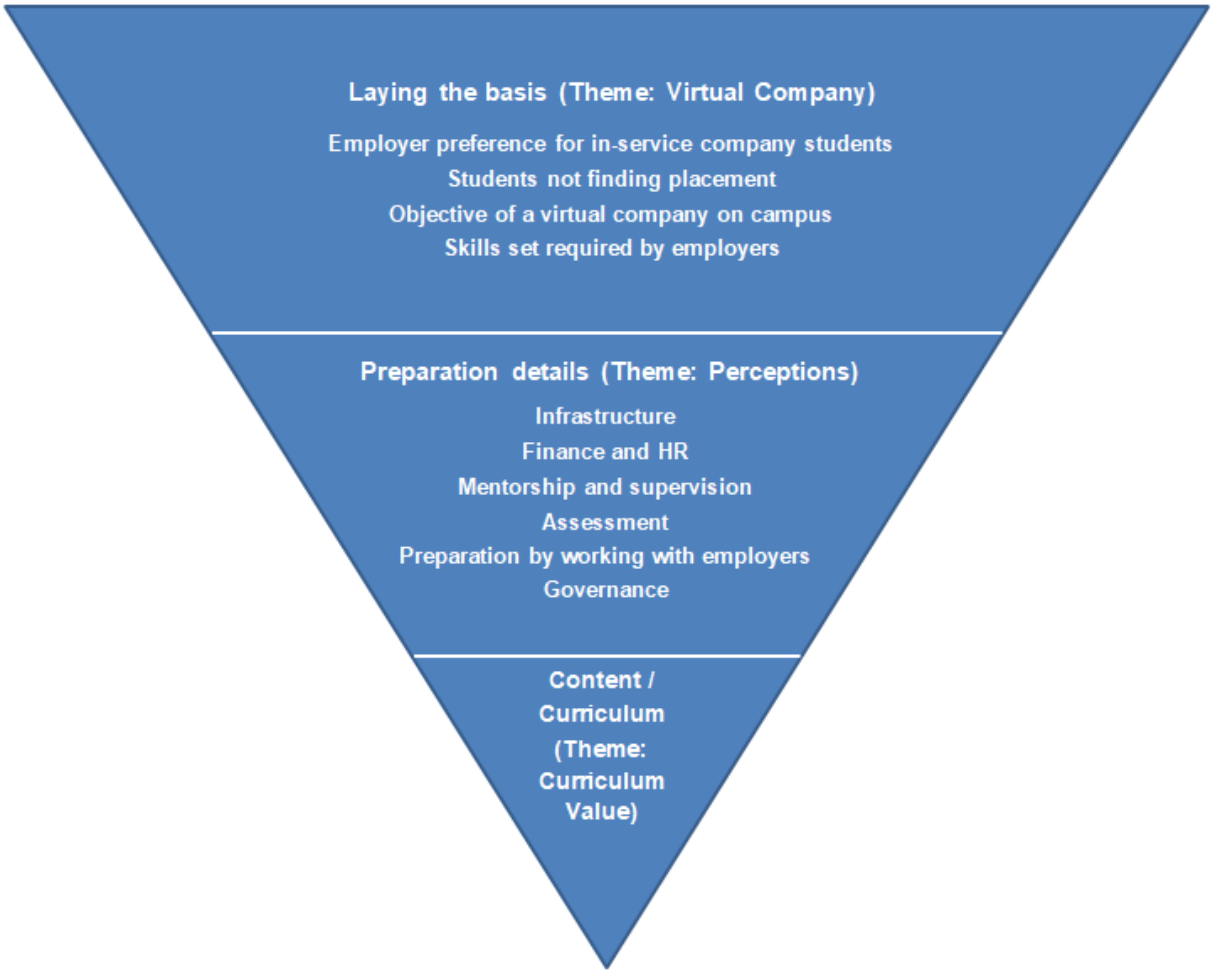

Figure 6.6: Approach to a creative pedagogy for a virtual company on campus

6.3 Theoretical and practical contribution of the research

This research is directed towards *value in use* and therefore contributes to the body of knowledge. The research attempted to investigate the detachment that exists between the work readiness of students in industry and those completing group projects on campus, and to ultimately make recommendations on how this separation can be addressed. Through this study, the above contributions have been addressed, and can be included in the body of WIL knowledge.

The study contributes to the existing body of knowledge by proposing an approach to a pedagogy that can be used to implement a virtual company on campus, thereby enabling the solving of real-world problems by WIL students who cannot find placement at companies (and who are consequently not work-ready). The study further aims to provide an understanding of the factors contributing to the successful implementation of a virtual company for WIL students on campus and a proposed approach to a creative pedagogy for the implementation of such a simulated company, as illustrated in the model presented in this chapter.

6.4 Conclusion

Through an in-depth literature review, analysis of data collected from responses to questionnaires by various role players and adapting the existing model of Jacobs (2015), an approach to a creative pedagogy to improve the learner-content relation of ICT education was proposed that can be used by VUT (the case of this research), to implement a virtual company based at the University. This will provide students registered for the IT qualification with an opportunity to experience work-integrated learning. According to Tharp (2018), an effective pedagogy has five standards. The five standards should be focused on when the actual virtual company an accompanying curriculum are developed. The standards are:

i) **Joint productive activity:** Joint activity and discourse to allow for the highest level of academic achievement, using formal, 'schooled' or 'scientific' ideas to solve practical, real-world problems. This standard will be achieved when students, together with their supervisor or mentor) engage in real-world problems.
ii) **Language development:** This standard is interwoven into all the activities, including the creation of CVs, interview skills and presenting their work coupled with regular discussions with the supervisor/mentor and fellow students.
iii) **Contextualisation:** The fact that students will be working on real-life problems will contextualise the academic component in applying theory to real-life situations.
iv) **Challenging activities:** Real-life problems given to students to solve are in essence challenging, thereby adhering to this standard.
v) **Instructional conversation:** The requirement for students to converse with the supervisor/mentor in stating their ideas on how to solve problems, with appropriate feedback from this supervisor/mentor will ensure that this standard is upheld.

In using the model of Jacobs (2015) and the standards proposed by Tharp (2018), as incorporated into the proposed model of this study, students might receive the opportunity to experience the world of work without having to find a job at companies or industry.

CHAPTER 7: CONCLUSIONS AND FUTURE IMPLEMENTATION

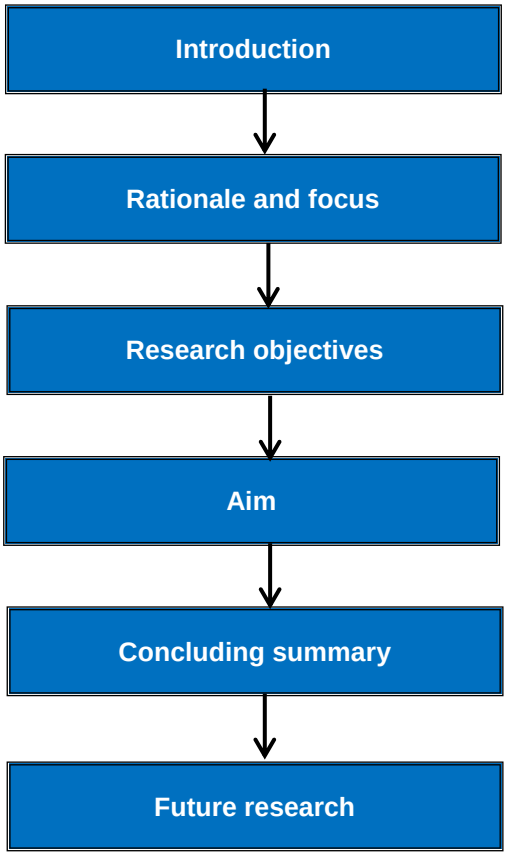

Figure 7.1: Outline of Chapter 7

7.1 Introduction

With the literature review done, reflection on this study and the analysis of the survey data completed, an approach to a creative pedagogy for IT WIL students at VUT needs to be contextualised with the rationale and objectives of the study. Therefore, the rationale and objectives of this study are presented through summaries of the key and pertinent concepts and issues identified in the literature review, data analysis and findings.

7.2 Rationale and focus

Tertiary education has been shown to strive towards and supporting both access and quality in education (Akoojee & Nkomo, 2007). To this end, it has been suggested that the role of lecturers and teachers should extend beyond offering subject content in the traditional teacher-centred way (Arendale, 1994). It is well documented that new creative ideas, concepts and strategies are embraced by students when they are located within the context of something familiar and for which there is immediate application (Higbee et al., 2005; Craft et al., 2014).

It is important to note that play, together with using simulation techniques in teaching and learning is commonly associated with younger children. It is therefore not surprising that most research on the efficiency of play in teaching and learning is based only on the young child (Whalen, 1995; Sally, 2003). However, one of the objectives of this study was to focus on the effectiveness of creative teaching methods on the adult learner using play-centred or simulation learning tools. More and more studies show a positive relationship between play and learning for the adult learner. Fallows & Steven (2000), Ott & Tavella (2009), Lewis et al. (2005) and Cremin (2015) support this finding by pointing out that in adult learning, the play factor seems to be more effective than most other motivators.

The value of creative tools in education has been promoted by numerous scholars (Garcia & Pintrinch, 1992; Jenkins, 2001; Pillay, 2002; Feldgen & Clua, 2004; Liu, 2005; Gee, 2007). Among emerging educational tools, creative tools such as game-based tools and the use of simulations are perceived to be a powerful and useful means of instilling greater motivation towards learning (Garcia & Pintrinch, 1992). This study therefore focused on a simulated working environment in the form of a virtual company for IT students in a tertiary educational setting.

7.3 Research objectives

The research objectives of this study were (see section 1.5):

- To investigate why creative pedagogies are increasingly needed in education
- To determine what characteristics should be incorporated into a creative pedagogical approach
- To investigate how WIL is applied in tertiary education
- To determine what the perceptions of tertiary learners, lecturers and employers will be in accepting a creative pedagogical approach in their learning WIL experience to prepare them for the world of work
- To determine what skills a creative learning pedagogical approach should address for WIL, on campus in a simulated company environment
- To determine the factors that may influence the success of creative learning in WIL, on campus in a simulated company environment
- To determine how these factors can be incorporated into an approach to a creative pedagogy for WIL, on campus in a simulated company environment

Each of these objectives together with the corresponding SRQs is discussed in detail in the sections that follow.

7.3.1 The increasing need for creative pedagogies in education

SRQ1: Why are creative pedagogies increasingly needed in education?

This research question was answered in the literature review presented in Chapter 2. In section 2.2 it was stated that the educational problems and difficulties experienced in the current educational landscape are attributed to the consuming and overwhelming character of education (Ageyev, 2012). To overcome this problem, Ageyev (2012) argues that education should move from education based on the consumption of knowledge to education based on creativeness, i.e. self-dependent creation of the new knowledge. Craft et al. (2014:18) state that the emphasis of a creative pedagogy should involve an "imaginative and innovative arrangement of curricula and teaching strategies in school classrooms' to develop children's creativity". Although the study of Craft et al (2014:18) was conducted at a primary school, it still rings true for higher education. A virtual company experience offered in the final (WIL) module of the IT qualification where students learn through real-life problem solving in creative ways will provide a similar learning platform.

Studies in the use of creative pedagogies mainly focus on teaching and learning situations in basic education (Lin, 2011; Davies et al., 2013; Kuntz et al., 2013; Craft et al., 2014). Fewer studies have been conducted for using creative pedagogies in higher education (Cochrane et al., 2014). Cochrane et al. (2014) focus on the development of creative thinking in higher education and found that the most valued attributes of higher education graduates to potential employers are that they are creative, self-directed and can work effectively in teams. The authors further argue that an education system focusing only on delivering content and learning measured by examinations does not inspire creativity (Cochrane et al., 2014). The implementation of a creative pedagogy in higher education should concentrate on a rounded approach to education, focusing on the learner becoming part of a professional community (which can be simulated on campus), where learners can excel in knowledge and performance to become part of the community they will work in. Cochrane et al. (2014) indicate that a framework for a rounded approach should focus on using creative pedagogies within the context of the curriculum.

Studies seem to focus on how to improve creativity (Lin, 2011; Cremin, 2015), how to develop creative thinking (Yang, 2012), the development of creative skills (Davies et al., 2013), how to foster creative thinking and creative behaviours (Newton, 2013), and creative writing practices (Edwards-groves, 2012). Furthermore, the studies on creative pedagogies concentrate on using computers as simulated environments or introducing computers into the learning environment, such as digital game-based learning (Young, 1995; Yang, 2012) and the use of mobile devices in teaching (Cochrane et al., 2014). Kuntz et al. (2013) found

that teachers or lecturers obliged to teach scripted curricula and discouraged from engaging as critical thinkers are denied the creativity involved in problem-solving. To allow and encourage such creativity among teachers, teachers should be encouraged to exercise their own creativity to continue investigating established knowledge and to critically evaluate established truths, including approaches to teaching (Kuntz et al., 2013).

7.3.2 Characteristics to be incorporated into a creative pedagogical approach

SRQ2: What characteristics should be incorporated into a creative pedagogical approach?

SRQ2 was answered in the literature review presented in Chapter 2. Craft et al. (2014) identified a number of characteristics or standards required to implement creative pedagogies (section 2.2; section 6.3). These characteristics can be applied to a simulated working environment for higher education students as well. Craft et al.'s (2014) characteristics are as follows:

Characteristic 1: Co-construction

Co-construction implies moving away from teaching a prescribed curriculum towards the students participating in determining aspects of the curriculum that acknowledge their interests. Tharp (2018) explains this as a joint productive activity that should be included in any pedagogy.

Characteristic 2: Student ownership

The emphasis needs to be on providing a trusting, engaging environment, encouraging student decision-making, thereby offering them ownership and control over their learning. Tharp (2018) suggests that instructional conversation will lead to student ownership.

Characteristic 3: High expectations

Students are expected to engage in creative problem solving and in having high expectations in their creative engagement skills (Craft et al., 2014). According to Tharp (2018), challenging activities should be incorporated into a pedagogy, which will in turn foster high expectations.

Additional characteristics suggested by Tharp (2018) include language development and contextualisation.

Kirkpatrick & Garrick (2001) (section 2.5), recognises that workplace characteristics such as culture, structure, management and systems are central to the nature and scope of learning. The university plays a role in setting targets in terms of the requirements for the student's learning and experience.

According to responses received from employers (section 4.7), a good working relationship between the department running the 'pedagogical approach' and industry should be fostered whereby Industry provides real-life scenarios and problems to solve, among others.

The approach to a creative pedagogy proposed in this thesis is therefore not necessarily to create or develop creativity in students, but to transform the current *status quo* of how WIL is offered into a creative, virtual company to teach students real-world experiences in order to adequately prepare them for a career in ICT after graduation.

7.3.3 The application of WIL in tertiary education

SRQ3: How is WIL applied in tertiary education?

This research question was answered in the literature review presented in Chapter 2. Currently, a variety of WIL programmes are offered by various institutions worldwide (Rowe et al., 2012). Each programme has unique benefits and disadvantages in the context of an ICT curriculum as outlined in a) to e) below.

a) The ad-hoc approach

This approach expects students to find employment/placement themselves. There is no specific curriculum to be followed in the workplace; students are expected to learn as each day progresses and learning opportunities present themselves. The core understanding in this scenario is that students first gain knowledge and skills from subjects undertaken at university and then learn to apply these in practice (Reeders, 2000). This is the most used model for ICT education ay UoTs in South Africa. A distinct hurdle with this model is that many students do not find company placement within the immediate vicinity of the university, or do not find placement at all. Many companies are only willing to place students who already completed their undergraduate qualification. The challenge with this situation is that students are required to undertake WIL as a necessary component to acquire his/her IT qualification.

b) Co-operative education

This is a contractual agreement between the university and an outside agency (Abeysekera, 2006). The university, through a central office, finds in-service placement for students at appropriate agencies or companies. Students usually alternate between work and the classroom. This enables students to complete the theoretical component on campus, followed by WIL. This model is however not currently used for UoTs in ICT education in South Africa, as it is not compulsory for students to do WIL at companies in order to obtain their qualification. Nevertheless, the model is used in qualifications such as Engineering, Biomedical Technology and Computer Systems Engineering. The advantage of this model is

that students find placement using the strength of the institution's reputation and recommendation rather than attempting to convince a corporate of the merits of his/her own abilities. However, some students still remain without placement for a number of reasons, but mainly due to the unavailability of posts. Consequently, students not finding placement in the specified time are not allowed graduate until such placement becomes available and is completed.

c) Development of work-based programmes for organisations

This programme focuses on the institution as an agent for change rather than an inactive recipient of industry demands. The model recognises that workplace characteristics such as culture, structure, management and systems are central to the nature and scope of learning (Kirkpatrick & Garrick, 2001). The university plays a role in setting targets in terms of the requirements for the student's learning and experience.

d) Workplace-based programmes

In this model the qualification is taught in the workplace. Students do not attend classes at a university – all learning takes place in the workplace (Abeysekera, 2006). The model is not used for IT qualifications at UoTs in South Africa. The appropriateness of a workplace-based programme in an undergraduate ICT qualification could be questioned (theoretical basis and broader background knowledge) if the majority of students in an ICT programme are employed on a full-time basis or as students in junior positions in firms.

e) Service learning

This approach focuses on work performed in an institutional setting, thus, no in-service placements take place. It is a carefully monitored service experience where the student sets intentional learning goals and reflects actively on what has been learnt throughout the experience (Abeysekera, 2006).

it is a difficult task to offer a single definition for WIL when the various types of WIL are described in terms of a frame of locality (Rowe et al., 2012), but it does provide a view to appreciate the purposefulness of particular activities. The current WIL model followed in the IT qualification of the Vaal University of Technology is closest to the ad-hoc approach where students are responsible for finding their own placement. Again, the fact that not all students manage to find placement at companies is problematical. Consequently, some students have a richer experience in their final (WIL) module of their IT qualification compared to their peers.

These models and the results emanating from the present study suggest that a service learning approach should be followed where work is performed in an institutional setting. This

institutional setting encapsulates a simulated environment in the form of a virtual company that will be run on campus, to simulate, as close to reality as possible, a working experience for all WIL students. This creative pedagogical approach will contribute to enhancing the learner-content relation of WIL students in tertiary ICT education, with a high probability of improving the work readiness of students after graduation.

7.3.4 Perceptions of tertiary learners, lecturers and employers in accepting a creative pedagogical approach in the WIL learning experience to prepare them for the world of work

SRQ4: What are the perceptions of tertiary learners, lecturers and employers in accepting a creative pedagogical approach in the learning experience to prepare learners for the world of work?

SRQ4 was answered in the analysis and findings of Chapter 4.

a) Students

Eleven of the 12 in-service training students (92%) felt they enjoyed the exposure and more relevant experience through working in industry compared to their peers who remained on campus working on projects in groups (Table 4.9). This sentiment is shared by 52% of the on-campus project students who they felt their fellow students in industry were better prepared than they are (Table 4.8). Only one (1) in-service student believed there is nothing more to gain by working in industry, while 11 of the 12 in-service students opined that they would not have learnt as much if they remained on campus to work in groups on a project (Table 4.9). This corresponds with in-service students who were asked if they felt they had gained more relevant experience by working in a company – 11 of the 12 students indicated that they have gained more relevant experience than they would have if they remained on campus for a group project.

The perception thus exists in the student groups that it is beneficial to be employed through in-service training rather than engaging in a group project on campus. The sentiment of students, whether on campus or in-service, is that in-service training is more valuable and adequately prepares students for employment and future career in ICT. Furthermore, student morale can be enhanced if there are WIL opportunities at HEIs that provide similar exposure to on-campus students than those placed in companies for in-service training. A similar study by Gledson & Dawson (2017) demonstrates that the introduction of a virtual project in the final year of the Architectural Technology undergraduate degree programme enhanced student learning and delivered on mastering the softer employability skills desired by industry. Likewise, in a study for teacher students, Howley et al. (2016) found that in-service

training during the course of tertiary education equipped students with the experience they require to become efficient in their profession.

b) Employers

Four (4) of the employers agreed that students who acquired some industry experience are better prepared for employment after graduation. All five (5) respondents felt that the proposal of creating a simulated working environment for students on campus can be a workable method to prepare students for employment post university training. Some of the positive responses include (Annexure G):

> *"It will be really helpful for students who cannot get placement to gain work experience and use this experience to get employed at a later stage."*

> *"This should be very helpful. They often land up in a working environment with theoretical knowledge, without practical experience. The people [who are] supposed to train them at the working place do not have the time to do so, seeing that they have their normal work to do. It then often happens that the students land up in an admin job, not getting the necessary exposure."*

There were, however, points of concern raised, including that students must be taught work ethics, punctuality and submitting work on time, and that business partners should be involved in making a the implementation of a virtual company on campus a success.

c) Lecturers

Lecturers perceptions were that a simulated environment on campus will more beneficial compared to the current situation where students who cannot find placement in companies work in groups to develop software systems. Lecturers also listed the skills or areas they view as 'non-negotiables' that should be incorporated into a simulated business environment on campus. Lecturer comments highlight the importance of incorporating soft skills into the curriculum. Comments focusing on the soft skills acquired when working in a business environment include aspects such as punctuality and adhering to deadlines and specifications. Academic knowledge specifically about business requirements gathering, system testing and implementation processes, was also mentioned as a requirement to be incorporated into the virtual company. Lecturers furthermore also felt that the virtual company should represent a real-life company as close as possible to legitimise the student experience.

7.3.5 Skills to be addressed by a creative learning pedagogical approach through simulating a virtual company on campus

SRQ5: What skills should a creative learning pedagogical approach address for WIL, on campus in a simulated company environment?

This research question was answered in Chapter 4 through the analysis of the data collected from different respondents on the aspects that are lacking in students who seek beneficial employment. Table 4.21 presents the skills viewed by employers as important to achieve success in the workplace and that should be incorporated as content in a virtual company on campus. These skills mostly resort in the soft skills category and include self-discipline, negotiating skills, technical mediation skills for contracted scope of work/area of responsibility, general problem solving, working in project teams, creative ideation, time keeping, and being prepared to go the extra mile. Academic skills that are also thought to require attention in preparing students for the world of work through a virtual company on campus include the ability to summarise technical issues and document such issues, software development lifecycle knowledge, having knowledge of performing and understanding software testing, and the implementation of different frameworks and processes in different scenarios.

7.3.6 To investigate the factors that may influence the success of the creative pedagogy for WIL, implemented as a virtual company on campus

SRQ6: What factors can influence the success of creative learning in WIL, on campus in a simulated company environment?

This research question was answered primarily in sections 4.7 and 5.5. The success of a virtual company will primarily lie on the shoulders of the person charged with this approach. In addition, the responsible trainer will be expected to be knowledgeable in the fields of business and IT. A virtual company should be managed with the assistance of business partners that will provide practical issues and expertise, with a commercial/industry focus closely resembling reality rather than merely an extension of the qualification. Students need to be provided with appropriate mentorship and supervision. The average time in-service students worked with a mentor and under supervision in in companies was up to 50%, as indicated in Table 4.32. It is therefore important to note that in a simulated environment, a mentor or supervisor should be available at all times to assist students with the same tasks they will be expected to perform in a company. Mentoring has been found to contribute to the retention and promotion of women in ICT (Johnson & Ridley, 2004; Logan & Crump, 2007).

Finally, employers felt that students were lacking mostly in the area of soft skills (see section 7.3.5). This needs to be addressed in the virtual company in order to be successful in preparing students for the world of work.

7.3.7 The incorporation of important factors into a creative pedagogy for WIL, on campus in a simulated environment

SRQ7: How can these factors be incorporated into an approach to a creative pedagogy for WIL, on campus in a simulated company environment, to adequately prepare students for the world of work?

As discussed in section 4.7, it is important that the person responsible for running a virtual company on campus needs to be knowledgeable in the fields of IT and business. In section 6.2.2 it was stated that the university implementing this approach needs to employ a person who will be solely responsible for managing the virtual company in order to ensure the success of implementation. The person in charge of the virtual company also has to be available to students in the capacity of mentor and supervisor in order to assist students with making the most of their experience in the simulated environment.

Industry participation and acceptance should be seen as crucial to the success of the virtual company. Industry needs to be a significant role player in training students to become employable graduates through providing real-life problems to students and bringing expertise to this virtual company. Nonetheless, the content development for this virtual company should be done in accordance with sound pedagogical standards and incorporate the issues presented by the employers of current graduates (Table 4.21; section 6.2.3).

7.4 Aim

The aim of this was to propose an approach to a creative pedagogy in the form of a simulated working environment on campus within a tertiary educational setting to contribute towards enhancing the learner-content relation of WIL students, in order to address student readiness for the world of work in an IT environment by providing the on-campus project students with an equal opportunity to those going into industry for their in-service training.

The primary research question, “What approach to a creative pedagogy will contribute to enhancing the learner-content relation of WIL students in tertiary ICT education in South Africa, thereby improving the perception of readiness of ICT graduates to enter the world of work?”, has been answered in detail in Chapter 6. The approach to a creative pedagogy has been presented as a simulated environment in the form of a virtual company on campus, adapted from Jacobs’ (2015) framework. The basics in terms of providing the basis for implementing a virtual company have been identified and discussed. Employer preferences for students who completed WIL have been elaborated on, together with the reasons why many students do not find company placement. The objectives of a virtual company were stated in accordance with the specific skills that need to be included in the implementation of

the virtual company. The preparation details (section 6.2.2) were discussed with inclusion of topics such as infrastructure, finance and human resources, approval processes, the preparation method to follow in working with employers, issues of monitoring, assessments and debriefing opportunities. Finally, the details of the content of the curriculum have been covered in section 6.2.3.

7.5 Concluding summary

The primary research question and aim of this study focused on determining what approach to a creative pedagogy can be proposed to enhance the learner-content relation of WIL training at tertiary education institutions in South Africa in order to enhance the readiness of IT graduates for employment by industry. The primary research question, “What approach to a creative pedagogy will contribute to enhancing the learner-content relation of WIL students in tertiary ICT education in South Africa, thereby improving the perception of readiness of ICT graduates to enter the world of work?”, has been answered in detail in Chapter 6. A framework has been presented in section 6.2.3.

The secondary research questions were answered, and the objectives were achieved through the development and presentation of a proposed approach to a creative pedagogy in the form of a virtual company on the campus of the Vaal University of Technology for the efficient training of Wil students to adequately prepare them for the world of work. SRQ1 was answered in section 2.2, where it has been shown from literature why creative pedagogies are needed in education. SRQ2, which considered the characteristics that should be incorporated into a pedagogical approach, was answered in section 2.2 (literature) and section 6.3 (empirical research). SRQ3, which covered the way in which WIL can be applied in tertiary education, was answered in the literature review in Chapter 2. This secondary research question covering the perceptions of learners, lecturers and employers in accepting a creative pedagogical approach (SRQ4) was answered through the analysis and findings in Chapter 4. Student perceptions were shown in table 4.8 and 4.9. Employer responses on their perceptions were encapsulated in annexure G, and student, lecturer and employer perceptions were presented in section 4.4. SRQ5 covering the skills needed to be addressed for WIL in a simulated company was answered in section 4.5. SRQ6 looked at the factors that can influence the success of creative learning in WIL, and was answered primarily in section 4.7 and section 5.5. For SRQ7, question was raised on how all these factors can be incorporated into an approach to adequately prepare students for the world of work. The primary sections used in answering this question are section 4.7, section 6.2.2, section 6.2.3 and Table 4.21.

By conducting this study, it was also possible to identify specific skills to better prepare students to become employable in the ICT industry. It was also found that employers prefer to employ students who already have gained some experience of the working environment. This preference of the employers can be provided through the implementation of a virtual company on campus, which makes it an ideal place for students to gain work experience.

7.6 Future research

Since this study was conducted on an institutional level with a single HEI as the case, and only for the IT qualification, a limited number of employers, lecturers and students were available to participate in the research. It is therefore recommended that further studies be conducted for a comparison between various qualifications. This will increase the number of employers, lecturers and students. Furthermore, the possibility exists that the specific skills identified in this study to better prepare students for the world of work can be into many (or all) subject areas of training. This can be investigated in future research.

REFERENCE LIST

Abeysekera, I. (2006) Issues relating to designing a work-integrated learning program in an undergraduate accounting degree program and its implications for the curriculum. *Asia-Pacific Journal of Cooperative Education.* 7(1). pp. 7-15. Available at: http://www.apjce.org/files/APJCE_07_1_7_15.pdf.

Ageyev, V. (2012) Psychological foundations of creative education. *Creative Education.* 3. pp. 1-9. doi:10.4236/ce.2012.31001.

Aggett, M. & Busby, G. (2011) Opting out of internship: Perceptions of hospitality, tourism and events management undergraduates at a British University. *Journal of Hospitality, Leisure, Sport & Tourism Education.* 10(1). pp. 106-113. doi:10.3794/johlste.101.310.

Akoojee, S. & Nkomo, M. (2007) Access and quality in South African higher education: The twin challenges of transformation. *South African Journal of Higher Education.* 21(3). pp. 385-399.

Alavi, M. & Carlson, P. (1992) A review of MIS research and disciplinary development. *Journal of Management Information Systems.* 8(4). pp. 45-62.

Ames, C. (1992) Classrooms: Goals, structures, and student motivation. *Journal of Educational Psychology*. 84(3). pp. 261-271. Available at: http://psycnet.apa.org/journals/edu/84/3/261/ [Accessed: 21 February 2016].

Amory, A. (2007) Game object model version II: A theoretical framework for educational game development. *Educational Technology Research and Development.* 55(1). pp. 51-77. doi:10.1007/s11423-006-9001-x.

Andersson, A. & Hatakka, M. (2017). Victim, mother, or untapped resource? Discourse analysis of the construction of women in ICT policies. *Information Technologies & International Development*. 13. pp. 72-86.

Andersson, C. & Palm, T. (2017) The impact of formative assessment on student achievement: A study of the effects of changes to classroom practice after a comprehensive professional development programme. *Learning and Instruction*. 49. pp. 92-102. doi:10.1016/j.learninstruc.2016.12.006.

Arendale, D. R. (1994) Understanding the supplemental instruction model. *New Directions for Teaching and Learning*. 1994(60). pp. 11-21. doi:10.1002/tl.37219946004.

Armatas, C. & Papadopoulos, T. (2013) Approaches to work-integrated learning and engaging industry in vocational ICT courses: Evaluation of an Australian pilot program. *International Journal of Training Research*. 11(1). pp. 56-68. doi:10.5172/ijtr.2013.11.1.56.

Bandaranaike, S. & Willison, J. (2011) Engaging students in work-integrated learning: Drives and outcomes. Paper presented at World Conference on Cooperative and Work-Integrated Learning, June 14-17, Drexel University, Philadelphia.

Bangert-Drowns, R. L. & Pyke, C. (2002) Teacher ratings of student engagement with educational software: An exploratory study. *Educational Technology Research and Development*. 50(2). pp. 23-38. Available at: http://www.jstor.org/stable/30221149.

Barnett, R., Parry, G. & Coate, K. (2001) Teaching in higher education change conceptualising curriculum change. *Teaching in Higher Education.* 6(4). pp. 435-449. doi:10.1080/1356251012007800.

Beard, C. & Wilson, J. P. (2006) *Experiential Learning: A best practice handbook for educators and trainers.* 2nd ed. London and Philadelphia: Kogan Page. doi:10.1080/0158037980200205.

Beiske, B. (2007) *Research methods uses and limitations of questionnaires, interviews, and case studies*. GRIN Verlag GmbH.

Bender, J. L., Cyr, A. B., Arbuckle, L. & Ferris, L. E. (2017) Ethics and privacy implications of using the internet and social media to recruit participants for health research: A privacy-by-design framework for online recruitment. *Journal of Medical Internet Research.* 19(4). p. e104. http://doi.org/10.2196/jmir.7029.

Bhattacherjee, A. (2012) Social science research: principles, methods, and practices*. Textbooks Collection*. 3. doi:10.1186/1478-4505-9-2.

Biggs, J. (2011) *Teaching for quality learning at university: What the student does*. McGraw-Hill Education (UK).

Billet, S. (2011). *Curriculum and pedagogical bases for effectively integrating practice-based experiences*. Strawberry Hills, NSW: Australian Learning and Teaching Council (ALTC).

Blaikie, N. (1993) *Approaches to social enquiry*. 1st ed. Cambridge: Polity Press.

Boud, D. (2000) Sustainable assessment: Rethinking assessment for the learning society. *Studies in Continuing Education*. 22(2). pp. 151-67.

Bunge, M. (2004) How does it work? The search for explanatory mechanisms. *Philosophy of the Social Sciences.* 34(2). pp. 182-210. doi:10.1177/0048393103262550.

Bunge, M. (2006) Chasing reality: strife over realism*. Canadian Journal of Archaeology*. 39(2). pp. 346-249.

Bransford, J. & Schwartz, D. (1999) Rethinking transfer: A simple proposal with multiple implications. *Review of Research in Education*. 24(1) pp. 61-100.

Braun, V. & Clarke, V. (2008) Using thematic analysis in psychology. *Qualitative Research in Psychology.* 3(2). Pp. 77-101. https://doi.org/10.1191/1478088706qp063oa.

Bryant, A. & Charmaz, K. (2007) The SAGE handbook of grounded theory. Los Angeles, CA: Sage.

Cameron, G. (2013) The vulnerable worker? A labour law challenge for WIL and work experience. *Asia-Pacific Journal of Cooperative Education.* 14(3). pp. 135-146.

Cascio, W. F. (2000) Managing a virtual workplace. *Academy of Management Executive*. 14(3). pp. 81-90.

Cates, C. & Jones, P. (1999) *Learning outcomes: The educational value of cooperative education*. Columbia, MD: Cooperative Education Association.

Cavanagh, J., Burston, M., Southcombe, A. & Bartram, T. (2015) Contributing to a graduate-centred understanding of work readiness: An exploratory study of Australian undergraduate students' perceptions of their employability. *International Journal of Management Education.* 13(3). pp. 278-288. https://doi.org/10.1016/j.ijme.2015.07.002.

Chamberlain, S. (2012) Developing reflection: A practice framework. *Proceedings*. The 2012 Australian Collaborative Education Network National Conference (ACEN), Geelong, 29 October – 2 November. pp. 26-32.

Charmaz, K. (2014) *Constructing grounded theory*. London: Sage.

CHE *see* Council on Higher education.

Clements, M. D. & Cord, B. A. (2011) Assessment guiding learning: Developing graduate qualities in an experiential learning programme. *Assessment & Evaluation in Higher Education.* 38. pp. 1-11. doi:10.1080/02602938.2011.609314.

Clinton, I. & Thomas, T. (2011). Business students' experience of community service learning. *Asia-Pacific Journal of Cooperative Education*. 12(1). pp. 51-66.

Cochrane, T., Antonczak, L., Keegan, H. & Narayan, V. (2014) Riding the wave of BYOD: Developing a framework for creative pedagogies. *Research in Learning Technology.* 22. pp. 1-14. doi:10.3402/rlt.v22.24637.

Cohen, L., Manion, L. & Morrison, K. (2007) Research methods in education. *British Journal of Educational Studies*. 55(4). pp. 469-470. doi:10.1111/j.1467-8527.2007.00388_4.x.

Coldwell-Nielson, J. & Craig, A. (2012) Preparing for WIL: Online career development for IT students. *Proceedings*. The 2012 Australian Collaborative Education Network National Conference (ACEN), Geelong, 29 October – 2 November. pp. 37-41.

Coll, R., Eames, C., Paku, L., Lay, M., Hodges, D., Bhat, R., Ram, S., Ayling, D., Fleming, J., Ferkins, L., Wiersma, C. & Martin, A. (2009) An exploration of the pedagogies employed to integrate knowledge in work-integrated learning. *Journal of Cooperative Education & Internships.* 43(1). pp. 14-35.

Collings, R., Swanson, V. & Watkins, R. (2014) The impact of peer mentoring on levels of student wellbeing, integration and retention: A controlled comparative evaluation of residential students in UK higher education. *Higher Education.* pp. 927-942. doi:10.1007/s10734-014-9752-y.

Collins English Dictionary. 2018a. In-service training. https://www.collinsdictionary.com/dictionary/english/in-service-training. [Accessed: 4 December 2018].

Collins English Dictionary. 2018b. Pedagogy. https://www.collinsdictionary.com/dictionary/english/pedagogy. [Accessed: 4 December 2018].

Collins English Dictionary. 2018c. Tertiary education. https://www.collinsdictionary.com/dictionary/english/tertiary-education. [Accessed: 4 December 2018].

Collins English Dictionary. 2018d. Transferable. https://www.collinsdictionary.com/dictionary/english/transferable. [Accessed: 4 December 2018].

Collins English Dictionary. 2018e. Information Technology. https://www.collinsdictionary.com/dictionary/english/information-technology. [Accessed: 22 April 2019].

Colvin, J. & Ashman, M. (2010) Roles, risks, and benefits of peer mentoring relationships in higher education. *Mentoring Tutoring Partnership in Learning.* 18(2). pp. 121-134. doi:10.1080/13611261003678879.

Cooper, L., Orrell, J. & Bowden, M. (2010) *Work-integrated learning: A guide to effective practice*. Abington: Routledge.

Corbin, J. & Strauss, A. (2015) *Basics of qualitative research techniques and procedures for developing grounded theory*. Thousand Oaks, CA: Sage.

Council on Higher education. (2011) *Work-integrated learning: Good practice guide.* HE Monitor. Available at: www.che.ac.za/sites/default/files/publications/Higher_Education_Monitor_12.pdf. [Accessed: 27 July 2017].

Craft, A., Cremin, T., Hay, P. & Clack, J. (2014) Creative primary schools: Developing and maintaining pedagogy for creativity. *Ethnography and Education.* 9(1). pp. 16-34. doi:10.1080/17457823.2013.828474.

Cremin, T. (2015) Perspectives on creative pedagogy: Exploring challenges, possibilities and potential. *Education 3-13.* 43(4). pp. 353-359. doi:10.1080/03004279.2015.1020632.

Creswell, J. W. (2012) *Educational research: Planning, conducting, and evaluating quantitative and qualitative research*. 4th ed. Boston, MA: Pearson.

Da Rocha, R. D. (2016) Interview on disadvantages of on-campus in-service training. Vaal University of Technology, South Africa.

Davies, D., Jindal-Snape, D., Collier, C., Digby, R., Hay, P. & Howe, A. (2013). Creative learning environments in education – A systematic literature review. *Thinking Skills and Creativity*. 8(1). pp. 80-91. doi:10.1016/j.tsc.2012.07.004.

Dean, B. A. (2015) *Learning on placement: A sociomaterial, practice-based approach to work-integrated learning*. University of Wollongong, Faculty of Business.

Department of Higher Education and Training. (2013) *White Paper for post-school education and training.* doi:10.5663/aps.v1i1.10138.

De Vaus, D. (2013) *Surveys in social research*. Routledge.

De Vos, A. S. & Schulze, S. (2002) The sciences and the professions. In De Vos, A. S. (ed). *Research at grass roots for the social sciences and human service professionals*. 2nd ed. Pretoria: Van Schaik. pp. 3-27.

Dewey, J. (1938) *Experience and education*. New York: Macmillan.

DHET *see* Department of Higher Education and Training.

Digital Academy. (2016) *Digital Academy*. Available at: http://www.thedigitalacademy.co.za/ [Accessed: 9 September 2016].

Dijkstra, J., Latijnhouwers, M., Norbart, A. & Tio, R. A. (2016) Assessing the "I" in group work assessment: State of the art and recommendations for practice. *Medical Teacher.* 38(7). pp. 675-682. doi:10.3109/0142159X.2016.1170796.

Douglass, A. G., Smith, D. L. & Smith, L. J. (2013) An exploration of the characteristics of effective undergraduate peer-mentoring relationships. *Mentoring & Tutoring: Partnership in Learning.* 21(2). pp. 219-234. doi:10.1080/13611267.2013.813740.

Dunlap, J. C. (2005) Problem-based learning and self-efficacy: How a capstone course prepares students for a profession. *Educational Technology Research and Development.* 53(1). pp. 65-83. doi:10.1007/BF02504858.

Eames, C. & Coll, R. (2010) Cooperative education: Integrating classroom and workplace learning. In Billett, S. (ed). *Learning through practice.* pp. 180-96. Dordrecht: Springer.

Edwards, D. & McMillan, J. (2015) Curriculum: Exploring work-integrated learning in Joining the Dots Industry - collaboration in the STEM curriculum. *Australian Council for Educational Research - Joining the Dots - Research Briefing.* 3(4). pp. 1-15.

Edwards-groves, C. (2012) Interactive creative technologies: Changing learning practices and pedagogies in the writing classroom. *Australian Journal of Language and Literacy.* 35(1). pp. 99-113.

Elnaggar, A. (2007). The status of Omani women in the ICT sector. *International Journal of Education and Development Using Information and Communication Technology.* 3(3). pp. 4-15.

Elo, S. & Kyngäs, H. (2008) The qualitative content analysis process. *Journal of Advanced Nursing.* 62(1). pp. 107-115. https://doi.org/10.1111/j.1365-2648.2007.04569.x.

Fallows, S. & Steven, C. (2000) Building employability skills into the higher education curriculum: A university-wide initiative. *Education + Training.* 42(2). pp. 75-83. doi:10.1108/00400910010331620.

Feldgen, M. & Clua, O. (2004) Games as a motivation for freshman students to learn programming. *Proceedings*. The 34th Annual Frontiers in Education (FIE 2004), Savannah, GA, USA, 20-23 October. IEEE. pp. 1079-1084. doi:10.1109/FIE.2004.1408712.

Ferns, S., Campbell, M. & Zegwaard, K. (2014) Work-integrated learning. *In* Ferns, S. (ed.), *Work-integrated learning in the curriculum*. Milperra, Australia: HERDSA. pp. 1-6. http://researchcommons.waikato.ac.nz/handle/10289/9196.

Ferns, S. & Zegwaard, K. E. (2014) Critical assessment issues in work-integrated learning. *Asia-Pacific Journal of Cooperative Education*, 15(3). pp. 179-188.

Fetters, M. D., Curry, L. A. & Creswell, J. W. 2013. Achieving Integration in mixed methods designs – principles and practices. *Health Service Resources*, 48(6):2134-2156.

Flick, U. (2009) *An introduction to qualitative research*. 4th ed. Sage.

Flick, U. (2014) *An introduction to qualitative research*. 5th ed. Sage.

Fong, M. & Sims, R. (2010). e-WIL in student education. *Interdisciplinary Journal of E-Learning and Learning Objects*. 6(1). pp. 45-60.

Fowler, F. J. J. (2013) *Survey research methods: Applied social research methods*. Los Angeles: Sage.

Fraser, W. & Killen, R. (2005). The perceptions of students and lecturers of some factors influencing academic performance at two South African universities. *Perspectives in Education.* 23(1). pp. 25-40.

Freudenberg, B., Brimble, M. & Cameron, C. (2011). WIL and generic skill development : The development of business students' generic skills through work-integrated learning. *Asia-Pacific Journal of Cooperative Education.* 12(2). pp. 79-93.

Freudenberg, B., Brimble, M. & Vyvyan, V. (2010) The penny drops: Can work-integrated learning improve students' learning? *e-Journal of Business Education & Scholarship of Teaching*. 4(1). pp. 42-61.

Gamble, N., Guinea, S. & Williams, P. (2012) Campus-based work-integrated learning: Opportunities for health education. *Proceedings*. The 2012 Australian Collaborative Education Network National Conference (ACEN), Geelong, 29 October – 2 November. pp. 98-102.

Gamble, N., Patrick, C. & Peach, D. (2010) Internationalising work-integrated learning: Creating global citizens to meet the economic crisis and the skills shortage. *Higher Education Research & Development*. 29(5). pp. 535-546.

Garcia, T. & Pintrinch, P. R. (1992) Critical thinking and its relationship to motivation, Learning strategies, and classroom experience. *Proceedings.* Contennial Annual Convention of the American Psychological Association, Washington, August 1992. pp. 1-19.

Garnett, J. (2012) Authentic work-integrated learning. In Hunt, L. & Chalmer, D. (eds). *University teaching in focus: A learning-centred approach.* pp. 164-179. Routledge.

Gee, J. P. (2007) *What video games have to teach us about learning and literacy.* 2nd ed. New York: Palgrave Macmillan.

Gergen, K. J. (2001) Psychological science in a postmodern context. *The American Psychologist*. 56(10). pp. 803-813.

Gerhardt, T. & Mackenzie-Philps, L. (2018) The challenges and opportunities of ICT in WIL: A case study among priests exploring the correlation and trajectory between effective WIL and ICT pervasiveness. *Higher Education, Skills and Work-Based Learning*. 8(4). pp. 408-421.

Gershenfeld, S. (2014) A review of undergraduate mentoring programs. *Review of Educational Research.* 20(10). pp. 1-27. doi:10.3102/0034654313520512.

Gewurtz, R. E., Coman, L., Dhillon, S., Jung, B. & Solomon, P. (2016) Problem-based learning and theories of teaching and learning in health professional education, *Journal of Perspectives in Applied Academic Practice.* 4(1). pp. 59-70.

Glaser, B. & Strauss, A. (1967) *The discovery of grounded theory: Strategies for qualitative research*. New York, VA: Aldine Transaction.

Glaser, B. G. (1978) *Advances in the methodology of grounded theory: Theoretical sensitivity*. Mill Valley, CA: Sociology Press.

Glaser, B. G. (2002) *Constructivist grounded theory?* [Electronic Version]. http://www.qualitative-research.net/index.php/fqs/article/view/825. [Accessed: 4 August 2018].

Glaser, B. G. & Strauss, A. L. (2009) *The discovery of grounded theory: Strategies for qualitative research*. Abingdon, Oxon: Transaction.

Gledson, B. J. & Dawson, S. (2017) Use of simulation through BIM-enabled virtual projects to enhance learning and soft employability skills in architectural technology education. In Gledson, B. J. & Dawson, S. (eds). *Building Information Modelling, High Performance Design and Smart Construction*. doi:10.1007/978-3-319-50346-2_6.

Goldkuhl, G. (2012) Pragmatism vs. interpretivism in qualitative information systems research. *European Journal of Information Systems.* 21(2). pp. 135-146. doi:10.1057/ejis.2011.54.

González-Alvarez, I., González-Alvarez, M. & Bermejo, M. (2011) Games in higher education. *Proceedings*. 3rd International Conference on Education and New Learning Technologies (EDULEARN11), Barcelona, Spain. 4-6 July. pp. 936-939.

González-González, C. & Blanco-Izquierdo, F. (2012) Designing social videogames for educational uses. *Computers & Education.* 58(1). pp. 250-262. doi:10.1016/j.compedu.2011.08.014.

Govender, C. M. & Wait, M. (2017) Work-integrated learning benefits for student career prospects – mixed mode analysis. *South African Journal of Higher Education.* 31(5). pp. 49-64. https://doi.org/10.28535/31-5-609.

Graduate Careers Australia. (2012). Australian graduate outlook survey 2009-2011.

Gray, D. (2007) Facilitating management learning: Developing critical reflection through reflective tools. *Management Learning*. 38(5). pp. 495-517.

Gribble, N., Dender, A., Lawrence, E., Manning, K. & Falkmer, T. (2014) International WIL placements: Their influence on student professional development, personal growth and cultural competence. *Asia-Pacific Journal of Cooperative Education*. 15(2). pp. 107-117.

Guest, G., MacQueen, K. M. & Namey, E. E. (2011) *Applied thematic analysis*. California: Sage.

Hainey, T., Connolly, T. M., Stansfield, M. & Boyle, E. A. (2011) Evaluation of a game to teach requirements collection and analysis in software engineering at tertiary education level. *Computers & Education.* 56(1). pp. 21-35. doi:10.1016/j.compedu.2010.09.008.

Hamilton, K., Morrissey, S. A., Farrell, L. J., Ellu, M. C., O'Donovan, A., Weinbrecht, T. & O'Connor, E. L. (2018). Increasing psychological literacy and work readiness of Australian psychology undergraduates through a capstone and work-integrated learning experience: Current issues and what needs to be done. *Australian Psychologist*. 53(2). pp.151-160.

Hanson, H. & Yoon, S. Y. (2018) *Idaho's educator landscape: How is the state's teacher workforce responding to its students' needs?* Regional Educational Laboratory Northwest, USA.

Harmse, A. (2018) Interview on disadvantages of on-campus in-service training. Vaal University of Technology, South Africa.

Harrison, C. J., Könings, K. D., Schuwirth, L., Wass, V. & Van der Vleuten, C. (2014) Barriers to the uptake and use of feedback in the context of summative assessment. *Advances in Health Sciences Education.* 20(1). pp. 229-245. doi:10.1007/s10459-014-9524-6.

Hasan, T., Marg, V. N. P., Ramaprasad, A., Singai, C. & Strategy, H. E. (2014) Rethinking higher education research: Ontology mapping of higher education systems. *Proceedings.* Higher Education Research and Development Society of Australasia (HERDSA) 2014, Hong Kong, 7-10 July, pp. 1-11.

Hatch, M. J. & Cunliffe, A. L. (2013) *Organisation theory*. 3rd ed. Oxford University Press.

Hevner, A. R. & Chatterjee, S. (2004) Design research in information systems. *Design Research in information Systems.* 28. pp. 75-105. doi:10.1007/978-1-4419-5653-8.

Higbee, J. L., Arendale, D. R. & Lundell, D. B. (2005) Using theory and research to improve access and retention in developmental education. *New Directions for Community Colleges.* 2005(129). pp. 5-15.

Hirschheim, R. A. (1992) Information systems epistemology: An historical perspective. In Galliers, R. (ed*). Information systems research: Issues, methods and practical guidelines*. London: Blackwell Scientific Publications. pp. 28-60.

Hodges, D. (2011) The assessment of student learning in cooperative and work-integrated education. In Zegwaard, K. E. & Coll, R. (eds). *International handbook for cooperative & work-integrated education*. 2nd ed. Lowell, MA: World Association for Cooperative Education. pp. 53-62.

Hodges, D., Eames, C. & Coll, R. K. (2014) Theoretical perspectives on assessment in cooperative education placements. *Asia-Pacific Journal of Cooperative Education.* 15(3). pp. 189-207.

Hofstee, E. (2009) Constructing a good dissertation: A practical guide to finishing a Master's, MBA or PhD on schedule. Sandton: EPE.

Holmes, A. M., Kinslow, R. & Pope, M. (2012) Learning integrated work: Inter-organisational collaborators reflect on provision of authentic virtual multimedia project experience. *Proceedings.* The 2012 Australian Collaborative Education Network National Conference (ACEN)*,* Geelong, 29 October – 2 November, pp. 120-124.

Holton, J. (2007) The coding process and its challenges. In Bryant, A. & Charmaz K. (eds). *The Sage handbook of grounded theory*. London: Sage. pp. 265-289.

Holton, J. A. (2008) Grounded theory as a general research methodology. *The Grounded Theory Review*. 7(2). pp. 67-93.

Hood, J. C. (2007) *Orthodoxy vs. power: The defining traits of grounded theory*. London: Sage.

Howley, P., Reynolds, R. & Southgate, E. (2016) The teaching discipline doesn't matter? An assessment of preservice teachers' perception of the value of professional experience in attaining teacher competencies. *Australian Journal of Teacher Education*. 41(10). pp. 30-47. doi:10.14221/ajte.2016v41n10.3.

Hunt, W. & Scott, P. (2018) Paid and unpaid graduate internships: prevalence, quality and motivations at six months after graduation. *Studies in Higher Education*. pp. 1-13. https://doi.org/10.1080/03075079.2018.1541450.

Isotani, S., Mizoguchi, R., Isotani, S., Capeli, O. M., Isotani, N., De Albuquerque, A. R. P. L., Bittencourt, I. I. & Jaques, P. (2013) A semantic web-based authoring tool to facilitate the planning of collaborative learning scenarios compliant with learning theories. *Computers and Education*. 63. pp. 267-284. doi:10.1016/j.compedu.2012.12.009.

Ivankova, N. V., Cresswell, J. W. & Plano Clark, V. L. (2012) Foundations and approaches to mixed methods research. In Maree, K. (ed). *First steps in research*. Pretoria: Van Schaik. pp. 261-290.

Ivankova, N. V., Creswell, J. W. & Stick, S. (2006) Using mixed methods in sequential explanatory design: From theory to practice. *Field Methods.* 18(3). pp. 3-20.

Jackson, D. (2013) The contribution of work-integrated learning to undergraduate employability skill outcomes. *Asia-Pacific Journal of Cooperative Education.* 14(2). pp. 99-115.

Jackson, D. (2015) Employability skill development in work-integrated learning: Barriers and best practice. *Studies in Higher Education*, 40(2). pp. 350-367. doi:10.1080/03075079.2013.842221.

Jackson, D. (2018) Developing graduate career readiness in Australia: Shifting from extra-curricular internships to work-integrated learning. *International Journal of Work-Integrated Learning.* 19(1). pp. 23-35.

Jackson, D., Fleming, J. & Rowe, A. (2018) Student transfer of skills and knowledge across university and work contexts. *Refereed Proceedings.* The 3rd International Research Symposium on Cooperative and Work-Integrated Education, Stuttgart, Germany. p. 65.

Jacobs, H. S. (2015) *A strategy to optimise the contribution of work-integrated learning towards the employability for students of the Central University of Technology, Free State.* PhD thesis, Central University of Technology.

Jaekel, A., Hector, S., Northwood, D., Benzinger, K., Salinitri, G., Johrendt, J. & Watters, M. (2011) Development of learning outcomes assessment methods for co-operative education programs. *Journal of Cooperative Education and Internships*. 45(1). pp. 11-33.

Jenkins, T. (2001) The motivation of students of programming. *Proceedings*. The 6th Annual Conference on Innovation and Technology in Computer Science Education (ITiCSE '01), Canterbury, UK, 25-27 June. pp. 53-56. doi:10.1145/507758.377472.

Johari, J. (2006) Interpretivism in Information System (IS) Research. *Integration & Dissemination.* 4. pp. 25-27.

John, E. D. (2011) The role of industry as a partner in providing innovative leadership to guide the education and training of a high quality workforce in a rapidly changing industry. *Bhavan's International Journal of Business.* 5(2). pp. 113-123.

Johnson, W. & Ridley, C. (2004) *The elements of mentoring*. NY: Palgrave Macmillan.

Jonassen, D. (2000) Toward a design theory of problem solving. *Educational Technology Research and Development*. 48(4). pp. 63-85. doi:10.1007/BF02300500.

Joubert, A. G. (2018) Interview on disadvantages of on-campus in-service training. Vaal University of Technology, South Africa.

Ke, J. & Wenglensky, S. (2010) *Grounded theory*. http://avantgardejing.blogspot.co.za/2010/03/grounded-theory.html. [Access: 20 August 2018].

Kear, K. & Donelan, H. (2016) Assessing online collaborative learning. *Proceedings*. ALT-C Annual Conference, University of Warwick, UK, 6-8 September.

Kirkpatrick, D. & Garrick, J. (2001) *Critical issues in workplace-based learning*. doi:10.1016/j.jen.2008.02.004.

Knight, P. (2007) *Fostering and assessing 'wicked' competences*. Milton Keynes, UK: Institute of Educational Technology, The Open University.

Kolb, D. A. (1984) Experiential learning: Experience as the source of learning and development. *Journal of Organisational Behavior*. 8. pp. 359-360. doi:10.1002/job.4030080408.

Koppi, T., Edwards, S. L., Sheard, J., Naghdy, F. & Brookes, W. (2010) The case for ICT work-integrated learning from graduates in the workplace. *Conferences in Research and Practice in Information Technology Series.* 103(Ace). pp. 107-116.

Kotzee, B. (2012) Private practice: Exploring the missing social dimension in "reflective practice". *Studies in Continuing Education.* 34(1). pp. 5-16. doi:10.1080/0158037X.2012.660521.

Kuhn, T. S. (1962) *The structure of scientific revolutions*. Chicago and London: University of Chicago Press. doi:10.1046/j.1440-1614.2002.t01-5-01102a.x.

Kuntz, A. M., Presnall, M. M., Priola, M., Tilford, A. & Ward, R. (2013) Creative pedagogies and collaboration: An action research project. *Educational Action Research.* 21(1). pp. 42-58. doi:10.1080/09650792.2013.761925.

Kuriakose, R. B. & Swart, A. J. (2014) Work-integrated learning at a university of technology: Assessment and management. *Proceedings*. 2014 IEEE Frontiers in Education Conference (FIE), 22-25 October. pp. 1-6. doi:10.1109/FIE.2014.7044374.

Laverde, A. C., Cifuentes, Y. S. & Rodríguez, H. Y. R. (2007) Toward an instructional design model based on learning objects. *Educational Technology Research and Development*. 55(6). pp. 671-681. http://www.jstor.org/stable/30221258.

Lee, A. S. (1991) Integrating positivist and interpretive approaches to organisational research. *Organisation Science.* 2(4). pp. 342-365. doi:10.1287/orsc.2.4.342.

Lee, C. D. (2016) Social work with groups practice ethics and standards: Student confidence and competence. *Research on Social Work Practice.* p. 475-481. doi:10.1177/1049731516655456.

Leidenfrost, B., Strassnig, B., Schabmann, A., Spiel, C. & Carbon, C.-C. (2011) Peer mentoring styles and their contribution to academic success among mentees: A person-oriented study in higher education. *Mentoring & Tutoring: Partnership in Learning.* 19(3). pp. 347-364. doi:10.1080/13611267.2011.597122.

Leong, R. & Kavanagh, M. (2013) A work-integrated learning (WIL) framework to develop graduate skills and attributes in an Australian university's accounting program. *Asia-Pacific Journal of Cooperative Education*. 14(1). pp. 1-14.

Levesque, L. L., Neill, R. M. O., Nelson, T. & Dumas, C. (2005) Sex differences in the perceived importance of mentoring functions. *Career Development International*. 10(6/7). pp. 429-443.

Levin, D. M. (1988) *The opening of vision: Nihilism and the postmodern situation*. London: Routledge.

Lewis, K., Lange, D. & Gillis, L. (2005) Transactive memory systems, learning, and learning transfer. *Organisation Science*. 16(6). pp. 581-598. http://www.jstor.org/stable/25145998.

Lewis, S., McKay, J. & Lang, C. (2006) The next wave of gender projects in IT curriculum and teaching at universities. *Conferences in Research and Practice in Information Technology Series.* 52. pp. 135-142. January.

Lim, Y. M., Lee, T. H., Yap, C. S. & Ling, C. C. (2016) Employability skills, personal qualities, and early employment problems of entry-level auditors: Perspectives from employers, lecturers, auditors, and students. *Journal of Education for Business.* 91(4). pp. 185-192. https://doi.org/10.1080/08832323.2016.1153998.

Lin, Y.-S. (2011) Fostering creativity through education: A Conceptual framework of creative pedagogy. *Journal of Creative Education.* 2(3). pp. 149-155. doi:10.4236/ce.2011.23021.

Liu, M., Myers, R. & Harron, J. (2005) Motivating students through problem-based learning. *Proceedings*. National Educational Computing Conference, Philadelphia, June. pp. 1-24.

Logan, K. & Crump, B. (2007) The value of mentoring in facilitating the retention and upward mobility of women in ICT. *Australasian Journal of Information Systems.* 15(1). pp. 41-58. https://doi.org/10.3127/ajis.v15i1.478.

Macgowan, M. J. & Wong, S. E. (2017) Improving student confidence in using group work standards: A controlled replication. *Research on Social Work Practice*. 27(4). pp. 434-440. doi:10.1177/1049731515587557.

Mackenzie, J. (2011) Positivism and constructivism, truth and "truth". *Educational Philosophy and Theory.* 43(5). pp. 534-546. doi:10.1111/j.1469-5812.2010.00676.x.

Mackenzie, N. & Knipe, S. (2006) Research dilemmas: Paradigms, methods and methodology. *Issues in Educational Research.* 16(2). pp. 193-205.

Malope, R. (2017) VUT ITS database. Vaal University of Technology, Institutional Planning Department.

Manuti, A., Pastore, S., Scardigno, A. F., Giancaspro, M. L. & Morciano, D. (2015) Formal and informal learning in the workplace: A research review. *International Journal of Training and Development*. 19(1). pp. 1-17.

Maree, K. (2010) *First steps in research*. Pretoria: Van Schaik.

Marshall, M. N. (1996) Sampling for qualitative research. *Family Practice.* 13(6). pp. 522-525. doi:10.1093/fampra/13.6.522.

Martin, A. J. & Rees, M. (2012) Increasingly embedding workplace and applied learning opportunities within the curriculum: A resource based approach. *Proceedings*. The 2012 Australian Collaborative Education Network National Conference (ACEN), Geelong, 29 October – 2 November. pp. 185-189.

Martin, A. J., Rees, M. & Edwards, M. (2011) *Work-integrated learning. A template for good practice: Supervisors' reflections.* Wellington, NZ: Ako Aotearea.

Martin, A. J., Rees, M., Edwards, M. & Paku, L. (2012) An organisation overview of pedagogical practice in work-integrated education. *Asia-Pacific Journal of Cooperative Education.* 13(1). pp. 23-37.

Math and Science Partnership – Knowledge Management and Dissemination (2018) *Instrument search*. http://www.mspkmd.net/. [Accessed: 24 July 2018].

Matoti, N., Junqueira, E. K. & Odora, R. J. (2011) A comparative study of pre-service teachers' self-efficacy beliefs before and after work-integrated learning. *South African Journal of Higher Education*. 25(6). pp. 1140-1177.

McLennan, B. & Keating, S. (2008) Work-integrated learning (WIL) in Australian universities: The challenges of mainstreaming WIL. *Paper presentation*. National Symposium on Career Development Learning: Maximising the Contribution of Work-Integrated Learning (WIL) to the Student Experience.

McMillan, J. H. & Schumacher, S. (2010) *Research in education: Evidence based inquiry*. 7th ed. Upper Saddle River, NJ: Pearson.

McNamara, J. (2013) The challenge of assessing professional competence in work-integrated learning. *Assessment & Evaluation in Higher Education*. 38(2). pp. 183-197. doi:10.1080/02602938.2011.618878.

Merriam, S. B. (2002) *Qualitative research in practice: Examples for discussion and analysis.* Jossey-Bass Inc.

Mertens, D. M. (1998) *Research methods in education and psychology: Integrating diversity with quantitative and qualitative approaches.* Thousand Oaks, California: Sage.

Miles, M.B. & Huberman, A.M. (1994) *Qualitative data analysis: an expanded sourcebook*. 2nd ed. Sage.

Mkansi, M. & Acheampong, E. A. (2012) Research philosophy debates and classifications: Students' dilemma. *Electronic Journal of Business Research Methods.* 10(2). pp. 132-140. doi:1477-7029.

Morrow, B. (2015) Ethical considerations for critical care research. *Southern African Journal of Critical Care.* 31(2). pp. 34-35. doi:10.7196/SAJCC.2015.v31i2.249.

Morton, P. (2006) Using critical realism to explain strategic information systems planning. *Journal of Information Technology Theory and Application.* 8(1). pp. 1-20.

MSP-KMD *see* Math and Science Partnership – Knowledge Management and Dissemination.

Mullen, C. & Fletcher, S. (2012) *The Sage Handbook of mentoring and coaching in education.* Sage.

Nagarajan, S. (2012) Work-integrated learning for the development of professional skills of Information Technology graduates. *Proceedings.* The 2012 Australian Collaborative Education Network National Conference (ACEN), Geelong, 29 October – 2 November. pp. 218-222.

Nagarajan, S. V. & Edwards, J. (2015) Professional skills requirements of IT professional practice: Australian IT graduate perspectives. *Journal of Research and Practice in Information Technology.* 47(1). pp. 3.

Nduwamungu, C. M. (2016) Interview on disadvantages of on-campus in-service training. Vaal University of Technology, South Africa.

Neill, J. (2007) *Qualitative versus quantitative research: Key points in a classic debate.* http://wilderdom.com/research/QualitativeVersusQuantitativeResearch.html. [Accessed: 16 November 2016].

Neuman, W. L. (2003) *Social research methods: Qualitative and quantitative approaches.* Allyn and Bacon. doi:10.2307/3211488.

Newton, D. P. (2013) Moods, emotions and creative thinking: A framework for teaching. *Thinking Skills and Creativity*. 8(1). pp. 34-44. doi:10.1016/j.tsc.2012.05.006.

Ngila, D., Boshoff, N., Henry, F., Diab, R., Malcom, S. & Thomson, J. (2017) Women's representation in national science academies: An unsettling narrative. *South African Journal of Science.* 113(7-8). pp. 1-7.

Nieuwenhuis, J. (2010) Qualitative research designs and data gathering techniques. In Maree, K. (ed). *First steps in research*. Pretoria: Van Schaik.

Norris, A., Jackson, A. & Khoshnood, K. (2012) Exploring the ethics of observational research: The case of an HIV study in Tanzania. *AJOB Primary Research.* 3(4). pp. 30-39. doi:10.1080/21507716.2012.714836.

Ogunbona, P., Naghdy, F., Koppi, T., Armarego, J., Bailes, P., Hyland, P., McGilland, T., et al. (2013). *Addressing ICT curriculum recommendations from surveys of academics, workplace graduates and employers*. Australian Learning and Teaching Council Ltd, an initiative of the Australian Government Department of Education, Employment and Workplace Relations.

O'Leary, Z. (2017) *The essential guide to doing your research project*. 3rd ed. London: Sage.

Olivier, M. S. (2009) *Information technology research - a practical guide for Computer Science and Informatics*. 3rd ed. Pretoria: Van Schaik.

Olson, M. E., Paul, S. & Borman-Shoap, E. (2016) Teaching and learning communities: Implementation of a novel peer group based mentoring initiative. *Academic Paediatrics*. 16(6). p. e39. doi:10.1016/j.acap.2016.05.095.

Orkwis, R. & McLane, K. (1998) A curriculum every student can use: Design principles for student access. ERIC/OSEP Topical Brief.

Orrell, J. (2004) Work-integrated learning programmes: Management and educational quality. *Proceedings.* The Australian Universities Quality Forum, Victoria University, July. pp. 1-5.

Orrell, J. (2018) *Work-integrated learning: Why is it increasing and who benefits?* http://theconversation.com/work-integrated-learning-why-is-it-increasing-and-who-benefits-93642 [Accessed: 17 September 2018].

Ott, M. & Tavella, M. (2009) A contribution to the understanding of what makes young students genuinely engaged in computer-based learning tasks. *Procedia - Social and Behavioural Sciences.* 1(1). pp. 184-188. doi:10.1016/j.sbspro.2009.01.034.

Packard, B. W., Marciano, V. N., Payne, J. M., Bledzki, L. A. & Woodard, C. T. (2014) Negotiating peer mentoring roles in undergraduate research lab settings. *Mentoring & Tutoring: Partnership in Learning*. 22(5). pp. 433-445. doi:10.1080/13611267.2014.983327.

Paku, L. & Lay, M. (2008) Reflection and review: Confessions of placement students. Paper presented at the 11th Annual Conference of the New Zealand Association for Cooperative Education, 23-24 April, New Plymouth, New Zealand.

Parhizgar, K. D. (2010) Comparative ethical analysis of educational competition in academia: Massification and elitism in higher education. *Competitiveness Review: An International Business Journal incorporating Journal of Global Competitiveness*. 20(1). pp. 72-84. doi:10.1108/10595421011019993.

Parker, P., Hall, D. T. & Kram, K. E. (2008) Peer coaching: A relational process for accelerating career learning. *Academy of Management Learning and Education*. 7(4). pp. 487-503. doi:10.5465/AMLE.2008.35882189.

Patrick, C.-J, Peach, D., Pocknee, C. Webb, F., Fletcher, M. & Pretto, G. (2008) *The WIL (Work-Integrated Learning) report: A national scoping study*. Australian Learning and Teaching Council (ALTC) Final report. Brisbane: Queensland University of Technology. www.altc.edu.au and www.acen.edu.au.

Paulus, T. M., Horvitz, B. & Shi, M. (2006) "Isn't it just like our situation?" Engagement and learning in an online story-based environment. *Educational Technology Research and Development*. 54(4). pp. 355-385. http://www.jstor.org/stable/30220465.

Pham, R. (2016) *Improving the software testing skills of novices during onboarding through social transparency*. Berlin: Logos Verlag Berlin GmbH.

Pilgrim, C. (2011) Work-integrated learning in ICT degrees. *Conferences in Research and Practice in Information Technology Series.* 114(Ace). pp. 119-124.

Pilgrim, C. (2012) Industry and university perspectives of work-integrated learning programs in ICT degrees. *Proceedings*. The 23rd Australasian Conference on Information Systems, Geelong, 3-5 December. pp. 1-9.

Pilgrim, C. J. & Koppi, T. (2012) Work-integrated learning rationale and practices in Australian Information and Communications Technology Degrees. *Proceedings.* The Fourteenth Australasian Computing Education Conference - Volume 123, Darlinghurst, Australia. pp. 25-32. http://dl.acm.org/citation.cfm?id=2483716.2483720.

Pillay, H. (2002) An investigation of cognitive processes engaged in by recreational computer game players: Implications for skills of the future. *Journal of Research on Technology in Education.* 34(3). p. 336. doi:10.1080/15391523.2002.10782354.

Pinto, L. H. & Ramalheira, D. C. (2017) Perceived employability of business graduates: The effect of academic performance and extracurricular activities. *Journal of Vocational Behavior. 99.* pp. 165–178. https://doi.org/10.1016/j.jvb.2017.01.005.

Poppins, P. & Singh, M. (2005) Work-integrated learning in Information Technology education. In Van Weert, T. & Tatnall, A. (eds). *Information and Communication Technologies and real-life learning*. Boston, MA: Springer.

Precision Group (2016a) *Precision Group*. http://www.precisiongroup.com.au/news-media/testimonials/simulated-business-environment/. [Accessed: 4 September 2016].

Precision Group (2016b) *Simulated business environment*. http://www.precisiongroup.com.au/news-media/testimonials/simulated-business-environment/. [Accessed: 28 August 2016].

Prince, C. (2015) *Information technology in a complex economy: The African oil and gas industry.* DTech thesis, Cape Peninsula University of Technology.

Pritchard, A. (2009) Ways of learning: Learning theories and learning styles in the classroom. *European Journal of Teacher Education*. 33(September). pp. 219-221. doi:10.1080/02619760903499646.

Rashmi, P. (2012) Fostering creativity: A four elemental model of creative pedagogy. *Journal of Education and Practice.* 3(12). pp. 190-201.

Ratner, C. (2002) Subjectivity and objectivity in qualitative methodology. *Forum: Qualitative Social Research.* 3(3). pp. 1-7.

Reeders, E. (2000) Scholarly practice in work-based learning: Fitting the glass slipper. *Higher Education Research & Development.* 19(2). pp. 205-220. doi:10.1080/072943600445655.

Remenyi, D., Williams, B., Money, A. & Swartz, E. (1998) *Doing research in business and management: An introduction to process and method*. London: Sage.

Resnik, D. B. (2011) *What is ethics in research & why is it important?* National Institute of Environmental Health Sciences. https://www.niehs.nih.gov/research/resources/bioethics/whatis/ [Accessed: 5 May 2017].

Richardson, J., Jackling, B., Henschke, K. & Tempone, I. (2013) Developing a collaborative model of industry feedback for work placement of business students. *Asia-Pacific Journal of Cooperative Education*. 14(1). pp. 28-43.

Riding, R. & Rayner, S. (2013) *Cognitive styles and learning strategies: Understanding style differences in learning and behaviour*. Routledge.

Riebe, L. & Jackson, D. (2014) The use of rubrics in benchmarking and assessing employability skills. *Journal of Management Education*. *38*(3). pp. 319-344.

Riege, A. M. (2003) Validity and reliability tests in case study research: A literature review with “hands-on” applications for each research phase. *Qualitative market research: An international journal.* 6(2). pp. 75-86.

Riel, M. (2016) *Understanding action research.* Centre for Collaborative Action Research. doi:10.1016/j.pragma.2010.08.016.

Robertson, C. & Scott, M. (2010) Personal inquiry project: Students’ perceptions of world of work initiatives; does anybody know that they’re out there. *CETL Journal Innovations in Practice.* 2. p. 2.

Rose, D. H. & Meyer, A. (2002) *Teaching every student in the digital age: Universal design for learning*. Association for Supervision and Curriculum Development. http://www.eric.ed.gov/ERICWebPortal/detail?accno=ED466086. [Accessed: 10 February 2016].

Rowe, A., MacKaway, J. & Winchester-Seeto, T. (2012) “But I thought you were doing that” - clarifying the role of the host supervisor in experience-based learning. *Asia-Pacific Journal of Cooperative Education.* 13(2). pp. 115-134.

Rowe, A., Winchester-Seeto, T. & MacKaway, J. (2012) That’s not really WIL! – building a typology of WIL and related activities. *Proceedings*. Australian Collaborative Education Network National Conference (ACEN), Geelong, Australia, 29 October – 2 November. pp. 246-252.

Rubenstein, L. D., Ridgley, L. M., Callan, G. L., Karami, S. & Ehlinger, J. (2018) How teachers perceive factors that influence creativity development: Applying a Social Cognitive Theory perspective. *Teaching and Teacher Education*. 70*.* pp.100-110.

Saldana, J. (2009) *The coding manual for qualitative researchers*. Thousand Oaks, CA: Sage. doi:10.1109/TEST.2002.1041893.

Sale, J. E. M., Lohfeld, L. H. & Brazil, K. (2002) Revisiting the quantitative-qualitative debate: Implications for mixed-methods research. *Quality & Quantity*. 36(1). pp. 43-53. doi:10.1023/a:1014301607592.

Sally, D. (2003) Dressing the mind properly for the game. *Philosophical Transactions: Biological Sciences*. 358(1431). pp. 583-592. http://www.jstor.org/stable/3558136.

Sandelowski, M. (2000) Combining qualitative and quantitative sampling, data collection, and analysis techniques in mixed-method studies. *Research in Nursing & Health.* 23(3). pp. 246-255. doi:10.1002/1098-240x(200006)23:3<246::aid-nur9>3.0.co;2-h.

Saunders, M. N. K. & Tosey, P. (2012) The layers of research design. *Rapport: The Magazine for NLP Professionals*. pp. 58–59. http://www.academia.edu/4107831/The_Layers_of_Research_Design.

Saunders, M., Lewis, P. & Thornhill, A. (2012) *Research methods for business students*. 6th ed. Harlow: Pearson.

SAQA (2018) *see* South African Qualifications Authority.

Schön, D. A. (1983) *The reflective practitioner: How professionals think in action*. Volume 5126. Basic books.

Schroder, T. (2014) Didactical concept of work-based training in a virtual working space. *US-China Education Review.* 4(7). pp. 441-448.

Schunk, D. H. & Mullen, C. A. (2013) Toward a conceptual model of mentoring research: Integration with self-regulated learning. *Educational Psychology Review.* 25(3). pp. 361-389. doi:10.1007/s10648-013-9233-3.

Schwartz, J. (2012) Faculty as undergraduate research mentors for students of colour: Taking into account the costs. *Science Education.* 96(3). pp. 527-542. doi:10.1002/sce.21004.

Scott, C. L. (2015) The futures of learning 3: What kind of pedagogies for the 21st century? *Education Foresight and Research: Working Papers Series.* 15. Paris: UNESCO.

Šerić, M. & Praničević, D. G. (2018) Managing group work in the classroom: An international study on perceived benefits and risks based on students' cultural background and gender. *Management (Croatia).* 23(1). pp. 139–156. doi:10.30924/mjcmi/2018.23.1.139.

Sharma, Y. (2013) A focus on skills increasingly links higher education with employment. *University World News.* (253). ISSN: 1756-297X.

Siemens, G. (2014) Connectivism: A learning theory for the digital age. *International Journal of Instructional Technology and Distance Learning.* 1. pp. 1-8. doi:10.1.1.87.3793.

Sixsmith, A. & Litchfield, A. (2010) Improving the learning of graduate attributes in the curriculum: A case-study in IT management. *Conferences in Research and Practice in Information Technology Series.* 103(January). pp. 155-164.

Smith, C. (2012) Evaluating the quality of work-integrated learning curricula: A comprehensive framework. *Higher Education Research & Development.* 31(2). pp. 247-262. doi:10.1080/07294360.2011.558072.

Smith, M., Brooks, S., Lichtenberg, A. & McIlveen, P. (2009) Career development learning: maximising the contribution of work-integrated learning to the student experience. Final project report, June.

Smith, J. G., Meijer, G. & N. Kielly-Coleman. (2010) Assurance of learning: The role of work-integrated learning and industry partners. Paper presented at the Australian Collaborative Education Network (ACEN), 29 September – 1 October, Perth, WA, Australia.

Smith, R., Mackay, D., Holt, D. & Challis, D. (2008) Expanding the realm of best practices in cooperative industry-based learning in information systems and information technology: An inter-institutional investigation in Australian higher education. *Asia-Pacific Journal of Cooperative Education.* 9(1). pp. 73-80.

Smith-Ruig, T. (2014) Exploring the links between mentoring and work-integrated learning. *Higher Education Research & Development.* 33(4). pp. 769-782. doi:10.1080/07294360.2013.863837.

Smith, L. & Mann, S. (2002) Playing the game: A model for gameness in interactive game based learning. *Proceedings.* 15th Annual National Advisory Committee on Computing Qualifications (NACCQ). pp. 397-402. http://site.tekotago.ac.nz/staticdata/papers02/papers/smith397.pdf. [Accessed: 12 November 2016].

SouthAfrica.info. (2016) *Studying in SA: Study permits*. http://www.southafrica.info/travel/documents/studypermits.htm#.V8MpS_n5iCg#ixzz4IeUJzY5B. [Accessed: 17 February 2017].

South African Qualifications Authority (2018) *National Diploma: Information Technology.* http://allqs.saqa.org.za/showQualification.php?id=72737. [Accessed: 3 December 2018].

Stringer, E. (2010) *Action Research in Education.* International Encyclopedia of Education. doi:10.1016/B978-0-08-044894-7.01531-1.

Suriya, D. (2003) *Gender-based digital divide in the IT sector in India*. India: Annamalai University. http://unpan1.un.org/intradoc/groups/public/documents/apcity/unpan046515.pdf [Accessed: 15 May 2017].

Swirski, T. & Simpson, M. D. (2012) Re-imagining work-integrated learning through slow innovation in higher education. *Asia-Pacific Journal of Cooperative Education*. 13(4). pp. 239-253.

Sykes, C. & Dean, B. A. (2013) Studies in continuing education. A practice-based approach to student reflection in the workplace during a work-integrated learning placement. *Studies in Continuing Education.* 35(2). pp. 179-192. doi:10.1080/0158037X.2012.736379.

Taha, H. binti M., Jalal, F. H. binti A., Yahya, N. binti D., Omar, M. S. bin & Lin, E. Y. E. (2014) The effectiveness of peer mentoring module on the personality of peer mentors. *International Journal of Asian Social Science, Asian Economic and Social Society.* 4(2). pp. 145-151. February.

Tanggaard, L. (2018) Creativity in higher education: Apprenticeship as a “Thinking Model” for bringing back more dynamic teaching and research in a university context. In *Sustainable Futures for Higher Education.* Cham, Switzerland: Springer. pp. 263-277.

Teddlie, C. & Yu, F. (2007) Mixed methods sampling: A typology with examples. *Journal of Mixed Methods Research.* 1(1). pp. 77-100. doi:10.1177/2345678906292430.

Tenenbaum, L. S., Anderson, M. K., Jett, M. & Yourick, D. L. (2014) An innovative near-peer mentoring model for undergraduate and secondary students: STEM focus. *Innovative Higher Education.* 39(5). pp. 1-11. doi:10.1007/s10755-014-9286-3.

Terrion, J. L. & Leonard, D. (2007) A taxonomy of the characteristics of student peer mentors in higher education: Findings from a literature review. *Mentoring & Tutoring: Partnership in Learning.* 15(2). pp. 149-164. doi:10.1080/13611260601086311.

Tharp, R. (2018) *Teaching transformed: Achieving excellence, fairness, inclusion, and harmony*. Routledge.

Trede, F. (2012) Role of work-integrated learning in developing professionalism and professional identity. *Asia-Pacific Journal of Cooperative Education.* 13(3). pp. 159-167.

Tuzun, H. (2004) Motivating learners in educational computer games. *Methodology.* 23(2). pp. 97-97. doi:10.1111/j.1467-9604.2008.00377_5.x.

Tyler, R. W. (2013) *Basic principles of curriculum and instruction*. University of Chicago press.

Vaismoradi, M., Turunen, H. & Bondas, T. (2013) Content analysis and thematic analysis: Implications for conducting a qualitative descriptive study. *Nursing & health sciences.* 15(3). pp. 398-405.

Veillard, L. (2012) Transfer of learning as a specific case of transition between learning contexts in a French work-integrated learning programme. *Vocations and Learning.* 5(3). pp. 251-276. doi:10.1007/s12186-012-9076-y.

Volman, M., Van Eck, E., Heemskerk, I. & Kuiper, E. (2005) New technologies, new differences: Gender and ethnic differences in pupils' use of ICT in primary and secondary education. *Computers and Education.* 45(1). pp. 35-55. doi:10.1016/j.compedu.2004.03.001.

VUT Advisory Board. (2017) Annual meeting held with IT Industry company representatives on curriculum issues. Vaal University of Technology, South Africa.

Wadee, A. A., Keane, M., Dietz, T. & Hay, D. (2010) *Effective PhD supervision mentorship and coaching*. Amsterdam: Rozenberg Publishers.

Wadee, A. A. (2016) Informal discussion on mentoring, supervision and coaching. Vaal University of Technology, South Africa.

Wagner, R., Childs, M. & Houlbrook, M. (2001) Work-based learning as critical social pedagogy. *Australian Journal of Adult Learning.* 41. March. pp. 314-334.

Walsham, G. (1995) The emergence of interpretivism in IS research. *Information Systems Research.* 6(4). pp. 376-394. doi:10.1287/isre.6.4.376.

Watson, S. L., Loizzo, J., Watson, W. R., Mueller, C., Lim, J. & Ertmer, P. A. (2016) Instructional design, facilitation, and perceived learning outcomes: An exploratory case study of a human trafficking MOOC for attitudinal change. *Educational Technology Research and Development*. 64(6). pp. 1273-1300. doi:10.1007/s11423-016-9457-2.

Westera, W., Nadolski, R. J., Hummel, H. G. K. & Wopereis, I. G. J. H. (2008) Serious games for higher education: A framework for reducing design complexity. *Journal of Computer Assisted Learning*. 24(5). pp. 420-432. doi:10.1111/j.1365-2729.2008.00279.x.

Whalen, M. R. (1995) Working toward play: Complexity in children's fantasy activities. *Language in Society*. 24(3). pp. 31-348. Available at: http://www.jstor.org/stable/4168623.

Whiting, M. & Sines, D. (2012) Mind maps: Establishing 'trustworthiness' in qualitative research. *Nurse Researcher*. 20(1). pp. 21-27.

Wilton, N. (2012) The impact of work placements on skill development and career outcomes for business and management graduates. *Studies in Higher Education*. 37(5). pp. 603-620.

Winter, A. J., Czaplinski, I., Apps, M. & Mallet, D. G. (2018) Fostering connectedness in WIL: Reflections on improving students' WIL experiences, enhancing connectivity, and developing an inclusive WIL network. *Proceedings*. 2018 ACEN Conference - WIL: Creating Connections, Building Futures, Brisbane, Queensland, 3-5 October.

Wye, C., Lim, Y. & Lee, T. (2012) Perceived job readiness of business students at the institutes of higher learning in Malaysia. *International Journal of Advances in Management and Economics.* 1(6). pp. 149-157.

Woolfolk Hoy, A., Davis, H. A. & Anderman, E. M. (2013) Theories of learning and teaching in TIP. *Theory into Practice.* 52(1). pp. 9-21. doi:10.1080/00405841.2013.795437.

Xiao, J. (2017) Learner-content interaction in distance education: The weakest link in interaction research. Journal of *Distance Education*. 38(1). pp. 123-135. doi:10.1080/01587919.2017.1298982.

Yang, Y.-T. C. (2012) Building virtual cities, inspiring intelligent citizens: Digital games for developing students' problem solving and learning motivation. *Computers & Education.* 59(2). pp. 365-377. doi:10.1016/j.compedu.2012.01.012.

Yashin-Shaw, I., Buckridge, M., Buckridge, P. & Ferres, K. (2004) Enhancing graduate attributes: Mechanisms for facilitating the transfer of academically-acquired generic skills into the workplace. Paper presented at the 3rd International Lifelong Learning Conference, 13-16 June, Yeppoon, Australia.

Yilmaz, K. (2013) Comparison of quantitative and qualitative research traditions: epistemological, theoretical, and methodological differences. *European Journal of Education.* 48(2). pp. 311-325. doi:10.1111/ejed.12014.

Yorke, M. (2011) Work-engaged learning: Towards a paradigm shift in assessment. *Quality in Higher Education*. 17(1). pp. 117-30.

Young, M. (1995) Assessment of situated learning using computer environments. *Journal of Science Education and Technology*. Springer, 4(1). pp. 89-96.

ANNEXURE A: LETTER OF INFORMED CONSENT

Hello, my name is Rene van Eck. I am a DTech student at the Vaal University of Technology in the ICT department. I invite you to participate in my research project, which is entitled, “An approach to a creative pedagogy to improve the learner-content relation in tertiary ICT education in South Africa”.

The purpose of my research is to find an alternative method of conducting work-integrated learning (WIL) for students. These students are registered for the subject Business Analysis 3.2 and stay on campus to complete a project, so that they will accrue the same benefits as students who find placement in the workplace.

Your participation in this research is voluntary. You may withdraw from the study at any time or refuse to answer any particular questions. Refusal to participate will not jeopardise your studies or affect you in any other way. All responses will be treated confidentially. You are also not required to provide your name or any other personal details that might be used to identify you.

There are no benefits attached to answering this questionnaire, no participant will receive any compensation whatsoever. Although your participation will not affect you in any way, this may lead to the possibility of identifying alternative methods of conducting WIL on campus for future students.

Thank you so much for your participation in this study.

If you have any queries, feel free to call or email either me or my supervisor.

Researcher:
Mrs Rene van Eck
rene@vut.ac.za
Tel: (016) 950-9899

Supervisor: Prof. A Jordaan
annjor@yebo.co.za

This questionnaire will take approximately 5 –10 minutes to answer. I will appreciate your cooperation in this study.

_____
Rene van Eck

ANNEXURE B: EMPLOYER QUESTIONNAIRE

1. I am

☐	Male
☐	Female

2. Please select your age interval:

☐	Younger than 30
☐	30 – 45
☐	Older than 45

3. Select the answer that pertains best to your situation in your company.

a)	I am a mentor for WIL students	I am not currently a mentor for WIL students	
b)	I am in senior management	I am in middle management	I am not in management

4. Please rank the following items for importance of what students should know or achieve to be a successful employee in your company. The rankings are from 1–8, where 1 is very important and 8 is not important at all.

a)

1. Ability to speak to groups of people effectively	1	2	3	4	5	6	7	8
2. Ability to communicate effectively in writing	1	2	3	4	5	6	7	8
3. Ability to communicate in visual or graphical form	1	2	3	4	5	6	7	8
4. Ability to contribute positively to team-based projects	1	2	3	4	5	6	7	8
5. Ability to synthesise information into appropriate formats	1	2	3	4	5	6	7	8
6. Ability to identify the core issue in any situation from a mass of detail	1	2	3	4	5	6	7	8
7. Ability to understand, appreciate and meet the needs of your clients	1	2	3	4	5	6	7	8
8. Theoretical and academic knowledge	1	2	3	4	5	6	7	8

b) Are there any other skills or abilities which in your opinion should have been on the list above? Indicate the importance of these below (1 is very important, 8 not important at all).

1.	1	2	3	4	5	6	7	8
2.	1	2	3	4	5	6	7	8
3.	1	2	3	4	5	6	7	8
4.	1	2	3	4	5	6	7	8
5.	1	2	3	4	5	6	7	8

5. What is your general impression of the quality of VUT students completing WIL at your company?

_____

_____

6. Do you think that students entering your company for WIL are well-prepared in terms of the items below? Please indicate how prepared you feel they are (1 is very prepared, 8 not prepared at all).

1. Ability to speak to groups of people effectively	1	2	3	4	5	6	7	8
2. Ability to communicate effectively in writing	1	2	3	4	5	6	7	8
3. Ability to communicate in visual or graphical form	1	2	3	4	5	6	7	8
4. Ability to contribute positively to team-based projects	1	2	3	4	5	6	7	8
5. Ability to synthesise information into appropriate formats	1	2	3	4	5	6	7	8
6. Ability to identify the core issue in any situation from a mass of detail	1	2	3	4	5	6	7	8
7. Ability to understand, appreciate and meet the needs of your clients	1	2	3	4	5	6	7	8
8. Theoretical and academic knowledge	1	2	3	4	5	6	7	8

7. What, in your opinion, are the most important shortcomings (anything for which students lack skills or knowledge) for students that you take in for WIL?

_____
_____
_____

8. a) Please provide your opinion on the following statement:
A student that did WIL (even if the experience was not specifically academically aligned to a curriculum) is more prepared to be employed in the working sector than a student who stayed on campus and did a project in a group with other students.

- ☐ Agree
- ☐ Somewhat agree
- ☐ Not sure
- ☐ Disagree

b) Can you provide any reason for your response above?

_____
_____
_____

9. In your organisation, how much individual work are WIL students expected to do?

1. With no supervision	0%-25% of the time	25%-50% of the time	50%-75% of the time	More than 75% of the time
2. With some supervision	0%-25% of the time	25%-50% of the time	50%-75% of the time	More than 75% of the time
3. With full supervision	0%-25% of the time	25%-50% of the time	50%-75% of the time	More than 75% of the time

10. A problem currently experienced is that we have many students who cannot find placement at companies, and we also have many international students that companies are not allowed to take in for WIL. Students that do not find placement for WIL at a company currently do a group project on campus. We want to implement a simulated business environment on campus. This

is where a company scenario, with offices and work-related tasks, are implemented (simulated) on campus, for students to 'work' at if they could not find placement for WIL.

a) In your opinion, could a well-researched and well-implemented simulated business environment provide students adequate exposure to a working culture so that they may become more employable?

- ☐ Yes
- ☐ No
- ☐ Not sure

b) Please provide comments on your thoughts for the implementation of a simulated business environment?

_____
_____
_____

Please provide a list of factors that you would deem as 'non-negotiables' for students to learn in a simulated environment to make them employable in your company?

_____
_____
_____

ANNEXURE C: LECTURER QUESTIONNAIRE

1. I am

☐	Male
☐	Female

2. Please rank the following items below on how well you think students learn these abilities in doing their group project on campus (1 is very prepared, 8 not prepared at all).

1. Ability to speak to groups of people effectively	1	2	3	4	5	6	7	8
2. Ability to communicate effectively in writing	1	2	3	4	5	6	7	8
3. Ability to communicate in visual or graphical form	1	2	3	4	5	6	7	8
4. Ability to contribute positively to team based projects	1	2	3	4	5	6	7	8
5. Ability to synthesise information into appropriate formats	1	2	3	4	5	6	7	8
6. Ability to identify the core issue in any situation from a mass of detail	1	2	3	4	5	6	7	8
7. Ability to understand, appreciate and meet the needs of your clients	1	2	3	4	5	6	7	8
8. Theoretical and academic knowledge	1	2	3	4	5	6	7	8

3. a) Please provide your opinion on the following statement:
A student that did WIL (even if the experience was not specifically academically aligned to a curriculum) is more prepared to be employed in the working sector than a student who stayed on campus and did a project in a group with other students.

☐	Agree
☐	Somewhat agree
☐	Not sure
☐	Disagree

b) Can you provide any reason for your response above?

_____

_____

4. A problem currently experienced is that we have many students who cannot find placement at companies, and we also have many international students that companies are not allowed to take in for WIL. Students that do not find placement for WIL at a company currently do a group project on campus. We want to implement a simulated business environment on campus. This is where a company scenario, with offices and work-related tasks, are implemented (simulated) on campus, for students to 'work' at if they could not find placement for WIL.

a) In your opinion, could a well-researched and well-implemented simulated business environment provide students adequate exposure to a working culture so that they may become more employable?

☐	Yes
☐	No
☐	Not sure

b) Please provide comments on your thoughts for the implementation of a simulated business environment?

_____
_____
_____

5. Please provide a list of factors that you would deem as ‘non-negotiables’ for students to learn in a simulated environment to make them employable in a company?

_____
_____
_____

6. When reflecting on your experiences in working with the groups who did their projects, what is your opinion on how the average group’s dynamics worked?

☐	Everyone in the group work equally hard
☐	There is one person in the group that does not contribute at all
☐	There are only one or two persons in the group that work, the rest just ‘tag’ along

7. Do you have any suggestions on how the group project component of the curriculum could be done differently?

_____
_____
_____

ANNEXURE D: GRADUATES QUESTIONNAIRE

PLEASE NOTE THAT YOUR RESPONSES ARE ENTIRELY ANONYMOUS, SO YOU WILL NOT BE IDENTIFIED UNDER ANY CIRCUMSTANCES. RESPONSES TO ANY OR ALL QUESTIONS ARE ENTIRELY VOLUNTARY.

1. I am

   ☐ Male
   ☐ Female

2. Please select your age interval:

   ☐ Younger than 25
   ☐ 25 – 30
   ☐ Older than 30

3. Please indicate the format of how you completed the BA3.2 module?

   ☐ WIL at a company
   ☐ Group project on campus

4. When you started in your current job, do you think that you were sufficiently prepared for what was expected from you?

   ☐ Yes
   ☐ No

   Please explain your answer:

   _____
   _____
   _____

5. Do you think you would have been better prepared if you did the other WIL option for BA3.2, than the option you actually completed?

   ☐ Yes
   ☐ No

   Please explain your answer:

   _____
   _____
   _____

6. a) Please rank below aspects you feel you have learnt by doing the WIL component you completed (either WIL at a company or a project on campus)? Please indicate the level of learning for these you have achieved, where 1 is the least and 8 is the most.

1. Ability to speak to groups of people effectively	1	2	3	4	5	6	7	8
2. Ability to communicate effectively in writing	1	2	3	4	5	6	7	8
3. Ability to communicate in visual or graphical form	1	2	3	4	5	6	7	8
4. Ability to contribute positively to team-based projects	1	2	3	4	5	6	7	8

5. Ability to synthesise information into appropriate formats	1	2	3	4	5	6	7	8
6. Ability to identify the core issue in any situation from a mass of detail	1	2	3	4	5	6	7	8
7. Ability to understand, appreciate and meet the needs of your clients	1	2	3	4	5	6	7	8
8. Theoretical and academic knowledge	1	2	3	4	5	6	7	8

7. Do you think there were areas missing from the IT curriculum that would have prepared you better?

☐ Yes
☐ No

Please explain your answer:

_____
_____
_____

8. What in the IT curriculum do you feel prepared you the best for your current job?

_____
_____
_____

9. Do you have any suggestions on how BA3.2 can be conducted differently than how you did it?

_____
_____
_____

ANNEXURE E: PROJECT STUDENT QUESTIONNAIRE

PLEASE NOTE THAT YOUR RESPONSES ARE ENTIRELY ANONYMOUS SO YOU WILL NOT BE IDENTIFIED UNDER ANY CIRCUMSTANCES. RESPONSES TO ANY OR ALL QUESTIONS ARE ENTIRELY VOLUNTARY.

1. I am

   ☐ Male
   ☐ Female

2. Please select your age interval:

   ☐ Younger than 22
   ☐ 22 – 25
   ☐ Older than 25

3. In your own opinion, do you think that completing a group project on campus prepared you well enough for being an employable graduate?

   ☐ Yes
   ☐ No

   Please explain your answer:

   _____
   _____
   _____

4. a) Please rank below aspects you feel you learnt by completing a project on campus? Please indicate the level of learning for these you have achieved, where 1 is the least and 8 is the most.

1. Ability to speak to groups of people effectively	1	2	3	4	5	6	7	8
2. Ability to communicate effectively in writing	1	2	3	4	5	6	7	8
3. Ability to communicate in visual or graphical form	1	2	3	4	5	6	7	8
4. Ability to contribute positively to team-based projects	1	2	3	4	5	6	7	8
5. Ability to synthesise information into appropriate formats	1	2	3	4	5	6	7	8
6. Ability to identify the core issue in any situation from a mass of detail	1	2	3	4	5	6	7	8
7. Ability to understand, appreciate and meet the needs of your clients	1	2	3	4	5	6	7	8
8. Theoretical and academic knowledge	1	2	3	4	5	6	7	8

   b) Do you feel that you would have had the same experience in learning the above abilities, if you worked in a company for work-integrated learning?

   ☐ Yes
   ☐ No

c) Please provide a comment on why you said yes/no in (b)?

_____
_____
_____

5. Please choose one with regard to your preference in working on projects:

- ☐ I prefer to work in a group
- ☐ I prefer to work alone

6. Please choose one of the following, which you believe to be most true:

- ☐ Students doing a group project on campus are prepared the best for their job after graduation
- ☐ Students doing WIL at a company are prepared the best for their job after graduation

7. When reflecting on your experience in doing the group project:

a) How much work did you put in when compared to the rest of the group?

- ☐ I did nothing
- ☐ I did very little
- ☐ I contributed the same as everyone else
- ☐ I did a little bit more than the others
- ☐ I did everything

b) On Average, how much work did the other people in the group contribute to the final project?

- ☐ They did nothing
- ☐ Very little
- ☐ A little bit more than the others
- ☐ Everyone worked equally hard

c) Was there anyone specific in your group that contributed very little to the group project?

- ☐ Yes
- ☐ No

8. What were some of your most positive experience(s) while doing your project?

_____
_____
_____

9. What were some of your most negative experience(s) while doing your project?

_____
_____
_____

10. Looking back at your university curriculum, which subjects do you feel helped / prepared you the best for what was expected from you in the group project?

_____
_____
_____

11. Looking back at your university curriculum, which subjects do you feel were not useful or ‘a waste of time’ and that did not prepare you at all for what was expected from you in the group project?

    _____
    _____
    _____

12. Do you have any suggestions on how the group project component of the curriculum could be done differently?

    _____
    _____
    _____

ANNEXURE F: IN-SERVICE STUDENT QUESTIONNAIRE

PLEASE NOTE THAT YOUR RESPONSES ARE ENTIRELY ANONYMOUS, SO YOU WILL NOT BE IDENTIFIED UNDER ANY CIRCUMSTANCES. RESPONSES TO ANY OR ALL QUESTIONS ARE ENTIRELY VOLUNTARY.

1. I am

   ☐ Male
   ☐ Female

2. Please select your age interval:

   ☐ Younger than 22
   ☐ 22 – 25
   ☐ Older than 25

3. In your opinion, did you gain any more relevant experience by working in a company compared to your fellow students that stayed on campus, working in a group project?

   ☐ Yes
   ☐ No

   Please explain your answer:

   _____
   _____
   _____

4. a) Please rank below aspects you feel you learnt by working in a company? Please indicate the level of learning for these you have achieved, where 1 is the least and 8 is the most.

1. Ability to speak to groups of people effectively	1	2	3	4	5	6	7	8
2. Ability to communicate effectively in writing	1	2	3	4	5	6	7	8
3. Ability to communicate in visual or graphical form	1	2	3	4	5	6	7	8
4. Ability to contribute positively to team based projects	1	2	3	4	5	6	7	8
5. Ability to synthesise information into appropriate formats	1	2	3	4	5	6	7	8
6. Ability to identify the core issue in any situation from a mass of detail	1	2	3	4	5	6	7	8
7. Ability to understand, appreciate and meet the needs of your clients	1	2	3	4	5	6	7	8
8. Theoretical and academic knowledge	1	2	3	4	5	6	7	8

   b) Do you feel that you would have had the same experience in learning the above abilities, if you stayed on campus?

   ☐ Yes
   ☐ No

c) Please provide a comment on why you said yes/no in (b)?

_____
_____
_____

5. How often were you expected to work in groups in the working environment?

- ☐ Every day
- ☐ Once a week
- ☐ Once a month
- ☐ Not often

6. a) If you worked in groups, what was the size of your group?
_____ students/group

b) In your opinion, was this conducive to your learning?

- ☐ Yes
- ☐ No

c) Please provide any reason that would help us understand what you answered in 4(b).

_____
_____
_____

d) In your opinion, what should the group sizes be to be most effective?
_____ students/group

d) When reflecting on your experience in doing the group project:

e1) How much work did you put in when compared to the rest of the group?

- ☐ I did nothing
- ☐ I did very little
- ☐ I contributed the same as everyone else
- ☐ I did a little bit more than the others
- ☐ I did everything

e2) On Average, how much work did the other people in the group contribute to the final project?

- ☐ They did nothing
- ☐ Very little
- ☐ A little bit more than the others
- ☐ Everyone worked equally hard

e3) Was there anyone specific in your group that contributed very little to the group project?

- ☐ Yes
- ☐ No

7. a) Did the company you completed your WIL at, actively involve you in their day-to-day activities, or did they use you as ‘cheap labour’?

Please elaborate:

_____
_____
_____

b) Did you feel part of the company?

☐ Yes
☐ No

c) Did you experience a feeling of alienation?

☐ Yes
☐ No

8. What were some of your most positive experience(s) while doing WIL at your company?

_____
_____
_____

9. What were some of your most negative experience(s) while doing WIL at a company?

_____
_____
_____

10. Looking back at your university curriculum, which subjects do you feel helped/prepared you the best for what was expected from you in the company?

_____
_____
_____

11. Looking back at your university curriculum, which subjects do you feel were not useful or 'a waste of time' and that did not prepare you at all for what was expected from you in the company?

_____
_____
_____

12. Do you have any suggestions on how the WIL component of the curriculum could be done differently?

_____
_____
_____

ANNEXURE G: SUMMARY OF COMPLETED EMPLOYER QUESTIONNAIRES

1. I am

5	Male
0	Female

2. Please select your age interval:

0	Younger than 30
1	30 – 45
4	Older than 45

3. Select the answer that pertains best to your situation in your company.

I am a mentor for WIL students x5

I am in senior management x5

4. Please rank the following items for importance of what students should know or achieve to be a successful employee in your company. The rankings are from 1–8, where 1 is very important and 8 is not important at all.

a)

	R1	R2	R3	R4	R5
1. Ability to speak to groups of people effectively	3	1	2	4	3
2. Ability to communicate effectively in writing	2	1	2	2	4
3. Ability to communicate in visual or graphical form	4	2	2	3	3
4. Ability to contribute positively to team based projects	2	1	1	2	2
5. Ability to synthesise information into appropriate formats	1	2	2	3	4
6. Ability to identify the core issue in any situation from a mass of detail	2	2	2	1	3
7. Ability to understand, appreciate and meet the needs of your clients	1	1	3	1	3
8. Theoretical and academic knowledge	3	3	1	6	3

One employer elaborated on the skills above:

1. Ability to speak to groups of people effectively **2**

If they cannot communicate with their peers and colleagues it is so frustrating – see my comment on self-confidence above. I spend a lot of the first month or so building people up and teaching them to speak up, be brave!

2. Ability to communicate effectively in writing **2**

First impressions – when their CV is badly written, full of typing, spelling and grammatical errors then I despair… They MUST be able to put their argument down logically, be able to report on something in a clear and logical manner and write technical and business centric documents. No one can better 'technical author' his or her code than the developer who wrote it…

3. Ability to communicate in visual or graphical form **2**

Most of us in this industry are picture people – another of my hobby horses and theories if you want to discuss one day but the correlation between development, mathematics, music and graphical representation is something I've observed over the last 20 plus years. I can explain the most complex aspect in a diagram, as can most people, which would take hundreds of pages of text, which the average person in our industry battles to follow…

See the Sugata Mitra TED talk called 'Build me a school in the cloud' where he talks about how we force people to learn versus what comes naturally!
https://www.ted.com/talks/sugata_mitra_build_a_school_in_the_cloud

4. Ability to contribute positively to team based projects **1**

Self explanatory?

5. Ability to synthesise information into appropriate formats **2**

The ability to understand the data -> information -> knowledge -> wisdom concept and the ability to comprehend!

6. Ability to identify the core issue in any situation from a mass of detail **2**

Comprehend and understand – difficult to quantify but I use techniques to determine this during interviews.

7. Ability to understand, appreciate and meet the needs of your clients **3**

Internal clients – the other team members – this would be a one. I assume you're talking external clients and while I'd expose a junior to the client they'd have a senior assisting / supervising / over-seeing.

8. Theoretical and academic knowledge **2**

They obviously cannot know everything, but there are certain expectations of a junior. For example, a junior developer should be able to follow basic logic, recognise errors in the code he is familiar with and the like. One of my interview questions is as follows:

```
int a = 9
var b = 11 + 12 – 15
while …
etc.
```

They cannot do the sum and get the value of B correct… They do not see the missing at the end of the line and cannot tell me the difference between an 'int' and a 'var'. One in seven gets this question (and the "code" that follows) correct!!

b) Are there any other skills or abilities which in your opinion should have been on the list above? Indicate the importance of these below (1 is very important, 8 not important at all).

1.	Self-discipline	**1**	2	3	4	5	6	7	8
2.	Negotiating skills	1	**2**	3	4	5	6	7	8
3.	Technical mediation skills for contracted scope of work / area of responsibility	1	**2**	3	4	5	6	7	8
4.	Application of theoretical and academic knowledge in a short span of time	**1**	2	3	4	5	6	7	8

5. Ability to summarise technical issues and document such issues	**1**	2	3	4	5	6	7	8
6. Problem solving skills	**1**	2	3	4	5	6	7	8
7. Project domain knowledge – working in project teams – who does what in the project team, what the other team members will expect and demand, what the person can expect and demand in return	1	**2**	3	4	5	6	7	8
8. Presentation skills, techniques and some experience – see below	1	2	**3**	4	5	6	7	8
9. Software development lifecycle knowledge – what the stages in a SDLC are, what they mean, what is required of each stage, typical artefacts and documents of each	1	**2**	3	4	5	6	7	8
10. Testing – a good understanding of types of testing, when and why these are done, test plans, test cases and reporting	1	**2**	3	4	5	6	7	8
11. Frameworks, processes and the 'beyond UML' approach to modelling, data flow and process flow modelling – ask if you want more info	1	**2**	3	4	5	6	7	8
12. General problem solving	**1**	2	3	4	5	6	7	8
13. Creative ideation	**1**	2	3	4	5	6	7	8
14. Time keeping	1	**2**	3	4	5	6	7	8
15. Practical interpretation	1	**2**	3	4	5	6	7	8
16. Knowledge sharing in a team	1	2	**3**	4	5	6	7	8
17. Be prepared to go the extra mile	1	2	**3**	4	5	6	7	8

5. **What is your general impression of the quality of VUT students completing WIL at your company?**

Very well trained and eager to learn.

Neither Cornastone nor I have experience of the VUT students thus far. My experience of the students from another University of Technology (UoT) and two different universities is that the UoT students arrive champing at the bit to get started in development and usually have a reasonable knowledge and ability for someone entering the industry. The 'older / more traditional' university students tend to have more detailed theoretical knowledge and much less practical experience.

Mixed - we've had some great students and some who seemed unprepared for the course.

Theoretically they might meet the standard, but most of them fail when it comes to application. In some cases they have the ability but [are] scared to contribute.

6. Do you think that students entering your company for WIL are well-prepared in terms of the items below? Please indicate how prepared you feel they are (1 is very prepared, 8 not prepared at all).

	R1	**R2**	**R3**	**R4**	**R5**
1. Ability to speak to groups of people effectively	2	5	4	5	6
2. Ability to communicate effectively in writing	2	5	8	5	6
3. Ability to communicate in visual or graphical form	2	4	4	4	6

	R1	R2	R3	R4	R5
4. Ability to contribute positively to team based projects	2	4	3	2	4
5. Ability to synthesise information into appropriate formats	2	3	5	3	6
6. Ability to identify the core issue in any situation from a mass of detail	2	4	5	3	5
7. Ability to understand, appreciate and meet the needs of your clients	2	7	8	3	5
8. Theoretical and academic knowledge	2	2	3	3	5

7. What, in your opinion, are the most important shortcomings (anything for which students lack skills or knowledge) for students that you take in for WIL?

None worth mentioning from the students we had in the past.

There is a lack of knowledge on business processes, technical skills in the practical application, lack of self-trust and esteem / self-confidence due to not understanding the business world (market place).

Ability to communicate verbally and in writing – clearly state the issue or problem.

Self-confidence – in that they are not scared to admit they do not know or to ask questions.

Inability to think and problem solve – this takes much of the time when I work with intern / WIL groups – getting them to ask questions, to engage and to say what they think, know or do not know. Maybe it is a culture thing but I push the only one culture – the formal work / business culture.

Confidence, problem solving and creative thinking.

As said, they might have the theoretical knowledge but they struggle to apply in practice. This results in an extra burden on other employees, because they have to hold their hands, which has an effect on their normal workload.

8. a) Please provide your opinion on the following statement:
A student that did WIL (even if the experience was not specifically academically aligned to a curriculum) is more prepared to be employed in the working sector than a student who stayed on campus and did a project in a group with other students.

3	Agree
1	Somewhat agree
1	Not sure
0	Disagree

b) Can you provide any reason for your response above?

I do not have exposure to this, so not sure.

By being subjected via a program such as 'WIL' the student starts living the actual business culture in the market place. A student is learnt in a controlled environment how to support various types of businesses depending on the business placement. Types of businesses range from manufacturing (plant and associated client support), small

businesses that support niche markets, businesses that support as a sub-contractor, to bigger engineering and construction businesses and how to support various clients as a service provider business.

Every business has its own culture and a person can only learn multi-business cultures with a career change. This is then not applicable and first level of business engagement is what is important here.

A student is further subjected to business processes connected to the technical knowledge and knowhow.

NB: It must be noted that 'WIL' will not teach the student everything of the business and that it is only a starting point. Common sense, fault finding abilities are essentials that a student should possess to make a success of the initial and later phases of a career.

Exposure to new people outside of their class mates and staff, exposure to the 'real world' of real customers, real deadlines and real pressures. The development of the understanding of the consequence of their actions and the realisation of their role in a professional organisation and project team where project delivery, project profitability and client satisfaction are the core items – and not passing a test or assignment!

The academic world and the commercial world have always had a gap. I believe WIL helps bridge that gap.

Students doing WIL is normally more mature than those who only did a project. In the case of a project we do have 'passengers' not really participating.

9. In your organisation, how much individual work is WIL students expected to do?

	R1	**R2**	**R3**	**R4**	**R5**
1. With no supervision	50%-75% of the time	0%-25% of the time	0%-25% of the time	0%-25% of the time	0%-25% of the time
2. With some supervision	0%-25% of the time	25%-50% of the time	25%-50% of the time	50%-75% of the time	50%-75% of the time
3. With full supervision	0%-25% of the time	0%-25% of the time	0%-25% of the time	0%-25% of the time	50%-75% of the time

10. A problem currently experienced is that we have many students who cannot find placement at companies, and we also have many international students that companies are not allowed to take in for WIL. Students that do not find placement for WIL at a company currently do a group project on campus. We want to implement a simulated business environment on campus. This is where a company scenario, with offices and work-related tasks, are implemented (simulated) on campus, for students to 'work' at if they could not find placement for WIL.

a) In your opinion, could a well-researched and well-implemented simulated business environment provide students adequate exposure to a working culture so that they may become more employable?

5	Yes
0	No
0	Not sure

b) Please provide comments on your thoughts for the implementation of a simulated business environment?

Knowledge is power. Students could ensure they build a knowledge base which gives them the edge.

This concept is very likely to be developed and made a success. Personal experience where I have started two businesses within existing corporates proves that this concept will be based on similar principles.

With no disrespect to the academic staff intended at all and because of personal experience in this as a student, have as many industry people involved and assisting as possible. We are out there and many of us will help! Even though I'm based in the Cape I am willing to come onsite to assist if travel and accommodation costs are met. My company will allow me the time to assist with such.

Why I say this? As an Honours student at UCT in 2004, one of the academic staff (MCom(IS)) was newly out of industry where he'd been the CIO at a bank. His real-world knowledge and perspective was hugely appreciated by us students as we were all older and part time, working people.

Oldest on the course in 2004 was 57 years old and [the] youngest was 26 years old. We all experienced frustrations with staff who had never set a foot out of academia between Sub A / Grade 1 and their PhDs.

A reluctant yes. Provided those setting / running it, has a commercial / industry focus and relevant experience.

I think it is a very good project. It should however be close to reality and not just an extension of the diploma.

11. Please provide a list of factors that you would deem as 'non-negotiables' for students to learn in a simulated environment to make them employable in your company?

Working as a team / knowledge share / innovative ideas / problem solving.

Create a business with two sides, 'Demand and Supply' type of businesses to create the simulated market place:

- *Introduce business processes*
- *Business administration functions (business policies and procedures), Statement of Work and RACI as per a client contract, weekly, monthly and yearly technical reporting, technical recovery plans for disaster recovery and root cause analysis*
- *Project administration functions ((project policies and procedures), monthly project reporting (scope, cost, schedule, quality and resources)*
- *Introduce project management on high level (PMBOK methodology)*
- *Introduce the IT Infrastructure Library (ITIL) Framework ·*
- *Introduce ISO 9001*
- *Introduce Occupational Health and Safety Act and Regulations (OHS Act 85 of 1993)*

For a business with software development, create a Document Management System to manage version control of the software as well as all relevant master documents.

Last note: For this simulated business to be successful, adequate knowledge from the market place, processes and procedures, etc. need to be incorporated. If the business developers are highly dynamic and all the support is there, it will take an estimate of two years for this business to be developed and function optimally to ensure that sound knowledge and experience is instilled in the students. The aim should be to make the simulated business exposure a one year period to know both sides of the market place (demand and supply).

- *Software Development Lifecycle – see below*
- *Data flow and process flow modelling*
- *Testing processes, procedures, plans and test cases*
- *Written communication – technical and business writing*
- *Domain knowledge of some sort – be it a short intro into telecommunications, finance, ERP, etc.*
- *Modern trends and technologies – for example, including data blending and big data, visual recognition, IoT and Sixth Sense technologies*
- *A full range solution delivery from Discovery (what the potential customer wants) through Definition, Design, Development, Delivery and Delight (support and maintenance after going live); what I refer to as the 6D lifecycle*

Working to tight deadlines, being held accountable, solving their own problems.

UNDERSTAND the theory. Know how to apply. Know the implication of their work on the company. We cannot afford 'passengers'. Communicate. Listen to the client, understand their needs and expectations. During their internship training, we usually rotate them between the computer room, desktop technicians, server technicians, helpdesk, etc., in order to give them exposure. Unfortunately, some of them have an attitude, because they have a qualification, they know everything, and are not prepared to dirty their hands and listen to advice.

ANNEXURE H: SUMMARY OF COMPLETED LECTURER QUESTIONNAIRES

1. I am

9	Male
1	Female

2. Please rank the following items below on how well you think students learn these abilities in doing their group project on campus (1 is very prepared, 8 not prepared at all).

	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10
1. Ability to speak to groups of people effectively	6	5	4	1	3	3	4	5	4	6
2. Ability to communicate effectively in writing	6	5	6	1	4	3	4	6	5	3
3. Ability to communicate in visual or graphical form	7	4	4	2	4	3	3	6	6	4
4. Ability to contribute positively to team-based projects	6	5	4	1	5	3	4	4	4	4
5. Ability to synthesise information into appropriate formats	6	6	4	3	5	2	4	5	4	4
6. Ability to identify the core issue in any situation from a mass of detail	6	6	4	2	5	2	3	6	4	4
7. Ability to understand, appreciate and meet the needs of your clients	7	3	4	1	5	2	4	4	4	6
8. Theoretical and academic knowledge	6	4	3	1	5	2	3	4	5	7

3. a) Please provide your opinion on the following statement:
A student that did WIL (even if the experience was not specifically academically aligned to a curriculum) is more prepared to be employed in the working sector than a student who stayed on campus and did a project in a group with other students.

4	Agree
5	Somewhat agree
1	Not sure
0	Disagree

b) Can you provide any reason for your response above?

Students get an idea of the work environment.

Employers generally decide to keep on the students.

Experience can be gained through various channels and in various ways.

It all depends on his/her involvement in the project.

I'm not sure of how one can prove it.

I feel to some extent students benefit from WIL.

Usually they are more mature and should be able to think for themselves.

My reason to the choice above is that, even if the WIL was not fully aligned to the curriculum, the students will still learn other skills, e.g. working in a team, time management, etc.

They gain some experience in the workplace.

4. **A problem currently experienced is that we have many students who cannot find placement at companies, and we also have many international students that companies are not allowed to take in for WIL. Students that do not find placement for WIL at a company currently do a group project on campus. We want to implement a simulated business environment on campus. This is where a company scenario, with offices and work-related tasks, are implemented (simulated) on campus, for students to 'work' at if they could not find placement for WIL.**

   a) In your opinion, could a well-researched and well-implemented simulated business environment provide students adequate exposure to a working culture so that they may become more employable?

10	Yes
0	No
0	Not sure

   b) Please provide comments on your thoughts for the implementation of a simulated business environment?

   More emphasis must be placed from 1st year level on completing all projects / homework / assignments. Students often hand in half completed work – and this is unacceptable in a work environment.

   Involve our business partners.

   This will expose them to a more disciplined environment with real consequences.

   This can work well if we partner with SMMEs as they'll give related business requirements.

   As long as they are provided with a real business project and a mentor or supervisor to guide them.

   Platform works if business sector is involved. Agreement needs to be reached.

   It will be really helpful for students who cannot get placement to gain work experience and use this experience to get employed at a later stage.

   This should be very helpful. They often land up in a working environment with theoretical knowledge, without practical experience. The people [who are] supposed to train them at the working place do not have the time to do so, seeing that they have their normal work to do. It then often happens that the students land up in an admin job, not getting the necessary exposure.

   This simulation will work, provided it is run strictly as a business environment.

If it can be implemented as a real-world scenario, which will be extremely challenging, if possible as VUT.

5. **Please provide a list of factors that you would deem as 'non-negotiables' for students to learn in a simulated environment to make them employable in a company?**

   Complete all projects / homework / assignments thoroughly, test and verify that all work handed in is working 100%.

   Adhering to deadlines, punctuality, listening, adhering to specifications.

   Discipline, time-management, better communication skills, more applicable knowledge.

   Business requirements gathering, system testing and implementation processes.

   Must have completed all his subjects.

   Understand theory and implement ethics.

   Should have adequate infrastructure to implement simulated business environment, trained staff and also support from industry.

   Practical knowledge, repetition of the work until they UNDERSTAND it. Knowing about something without understanding it does not help. They must be interested in what they are doing and learning. Don't play games; make the environment as close the 'real world' as possible.

   A professional environment, i.e. agree on the hours that need to be done a day, timelines need to be adhered to, agree on the quality of the documentation and all products that need to be produced, etc.

   Be prepared, meet deadlines, communication skills, ability to solve a problem.

6. **When reflecting on your experiences in working with the groups who did their projects, what is your opinion on how the average group's dynamics worked?**

0	Everyone in the group work equally hard
0	There is one person in the group that does not contribute at all
10	There are only one or two persons in the group that work, the rest just 'tag' along

7. **Do you have any suggestions on how the group project component of the curriculum could be done differently?**

   I presume there must be clear boundaries for each group member. All group members must evaluate each other's performance.

   No.

   That's the million dollar question, and I'm genuinely not sure. A simulated work environment could help, where a student's individual contributions are logged.

   Look at having prizes for top performing group. Assisting with placement for top performing group with job placement agencies.

If specific tasks could be allocated to individuals.

Define each role on members clearly.

Each member should be assessed separately and given grades individually, even though they do their presentation as a group.

Split the work and they must prove that they did their part. Eliminate 'passengers'. Members of the group should feel free to point out the passenger as they go along. Implement a mechanism that can be used to do so, in order to stay anonymous.

This is not easy, because, even if the group members are aware that others are not contributing, they still won't let the lecturers know. The way that it is run should be effective if all the students were contributing towards making sure that the tasks are completed. The only other thing would be to advise all the lecturers to always run the projects through Turnitin because there is a lot of plagiarism.

My honest opinion of group projects is that it does not work at all.

ANNEXURE I: SUMMARY OF COMPLETED GRADUATE QUESTIONNAIRES

1. I am

11	Male
10	Female

2. Please select your age interval:

3	Younger than 25
15	25 – 30
3	Older than 30

3. Please indicate the format of how you completed the BA3.2 module?

2	WIL at a company
19	Group project on campus

4. When you started in your current job, do you think that you were prepared enough for what was expected from you?

5	Yes
15	No

Please explain your answer:

'Yes', explain: (interesting to note that all the yes answers came from the group that didn't do in-service training at a company)

Yes it taught me a lot of project management and building relationships with clients. I have currently been involved with six projects and due to my knowledge and trust from clients, two of them are being managed by me.

Everything taught during my diploma I manage to apply at the workplace.

I was always ready for any challenge.

'No', explain:

Not currently employed.

More could have been done. Our courses need to start modelling more what we're going to confront in the workplace. We need to take our subjects in a way to prepare students for work, not exams.

I don't have any experience, I have to get [an] internship first to get experience.

I have learnt theory, but [I] was never exposed to practicals, but 50% of what I have learnt in theory is still part of my job, still today.

I had to be taught the job that I was hired for, but I had the basic experience from diploma. Because of my low marks and that I am doing the subject the 2nd time. I have the knowledge about what I can do but with training will be more better.

Because I have not started to work yet.

Due to lack of experience it becomes difficult to handle a task at hand.

I was not sure of what I was doing, I completed 3.2 by getting most help from friends, not doing it by my own.

I am currently unemployed.

Because I stared as an IT technician so I had to basically learn practically what I already knew theoretically.

In a new environment you are always going to learn. So the knowledge from school was just an add on.

5. Do you think you would have been better prepared if you did the other WIL option for BA3.2, than the option you actually completed?

14	Yes
3	No

Please explain your answer:

Well, experiential learning has great advantage. For a person who will be new to an organisation they will have less advantage compared to one who is within. Both methodologies work better if you have the correct mindset.

In full.

Not sure.

I would have experience of the company environment.

Because BA3.2 only focuses on one field of IT. What about the technical part and other specialities.

Practising in the real world is better than being subjected to a project that will be long forgotten after months of doing it.

Because being in the working environment leads to more knowledge though the project at school is as practical as in the companies, I guess.

The companies are using different products and the school approach is broad and theoretically correct.

Doing the group project helped me get a voice and helped me in being confident. Extra knowledge was obtained and helped me in my work place.

Yes because being at the workplace prepares individually to know how to work with people and share ideas.

I believe so because there I'll be doing things [more] practical than here at school on campus.

Being in an environment and performing real work could have given me more opportunity to learn.

Being familiar on what you learnt during your diploma was going to make things easier.

That would have probably given me exposure to the exact field I prefer to work in.

I wanted to graduate with some work experience.

6. a) Please rank below aspects you feel you learnt by doing the WIL component you did (either WIL at a company or a project on campus)? Please indicate the level of learning for these you have achieved, where 1 is the least and 8 is the most.

1. Ability to speak to groups of people effectively	1	2	3	4	5	6	7	8
2. Ability to communicate effectively in writing	1	2	3	4	5	6	7	8
3. Ability to communicate in visual or graphical form	1	2	3	4	5	6	7	8
4. Ability to contribute positively to team based projects	1	2	3	4	5	6	7	8
5. Ability to synthesise information into appropriate formats	1	2	3	4	5	6	7	8
6. Ability to identify the core issue in any situation from a mass of detail	1	2	3	4	5	6	7	8
7. Ability to understand, appreciate and meet the needs of your clients	1	2	3	4	5	6	7	8
8. Theoretical and academic knowledge	1	2	3	4	5	6	7	8

Summary:

	Skill 1	**Skill 2**	**Skill 3**	**Skill 4**	**Skill 5**	**Skill 6**	**Skill 7**	**Skill 8**
R1	7	7	7	6	6	5	7	7
R2								
R3	8	8	5	8	6	8	8	8
R4								
R5	5	8	8	6	5	6	8	8
R6	8	6	6	8	7	4	8	6
R7	5	6	7	6	5	5	4	6
R8	7	8	8	8	8	6	8	8
R9	7	7	7	6	8	6	5	6
R10								
R11	5	6	6	5	6	7	7	7
R12	6	6	5	7	6	5	5	7
R13	6	5	7	8	8	8	8	6
R14	8	8	6	8	6	7	8	8

R15	5	5	6	5	6	3	4	4
R16								
R17	5	7	6	6	6	6	6	6
R18	5	6	4	8	7	4	6	8
R19	5	6	5	6	6	6	6	6
R20	8	7	8	8	7	8	8	8
R21	7	7	5	7	7	6	6	6

7. Do you think there were areas missing from the IT curriculum that would have prepared you better?

6	Yes
12	No

Please explain your answer:

Conflict management was something that really impacted on our projects; people don't really come and contribute to the team and [it is] so difficult to manage them. If this can [be] iterated more then I will be much happy.

Doing more practical than theoretical.

More detailed practicals could have been of advantage to learn more about the module.

The theory provided at school is broad and inclusive.

Companies are selective.

I feel confident in what I learnt from school.

I think the university IT department has it all.

The curriculum covered more than I'd expected.

Everything was on point in the right track.

8. What in the IT curriculum do you feel prepared you the best for your current job?

BA, Project Management, Information Systems, basically everything because I work in HR and I have an understanding of how IT integrates with other divisions and the role it plays within the digitised value chain.

I learnt about the mainframe computer which is not even covered in our syllabus, so I started from scratch. Our curriculum needs to expand to include newer technologies.

No, I don't have enough skills for the job.

Physical exposure of work facilities.

The core focus of DFDs and ERDs.

Information Technology.

Operating Systems, Databases.

Project Management.

BA and Project Management.

BA.

Project Management.

9. **Do you have any suggestions on how BA3.2 can be conducted differently than how you did it?**

   In terms of approvals of ERDs and DFDs there were those groups that were behind in terms of them being approved and again when they are in process of being approved, they must be approved by three individuals – junior, senior lecturer and the HOD. The reason being there were those ERDs that were approved but practically they don't make sense at all.

   More and more practical.

   More detailed practicals would be nice, to be exposed to the work environment.

   No exam will be fine.

   No.

   There should be a full-time class for practical based on the programming language that your system is going to be implemented on.

   It was good.

   Only that consultation time should not be once a week but twice or three times a week.

ANNEXURE J: SUMMARY OF COMPLETED PROJECT STUDENT QUESTIONNAIRES

1. I am

25	Male
22	Female

2. Please select your age interval:

0	Younger than 22
31	22 – 25
16	Older than 25

3. In your own opinion, do you think that completing a group project on campus prepared you well enough for being an employable graduate?

40	Yes
7	No

Please explain your answer:

It showed me how to work with people. I've also learnt how to analyse the existing business.

I have learnt to work as a group. I learnt different types of methods of problem solving, how to analyse information and implement solutions.

I gained confidence of speaking in a crowd and this helped me to improve group and leadership skills, also how to work with different people.

Because we are doing it in group and you might sometimes not understand other things.

It helped me to communicate with other students and also how to work together as one group.

It has caused me to [learn] a lot of things that I did not know throughout my course.

Because working with a system has enabled me to explore my IT knowledge in a very broad way, and I believe I can solve any problem that is Business related to IT.

Because group project teach us to work well with each other and how to exist with each other.

I have come to learn many things in group project and also how to interact with other people and come to understand what is required from me in a group.

I'm not sure, but it doesn't feel like industry work. It's like we have been given a project for a subject we might be doing.

The pressure was too high, and I believe that is what happens in the work environment.

This project has been a very useful task to embark on, as it allowed me to make thorough research and learning new ways of problem solving, responsibility and determination, this was a wonderful experience. It really boosted my academic confidence.

It helped me with taking responsibility and to give my work all my best.

Because I have learnt to start a system implementation from scratch and working in a group.

It helps me to be able to know how to develop a system and learn how to use an ERD and understand business requirement.

I encountered a lot of problems and my mentor was not helpful at all.

It helped me to deal with conflict and how to communicate.

We are forced to learn how to create a system using programming languages that expos us to get acquainted with certain programming languages.

I think that I am capable and prepared to see myself an employable graduate.

By doing a project it gives you an overview about professional environment.

On campus you have much space, time and resources such as free internet, consultation to mentors, classmates help.

Because it helps you to work with other people and work hard.

Because we are not doing practical things.

It prepares you to work in groups and learn to participate in a group.

It helps us so much because we were able to learn new skills.

It helped about putting together a complete Information System.

When you get to the working industry [it] is [a] completely new environment and how things are done.

I've learnt a lot of skills by researching all the different requirements needed to create the system.

It helped me to understand how to identify process and implement them, also prepared me to be able to work effectively in a team.

It prepared me to pay attention to small details and understand my work that I'm presenting.

It helps when it comes to being social with other people, and understanding views of different people.

It exposed me to things that are encountered in the corporate world.

Because it shows / teaches a person how to create a system.

I learnt how to work as a team. IT environment consists of working on projects which is made up of a team.

Because I will be able to create a system.

Because I and my group mates coded for long hours and that showed me that I can work under pressure.

All lecturers ensured high quality of work to prepare for industry.

4. a) Please rank below aspects that you feel you learnt by completing a project on campus? Please indicate the level of learning for these you have achieved, where 1 is the least and 8 is the most.

1. Ability to speak to groups of people effectively	1	2	3	4	5	6	7	8
2. Ability to communicate effectively in writing	1	2	3	4	5	6	7	8
3. Ability to communicate in visual or graphical form	1	2	3	4	5	6	7	8
4. Ability to contribute positively to team based projects	1	2	3	4	5	6	7	8
5. Ability to synthesise information into appropriate formats	1	2	3	4	5	6	7	8
6. Ability to identify the core issue in any situation from a mass of detail	1	2	3	4	5	6	7	8
7. Ability to understand, appreciate and meet the needs of your clients	1	2	3	4	5	6	7	8
8. Theoretical and academic knowledge	1	2	3	4	5	6	7	8

Summary:

	Skill 1	**Skill 2**	**Skill 3**	**Skill 4**	**Skill 5**	**Skill 6**	**Skill 7**	**Skill 8**
R1	8	8	6	8	6	6	7	7
R2	8	5	4	6	8	8	8	6
R3	6	7	8	8	6	6	8	6
R4	4	5	4	4	5	4	7	5
R5	5	7	5	8	8	7	8	8
R6	6	7	7	7	7	8	8	8
R7	8	7	7	7	5	6	7	7
R8	6	4	5	5	6	5	5	6
R9	6	7	5	6	6		7	7
R10	6	6	7	6	6	6	6	6
R11	7	8	8	8	7	8	7	8
R12	7	7	7	7	6	6	7	6
R13	7	7	7	7	7	6	7	7
R14	2	2	4	5	4	5	2	8
R15	5	3	2	5	6	7	6	5
R16	8	7	8	8	7	8	7	8
R17	5	6	7	8	7	6	7	8
R18	8	8	6	8	7	7	7	8

	Skill 1	Skill 2	Skill 3	Skill 4	Skill 5	Skill 6	Skill 7	Skill 8
R19	5	6	7	7	5	7	7	8
R20	5	5	5	5	5	5	5	5
R21	5	5	5	6	6	6	5	6
R22	6	7	6	5	8	5	6	7
R23	8	5	5	7	8	6	6	5
R24	5	7	3	7	4			
R25	3	4	5	5		6	4	8
R26	5	6	5	6	6	6	6	6
R27	7	8	8	7	7	7	7	8
R28	6	8	7	6	5	6	5	7
R29	7	7	7	7	7	6	6	5
R30	4	4	5	4	5	6	6	5
R31	6	8	6	7	7	8	8	8
R32	6	7	8	7	6	5	7	7
R33	5	6	5	6	7	5	5	
R34	5	8	7	7	8	8	7	8
R35	7	7	7	7	7	7	7	7
R36	3	3	5	6	3	3	4	5
R37	8	8	8	8	8	7	7	7
R38	4	7	7	7	6	6	6	7
R39	8	7	8	8	7	7	7	7
R40	8	8	8	8	8	8	8	8
R41	5	5	5	4	4	4	4	5
R42	4	7	7	7	6	7	6	7
R43	7	7	8	8	8	7	8	7
R44	6	6	6	6	7	6	7	7
R45	8	8	7	7	7	7	7	7
R46	6	4	3	7	5	6	5	7
R47	8	8	8	8	8	7	7	7

b) Do you feel that you would have had the same experience in learning the above abilities, if you worked in a company for work-integrated learning?

32	Yes
14	No

c) Please provide a comment on why you said yes/no in (b)?

Yes comments:

Because I have an ability [to] identify core issue[s] in any situation.

Because while we were doing the project, most of it focused on working on what the clients need.

It helped to have a research mind.

I am currently working as a software developer and applying all the skills acquired during the course.

I feel that I wouldn't have to struggle in telling people when, how to do their work.

Because what the institution is teaching us is what most companies need.

Because what we are learning is what is required in many companies.

We get more exposed to the realities of corporate world, how to face challenges.

In most companies people work in groups and I believe it would have been the same but the school project was much better.

Because it would have given me a job experience.

Because they will mentor me on the practical skills and practice.

It helped to enlarge or expand the knowledge and learn new things.

Because in a company you get to have real experiences of the field.

Because at work we are exposed to programming if it is a programming internship.

Provides experience for which ever field we have been hired for at work.

Yes because it exposes me to a professional environment and world.

That would help me acquire more knowledge based on what I've gained.

Because we learn to do the same things.

Because in the company you will be gaining more knowledge skills and be able to work under pressure.

I have learnt to work with group members with different views and opinions.

In a work you need to be confident and this shows that confidence and understanding goes a long way.

On campus you get to meet with people who have fresh ideas to come up with.

Because this project actually prepares you and be able to learn a lot of stuff.

Because we present work integrated project which is expected to be on the some standard as work.

Because it was practical work and our mentor was also involved, which guide us on doing what is right.

Because I think companies also work on huge systems, just like we did in our project.

No responses:
All the things I mentioned on the previous page (I have learnt to work as a group. I learnt different types of methods of problem solving, how to analyse information and implement solutions) had a great impact on my academics.

Because I learnt a lot from my group members.

In a company I think they specialise on a specific field in the IT department so here at VUT we deal with everything.

Because working in a company enables you to meet the user's need on a direct basis, unlike doing the system on campus.

Working in a company would be an opportunity to network with a lot of people that are in our industry.

Working for a company would have been different as I would have had a supervisor who would require me to do what he/she wants. Project on campus gave me full responsibility from the start of the project till the end, being involved in each process done.

At work you're more reserved and you don't interact with many people.

When working in a company, you won't have time to focus on your project – You won't have time to consult your mentors.

Because in a company I will be doing thing practical and more opportunities would be opened.

A project at school it just prepared you, but it doesn't give you work experience.

No, because at work / company they are only specific about what you learn and here I learnt a lot about planning and actually putting together the system.

In a company you learn to do exactly what needs to be done, unlike in the varsity.

Enough experience on campus was provided.

5. Please choose one with regard to your preference in working on projects:

38	I prefer to work in a group
9	I prefer to work alone

6. Please choose one of the following, which you believe to be most true:

22	Students doing a group project on campus are prepared the best for their job after graduation
24	Students doing WIL at a company are prepared the best for their job after graduation

7. When reflecting on your experience in doing the group project:
a) How much work did you put in when compared to the rest of the group?

0	I did nothing

3	I did very little
36	I contributed the same as everyone else
7	I did a little bit more than the others
1	I did everything

b) On average, how much work did the other people in the group contribute to the final project?

0	They did nothing
4	Very little
6	A little bit more than the others
37	Everyone worked equally hard

c) Was there anyone specific in your group that contributed very little to the group project?

8	Yes
36	No

8. What were some of your most positive experience(s) while doing your project?

Being able to work in a group and achieving our goal.

The positive experience we had was able to work with other people without conflict and completing on time and perfect system.

Working together until the end of the project and be able to resolve problems that we had in order to achieve our goal.

We were all discussing and find one conclusion on the work.

Getting to learn more about working together as a group.

It taught me to stay focused and to the best.

Learn how to build a functional system from scratch.

Learn to create database, develop the system, manage to cooperate or work in a group effectively.

I realised that we achieved more in doing a project as a group and everyone was welcoming to each group member's views or opinions.

Working with a group of people can be complex, but I've learnt to compromise and work with other people's ideas.

Spending time doing something that I am passionate about most.

Getting to know the group members and helping each other when we struggle to do something.

My group member is dedicated even though he doesn't know how to code that well, he makes sure he is involved. No need to push or force him.

Discovering that any good idea can come to reality, by putting effort, dedication and hard work.

Researching and implementing the researched information always came with interesting challenges e.g. having to understand the code syntax rather than copy and paste.

Spending time with my group mates, working hard together to complete the project.

To see a project running.

Be able to add tables on the database.

Learning new things like getting stuck on something I could go ask anyone on campus to help.

Learning new things and able to learn how to deal with conflict.

Having to learn new ways to code and knowing that I can put something in practical from theory.

Learning to deal with different personalities and learning codes.

I was learning about another language programming that we did not study in class.

Increased communication, learning new things concerning IT, building relationships with my colleague, increased my listening skills, increased my business analyses skills.

Gathering thoughts for the project system.

Team work spirit, working hard and making everything work.

We were able to do exactly what our mentor wanted.

That you have to be committed all the time, make yourself available every time you are needed.

Being able to do this much work over a short period of time and be able to complete in time.

Working in groups help a lot in terms of sharing different ideas and it helped me to grow as an individual.

Creating a working information system using Java from scratch and providing all its functionalities.

Having to learn all the research that needs to be done and getting all the advice from the mentor.

Learning new programming skills.

Communicating and analysis.

Communication skills, learning and understanding other new things.

Working in groups has improved my way or communication with people.

Learning from others.
It revealed my strength and weaknesses.

Is that we can make other companies use our system.

Learning how a system that can be manipulated 'with a valid reason' to fit your business rules.

Knowing how to code, insert pictures and running the website.

Being able to work on such a huge system.

Consultation with lecturer.

9. What were some of your most negative experience(s) while doing your project?

There were no positive experiences. It was just fights when it comes to people doing their work on time.

We've experienced errors that we don't [know] where they are coming from.

The negative thing was not being able to create a system that corresponds with all business rules.

Experiencing difficulties while implementing the system and sometimes the code does not work or cause errors.

We were leaving the school late and willing to do the work.

Some of the group members do not participate which leads to a lot of work to those who are willing to do the work.

Software problems, laptop problems.

We didn't have enough time to fully work on the system because of the strike.

Group members don't want to contribute when it comes to doing work piece by piece. They just relax and let others do everything.

We didn't have enough time to work properly ot the system.

Disagreement, conflicts about meeting times, some would forget to do their parts of the project when we have split the work.

Excuses for being late.

Not pitching in time and having to work for them.

I was the only programmer, too much pressure.

Arguing, quarrelling, frustrations.

Fees must fall strike had a very negative impact as we were not able to get a professional perspective from our mentor who has been very helpful to us.

The strike and not being able to meet regularly.

To not see the system being able to function.

Creating the reports.

Arguing.

Fighting for meeting and time that we suppose to meet and place.

Didn't have enough help.

Forcing group members to be at meetings and consultations.

Timing of preparation.

Disturbing our user while he was busy.

Panel which we presented to wasn't lenient.

Load of work.

The laptop didn't have the VGA port for us to present, then we have limited time to present because we had to borrow a laptop from other people.

When the system was not running sometimes, and it always needed updates.

The work load we got after consulting.

Most things were new to me so I had to put extra effort in every task at hand.

Struggling to add some.

The hiccups whereby the system does not do as the client desires.

Time management.

Struggling with coding and time.

Time, gathering.

Sleepless nights.

People coming late to the meeting.

Arguing with group members.

Is that what if our user won't like our system.

Stressful nights.

Consulting almost every week.

Working for long hours.

10. **Looking back at your university curriculum, which subjects do you feel helped / prepared you the best for what was expected from you in the group project?**

BA2.2, Dev2.2
Dev2.2, InfSyst2.2
IS, BA Entrep, DevS
BA and PHP
BA and IS
SQL, VB, PHP, Accounting, BA
BA and Infos
Infos
SQL, VB, BA
SQL, VB, BA
VB, PL/SQL, BA, Infos
VB, Infos, SQL, BA
Dev Softw, Infos, BA
Infos, BA
Comm, Entrep, Infos
Infos, ADO
BA, is, Programming
IS, BA, DS
VB, database, Java, PHP and IS
BA, VB
Comm
IS, BA
BA, IS, DS
BA, IS, VB
BA
IS and BA
BA
BA
BA and IS
BA
IS, BA, Comm and DS
IS and BA
BA
DS, BA
BA
Java

BA, OPS

IS, BA

IS, BA

DS

BA

Entrep, BA

BA

IS

Java, BA, IS, VB, ADO.net

DS, SS

11. Looking back at your university curriculum, which subjects do you feel were not useful or 'a waste of time' and that did not prepare you at all for what was expected from you in the group project?

EDL, CISCO

System Software 1

EDL, CISCO

SQL

Logic, Cyber Law

Accounting, Java

ProgrLogic

SS

ProgLog, EDL, Entrep

Web2.1

Entrep, Accounting, Law

Entrep

EDL, Java

Ado.net, PHP, cisco

EDL

Accounting

EDL

Cyberlaw

Cyberlaw

Accounting, Cyberlaw

Cyberlaw

Accounting, Cyberlaw

Web2.1

Accounting

Comm

Account

Account

Entrep

Entrep Account

12. Do you have any suggestions on how the group project component of the curriculum could be done differently?

No, everything is in order.

The university should find student in-service in order for them to improve the theory that they have learnt in school.

Each member of the group must have particular work to do. In that way all the group members will be able to participate.

Can we only have one mentor per semester, because dealing with different lecturers causes so much confusion and disagreements?

More time must be allocated in doing a project.

Getting an internship program.

Student should be given more time and be briefed weekly.

Yes, I feel like when the mentors are watching us present they are not concerned about how good your system is, rather how good your programming is, but BA is not about programming.

Find a way to make sure that everyone works, not buying systems from others.

Mentors should allow the system to be broken down and each member should be responsible for a particular part an during presentation we should be assessed based on the part a member was doing.

It is perfect the way it is done, it allows students to grow mentally and academically.

No suggestions, I believe the way things are going is well.

If everyone puts in the effort.

Have projectors with HDMI ports.

I would have had a mentor that actually cared and understood our system.

Learning programming.

Its fine this way.

It must allow student to even work here at campus, just for the experience, even if they don't get paid.

A group must be mentored by the people they are going to get on the presentation.

Introduce Java in 2.1.

Mentorship should be more of assisting the student to be fully prepared for the evaluation.

Cancel group projects and offer students in-service training.

Yes, it must have at least 1 semester test to contribute to the marks on the system.
An example of group presentation should be presented to better what student should expect when presenting.

ANNEXURE K: SUMMARY OF COMPLETED IN-SERVICE STUDENT QUESTIONNAIRES

1. I am

9	Male
3	Female

2. Please select your age interval:

1	Younger than 22
9	22 -25
2	Older than 25

3. In your opinion, did you gain any more relevant experience by working in a company than compared to your fellow students that stayed on campus, working in a group project?

11	Yes
1	No

Please explain your answer:

Working in a company gives a student a broader view of the field they studied, and helps students learn how to operate in the industry they have chosen. This helps improve skills like professionalism and work ethics in a workplace.

The people I have met and worked with while working at the current company, carry more knowledge and experience of what is required in the industry.

Because I was able to implement what I studied in class to a working environment and I have learnt more in co-op world that is not being covered in class.

Ever since I started working here I have learnt a lot, especially about the new Microsoft Office (Office 365) which included SharePoint, Exchange, Skype for business and One drive features.

In a workplace everything comes to reality. There is more pressure and real-time thinking. You get to grow a lot more than you do through research. In a workplace you build it and make it work.

I got to get out of my comfort zone, met people from other companies whom shared / showed me their work. And also learning about that was not taught at university.

I have gained experience on many aspects including programming and networking as we are in the telecommunication, where you have to understand every part of the network.

Working in a company gave me more experience as we work on real company solutions and we work with people who have experience in the work environment.

Even though we are doing the same thing, because of the different approach of handling problems (programming) and advance programming, we get a vivid understanding.

This organisation gets you ready for the real-world environment as you tackle real-life solutions and problems with environment-ready tools.

You work with people from different educational backgrounds and you are given mentors / managers to help mostly with.

Note: The one respondent who answered NO, did not supply a reason for saying so.

4. a) Please rank below aspects that you feel you learnt by working in a company? Please indicate the level of learning for these you have achieved, where 1 is the least and 8 is the most.

1. Ability to speak to groups of people effectively	1	2	3	4	5	6	7	8
2. Ability to communicate effectively in writing	1	2	3	4	5	6	7	8
3. Ability to communicate in visual or graphical form	1	2	3	4	5	6	7	8
4. Ability to contribute positively to team based projects	1	2	3	4	5	6	7	8
5. Ability to synthesise information into appropriate formats	1	2	3	4	5	6	7	8
6. Ability to identify the core issue in any situation from a mass of detail	1	2	3	4	5	6	7	8
7. Ability to understand, appreciate and meet the needs of your clients	1	2	3	4	5	6	7	8
8. Theoretical and academic knowledge	1	2	3	4	5	6	7	8

Summary:

	Skill 1	**Skill 2**	**Skill 3**	**Skill 4**	**Skill 5**	**Skill 6**	**Skill 7**	**Skill 8**
R1	6	7	7	6	7	7	7	7
R2	8	8	8	8	6	7	8	7
R3	6	7	6	7	5	7	7	5
R4	8	8	6	8	7	8	8	8
R5	7	5	5	7	8	5	8	6
R6	4	6	6	7	6	5	7	5
R7	7	7	8	7	8	7	8	8
R8	5	6	4	7	7	6	6	5
R9	5	6	7	6	6	7	7	7
R10	5	6	7	6	7	8	7	6
R11	8	8	8	8	8	8	8	7
R12	8	7	7	8	8	7	7	8

b) Do you feel that you would have had the same experience in learning the above abilities, if you have stayed on campus?

1	Yes
11	No

c) Please provide a comment on why you said yes/no in (b)?

Workplace experience teaches students better communication skills, participation, problem-solving skills, and gives students better knowledge because they interact with real customers and employees who occupy a certain career.

Some of the knowledge provided on campus is either limited or out dated compared to what is being done in industry.

Because in the co-op environment I learnt to work with different people with different backgrounds.

I think on campus they only focus on basics whereas in the workplace they go into details in what we do.

On campus you don't interact with clients, there is no proper feedback on your performance and how you work under pressure.

I would still not be able to speak to groups of people or understand the needs of our clients.

At school you can easily copy someone's work and claim it as yours, but here you are given different duties.

Working for a company is the next step, after being a student. So I would still leave campus for work.

What we do it's the same, just different approach. Everything is easy to grasp with too much practical implementation.

Real-world problem solving is slightly different from school system problem solving.

5. How often were you expected to work in groups in the working environment?

9	Every day
1	Once a week
1	Once a month
1	Not often

a) If you worked in groups, what was the size of your group?
Average = 4 students/group.

b) In your opinion, was this conducive to your learning?

12	Yes
0	No

c) Please provide any reason that would help us understand what you answered in 4(b).

Having a group mate helps a student understand and work efficiently. It helps a student learn how to interact with corporate people.

Being part of a group with not so many people can be easily managed, work can be delegated fairly, and more work can be covered.

Because when you miss something, someone will see the mistakes that you didn't see and you learn more when you are in a group than when you are alone.

Working in groups helps you to understand better what you working on; it helps to be able to communicate easily with other people around you.

The workload becomes or feels a lot less when you [are] working in a group and you spend less time on the project.

I have learnt a lot from my team, something I did not understand or know but with their help I do now.

Working as a group helped me understand my weaknesses as an individual. You can learn a lot from the other person.

Learning as a group helps solve problems much easier and you also learn other things that you did not know from your fellow group members as well as teach what you know.

Each group has its own big table, and each person has their own computer. We easily discuss with each other.

The organisation expects us to solve real problems from clients by creating working applications for ABSA. In a group, you get to focus on a specific solution in order to build the required app.

Yes it was because what the curriculum covered this Internship was more informatic [sic] and we learnt more and we are quite prepared and have the knowledge on how the industry is like and what is expected. (We work on the same project but mostly we are doing tasks given individually)

Sharing of ideas.

d) In your opinion, what should the group sizes be to work in to be most effective?

Average = 4 students/group.

e) When reflecting on your experience in doing the group project:

e1) How much work did you put in when compared to the rest of the group?

0	I did nothing
0	I did very little
8	I contributed the same as everyone else
3	I did a little bit more than the others
1	I did everything

e2) On Average, how much work did the other people in the group contribute to the final project?

0	They did nothing
1	Very little
1	A little bit more than the others
9	Everyone worked equally hard

e3) Was there anyone specific in your group that contributed very little to the group project?

2	Yes
10	No

6. **a) Did the company you completed your WIL at, actively involve you in their day-to-day activities, or did they use you as 'cheap labour'? Please elaborate.**

   They actively involved me in all their day-to-day activities, and helped me go through them when I was facing difficulties.

   I was actively involved in the daily operations of the company, I was assigned to a position that was fully required by the company.

   I was involved in most of their day-to-day activities.

   I was involved in the day-to-day activities and learnt more than expected. I'm even considering taking another course.

   They involved me in their day-to-day activities, monitoring the network, helping customers.

   I was very much involved because the person I'm working for only knew what he wanted not the details that I know.

   I was involved in the company's day-to-day activities, which sometimes took me over my career scope and I enjoy that a lot.

   Every Friday we had activities to ease our minds like games, etc.

   The company does contribute in building your career as we have live sessions in entrepreneurs, finance skills, business process and other life skills besides programming.

   We did projects of their partners so we were more involved.

   b) Did you feel part of the company?

10	Yes
0	No

   c) Did you experience a feeling of alienation?

1	Yes
9	No

7. **What were some of your most positive experience(s) while doing WIL at your company?**

   They helped me with my monthly reports and understood when I had to work on my reports instead of doing my day-to-day activities.

   I was given an opportunity to be part of the trainers. I was given an opportunity to consult to another company. I was appointed as a leader of my fellow interns.

   I was not limited to what I can do.

When we attended an Africa Automation fair 2017 and MTN digital entrepreneurs. I discovered that technology is really the future. I am in the right / perfect career.

I got to be part of the first people who worked on a certain new technology / protocol.

I gained a lot of information about a subject called Networking as we are in the business of telecommunication, responsibility and group work.

Not being limited to what I do. I was allowed to work on different aspect of the company and took responsibilities out of my 'WIL requirement' scope.

Learnt more programming.

Finishing a task fast, each member in a group is assigned a task to complete for a project.

You can be helped by anyone including your boss and team leaders, and junior programmers always come and help us when we needed any help. And mostly the communication that we used too (slack app) to work on a group and as a whole.

8. What were some of your most negative experience(s) while doing WIL at a company?

Not having enough time to grasp new knowledge before feedback was required, or meeting a deadline.

Not working well under pressure and underperforming.

Having to be around a lot of people, since I am introverted.

Not using quality products can have a negative impact on the goal you want to achieve.

Being put under pressure by my team leader as we have to meet the deadlines.

9. Looking back at your university curriculum, which subjects do you feel helped / prepared you the best for what was expected from you in the company?

Software Development and Business Analysis

Business Analysis, SQL, PHP, Java, Applied Communications, Web Management

Networking Systems, Operating Systems, Communication Studies

Operating Systems, Networking Engineering, IT Essentials

Systems Analysis, Programming

Networks, Programming

Networks, Programming

Database Principles

Database subjects

Development Software, Information Systems (PL/SQL), Web (PHP)

BA, IS, Web Management, and Software Dev.

10. **Looking back at your university curriculum, which subjects do you feel were not useful or 'a waste of time' and that did not prepare you at all for what was expected from you in the company?**

    Programming Logic, Accounting, Entrepreneurship

    Programming, Electronics

    EDL

    Accounting Skills, EDL

11. **Do you have any suggestions on how the WIL component of the curriculum could be done differently?**

    There shouldn't be only two focus subjects which are only accepted for in-service training, including Networking can also be beneficial because we did Cisco for three semesters, and some students wanted to follow that path instead of development or BA.

    Students could still do projects in their last semester relevant to what they would like to work at and use that to their advantage when applying for an in-service training or job.

    I think everything is okay with the current curriculum, but we must spend more time on these modules.

    By advertising at Varsities around South Africa so that students might know such programs exist.

    If participation of group work can be facilitated.

ANNEXURE L: ETHICAL CLEARANCE CERTIFICATE

Memorandum

Faculty of Applied and Computer Sciences
Tel: +27 (0)16 950 9249
Fax: +27 (0)16 950 9793

To: Executive Senate Research and Innovation Committee
CC:
From: Faculty of Applied and Computer Sciences: FRIC
Date: 10 October 2016
Subject: Approval of Ethics Application: Extract of Minutes of 28 September 2016

The following ethics application was discussed and approved at a Faculty Research and Innovation Committee meeting that took place on the 28 of September 2016

6. NEW ITEMS		
6.4. APPROVAL OF ETHICAL APPLICATIONS		
6.4.2. DEPARTMENT OF INFORMATION TECHNOLOGY		
i) Ms R van Eck	The Committee approved the ethics application for the following Research Proposal:- Thesis Title:- ***The use of a creative pedagogy to improve the Learner- content relation in tertiary ICT education In South Africa***	FRIC Chairperson → ESRIC

FRIC Chairperson: Dr AE Ofomaja

18/10/2016
Date

ANNEXURE M: LANGUAGE EDITING CERTIFICATE

THE EXAMINATIONS COMMITTEE.

Vaal University of Technology.

This confirms that the text of the dissertation prepared by Rene van Eck entitled:

AN APPROACH TO A CREATIVE PEDAGOGY TO IMPROVE THE LEARNER–CONTENT RELATION IN TERTIARY ICT EDUCATION IN SOUTH AFRICA;

has been edited for language and grammar. As is appropriate practice, direct quotes have not been edited and appear in the text as verbatim. Language and grammar edits have been attended to satisfactorily.

Sincerely,

Professor Ahmed A Wadee

Research Professor: Vaal University of Technology.

Director: ThornTree Coaching Facilitation and Mentoring. *(academic coaching specialists)*

Academic co-ordinator : South African Technology Network.

February 27th, 2019

ANNEXURE N: TURNITIN REPORT

Turnitin Originality Report

- Processed on: 27-Feb-2019 09:49 SAST
- ID: 1084620280
- Word Count: 77080
- Submitted: 1

Full thesis_final By Van Eck Rene

Similarity Index

4%

Similarity by Source

Internet Sources:

4%

Publications:

3%

Student Papers:

N/A

1% match (Internet from 10-Jan-2017)
http://50years.acs.org.au/__data/assets/pdf_file/0016/112525/Vol103.pdf
1% match (Internet from 18-Dec-2018)
http://digiresearch.vut.ac.za/bitstream/handle/10352/285/KWM%20KAFILONGO%20FINAL%20DISSERTATION%20IT%20%287%20April%202016%29.pdf?isAllowed=y&sequence=1
1% match (publications)
R. van Eck, Tranos Zuva. "Implementing an immersive environment: A critical review of literature", 2016 International Conference on Advances in Computing and Communication Engineering (ICACCE), 2016
1% match (Internet from 27-Nov-2015)

http://acen.edu.au/2014Conference/wp-content/uploads/2014/10/2014-ACEN-Conference-Full-Proceedings.pdf
1% match (Internet from 22-Sep-2011)
http://www.che.ac.za/documents/d000217/Higher_Education_Monitor_12.pdf
1% match (Internet from 06-Nov-2018)
https://pt.scribd.com/document/323109524/211299677-Prince-CD-DTech-IT-FID-2016