

**RECOMMENDATIONS FOR IMPROVEMENT TO THE SOUTH AFRICAN
INFORMATION TECHNOLOGY CURRICULUM: A CASE STUDY OF NEW
HIGHER CERTIFICATE GRADUATES' FIRST YEAR OF EMPLOYMENT**

by

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Exact wording of the title of the dissertation or thesis as appearing on the copies submitted for examination:

Recommendations for improvement to the South African Information Technology

curriculum: A case study of new higher certificate graduates' first year of employment.

I declare that the above dissertation is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

I further declare that I submitted the dissertation to originality checking software and that it falls within the accepted requirements for originality.

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ABSTRACT

Employment issues in South Africa (SA) are a significant problem. There are ongoing discussions revolving around the employability challenges facing South African graduates, particularly in the Information Technology (IT) sector. The preparedness of these IT graduates has been questioned with many looking towards skill sets and employability status while others have scrutinised the validity of the IT curriculum meeting industry needs.

The research focuses on a case study of graduates from an accredited, private higher education institution in SA. The study followed a qualitative approach using questionnaires and interviews to understand the experiences of employers, employed graduates and recruitment personnel upon employment of the graduates. This study investigated, determined and confirmed recommendations to adapt the South African higher education IT curriculum to improve the productivity of IT graduates upon employment.

KEYWORDS: Employability; graduate impacts; graduate preparedness; higher education; IT companies; IT curriculum design; IT graduates; skills gap; skill sets; unemployment.

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LIST OF ACRONYMS AND ABBREVIATIONS

CHE	Council on Higher Education
DHET	Department of Higher Education and Training
HC	Higher Certificate
HEQC	Higher Education Quality Committee
IT	Information technology
LBL	Lecture-based learning
MLM	Mastery Learning Methodology
NQF	National Qualifications Framework
PSET	Post-School Education and Training
SA	South Africa
SAQA	South African Qualifications Authority
WIL	Work-integrated Learning

TERMS AND DEFINITIONS

Curriculum	Academic content contained in a course/qualification.
Employability	The ability to be employed.
Graduate	A person who has received a degree or diploma on completing a course of study, as in a university, college or school (Dictionary.com, 2019).
Skill set	A range of abilities/skill.
Soft skills	There is no generally accepted definition of soft skills (Taylor, 2016b). In this dissertation, Taylor's (2016b:3) definition will be used “soft skills...is defined as intra- and inter- personal skills essential for personal development, social participation, and required to function in a specific employment environment”.
Productive	Merriam-Webster (2019) describes productive as ‘yielding or devoted to the satisfaction of wants’. This dissertation will use the definition of productive as achieving the expected results.
Productivity	The quality or state of being productive (Merriam-Webster, 2019). Productivity is measured by the performance rate of an employee (Dictionary.com, 2019).

CHAPTER 1

Introduction and project overview

1.1 Introduction and background

Employment issues in South Africa constitute a significant problem as various debates on the employability challenges in respect of local graduates will testify (Moyo, 2013; Taylor, 2016a; DHET, 2017). The concerns voiced range from aspects such as skill sets and employability status to curriculum validity. However, it would appear that students and academics have become complacent in respect of ensuring that students are conversant with the technical aspects of the IT field, resulting in less attention on promoting the skills that assist students when they enter the work environment (Simon & Jackson, 2013). Moyo (2013) indicates that South African IT graduates are not being adequately prepared to meet the needs of the workplace once employed. This concurs with the researcher's experience in both the IT industry and academia where numerous shortfalls and frustrations on the part of both employers and prospective employees (IT graduates) in respect of the required skills are experienced. Similar frustrations have been voiced by other researchers studying the situation in South Africa (Du Toit, Kraak, Favish & Fletcher, 2014; Simon & Jackson, 2013; Taylor, 2016a). According to Moyo (2012) despite the fact that the IT skills shortages in this country are the topic of frequent debate, the market is still facing a critical shortage of specialised skills, and is finding it difficult to attract expert talent. Brauns (2013:11) claims that despite the increase in student numbers in tertiary education, a decline in employment is evident, adding that "employers want graduates who can do the job. It is up to colleges and students to make sure that they are ready to bridge this gap". The researcher's experiences align with Moyo's (2013) view that the curricula at South African universities have not evolved at the same fast-paced rate as the IT industry is evolving. Jaffer, Ng'ambi and Czerniewicz (2007) argue that since many IT qualifications are theory-driven, it is assumed that students will be able to link theory and practice in an effective way. Students often receive limited practical exposure that poses a problem regarding their understanding the theory they have learnt. This is, in fact, one of the issues that may render an IT graduate less employable.

It is, thus, crucial that an investigation be conducted into the best ways of improving associations between industry and academia in order to deliver better-prepared graduates for the workplace (Howard, 2017). To this end, the Department of Higher Education and Training

(DHET) in South Africa is encouraging research engagements which are aimed at reducing job shortages while Post-School Education and Training (PSET) is aiming to create better cooperative liaison between academia and industry (DHET, 2017). With the government's agenda for 2017–2020 focusing on reducing job shortages in the country, the curricula offered on the higher education platform will also be scrutinised. It is hoped that this will help to address the need to identify and introduce proper quality assurance measures aimed at enhancing the curricula and creating and maintaining liaisons with industry (DHET, 2017). In the face of the job market shortfalls in South Africa, this necessitated an investigation into the possible causes of IT graduates' lack of preparedness for the job market and recommendations to be made about improving the IT curriculum.

Clarity is, therefore, required on the areas in which graduates lack the skills required by IT companies and whether these skills pertain to soft skills or subject matter expertise that was not acquired during the graduates' studies. The graduates' practical skills may also be questioned in terms of whether or not the graduates possess the necessary practical skills level for certain positions. Ascertaining further information, such as the measures taken by companies when graduate skill gaps are found, may prove to be a vital link in understanding the skills issue, and whether these gaps involve soft skills, practical skills, subject matter expertise or, perhaps, a combination of these three items. Further identifying the period of time required for the graduate to become productive in the work environment is a crucial issue on which to gather information as this will indicate the strains experienced by employers. In addition, highlighting the measures taken by recruitment personnel to find suitable graduates for positions advertised by IT companies should generate an understanding of the approach to be taken in placing graduates in positions.

The issues highlighted above focus on the themes of skill sets, employability and curriculum design. This study seeks to investigate, determine and confirm industry recommendations in order to enrich the higher education IT curriculum so that IT graduates may be more productive on entering the workplace. In addition, the study aims to ascertain the impact felt by industry on employing new graduates as well as the key skills that such graduates lack.

1.2 Problem statement and research questions

1.2.1 Problem statement

South Africa is experiencing major difficulties in the employment sector (Nonyana, 2015). Within the IT space students often have limited practical exposure which poses a problem with regard to understanding the theory they have learnt. This is one of the problems that may render an IT graduate less employable. According to Brown, Hesketh and Williams (2003), the employability aspect of a graduate may be considered as an advantage. Such advantage is dependent on the graduate's acquisition and development of the knowledge, skills and business readiness required in the workplace. This development would lead to the advancement of tertiary education as well as efforts to produce employable graduates. The employment shortfalls experienced in South Africa are necessitating, among other things, studies on the possible causes of IT graduates' lack of preparedness for the job market and subsequent recommendations for the improvement of the IT curriculum.

1.2.2 Research questions

The higher education IT curriculum in South Africa may be improved by identifying the skills which South African graduates appear to lack. The following research questions are aimed at gaining an insight into the performance gaps of employed graduate and what may be done to improve the curriculum to ensure better prepared graduates.

Main research question:

What recommendations for improvements to the IT curriculum in South Africa could be extracted from an understanding of new graduates' first year of employment?

Sub-questions involve:

1. What keys skills do South African IT graduates lack upon employment?
2. What is the impact of graduates not being fully prepared to enter the workplace productively?
3. What measures does industry take when performance gaps are identified among employed IT graduates?

4. What would industry recommend to improve the higher education IT curriculum so that graduates are fully prepared to enter the workplace productively?

1.2.3 Research objectives

The main goal of this research study was to determine industry recommendations in respect of the higher education IT curriculum in South Africa to improve the productivity of an IT graduate upon employment.

Unpacking the main goal led to the formulation of the following sub-research goals for the study, namely:

- To determine the key skills which graduates lack on employment.
 - To determine whether these skills involve the soft skills, practical skills, lack of subject matter expertise or perhaps a combination of all three items.
- To identify the impact on the workplace of the employment of inadequately prepared graduates.
 - To identify the time taken for the graduate to become productive within the work space.
 - To determine whether a graduate's higher education results affected the time taken to become productive in the work space.
- To identify measures taken to upskill graduates to enable them to meet the workplace needs.
- To ascertain recommendations that industry would like to make to improve the higher education IT curriculum.
- To determine any issues experienced by IT recruitment personnel when a graduate is considered for industry placement.
 - To attain recommendations from recruitment personnel for consideration in relation to the IT curriculum enhancement.

These research objectives further contributed to the vision and aims of the PSET's goals of refining higher education quality by generating a stronger and supportive relationship with the world of work (DHET, 2017).

1.3 Research context

This research study centred on an accredited private higher education institution in South Africa that has approved sites nationwide. The institution comprises twelve campuses – five campuses in Gauteng, one campus in KwaZulu-Natal, two campuses in the Eastern Cape, two campuses in the Western Cape, one campus in the Free State and one campus in Mpumalanga. There are three main faculties, namely, Applied Science, Humanities and Commerce and Law, which offer undergraduate to postgraduate studies with a total of thirty different qualifications to approximately two thousand students.

As depicted in Figure 1.1, this study was conducted in the Applied Science Faculty under the IT department. The institution's IT department offers two modes of studies – the traditional face to face (lecturing) contact mode of delivery known as lecture-based learning (LBL) and the self-directed, self-study contact learning mode known as the mastery learning methodology (MLM). The MLM mode may be seen as the opposite of the lecturing mode as most of the study material is covered via self-study while on campus with lecturer assistance and guidance from time to time. All qualifications in the MLM mode are governed by a specific academic period in which the modules must be completed. The modules are completed consecutively – see Tables 1.1 to 1.3 – and should be completed within the time duration specified. Each module in these qualifications requires a 60% pass mark.

The MLM mode of study offers only the Higher Certificate qualifications at NQF¹ 5 under the Information Systems (IS) band. The IS qualifications offered under the MLM mode of study entail the software and hardware streams and a combination of these streams.

For the purposes of this study, only graduates with the qualifications under the MLM mode of study were considered. The curricula for these qualifications are presented in Table 1.1 (the software stream) and Table 1.3 (the combined stream). Figure 1.1 on page 6 presents the institution's structure and highlights the qualification focus area.

¹ NQF - National Qualifications Framework used in the South African education system. The NQF is a framework and sets the boundaries, principle and guidelines, providing a vision, a philosophical base and an organisational structure for the construction of a qualifications system. Detailed development and implementation are carried out within these boundaries. All education and training in South Africa fits into this framework (“South African Qualifications Authority” n.d).

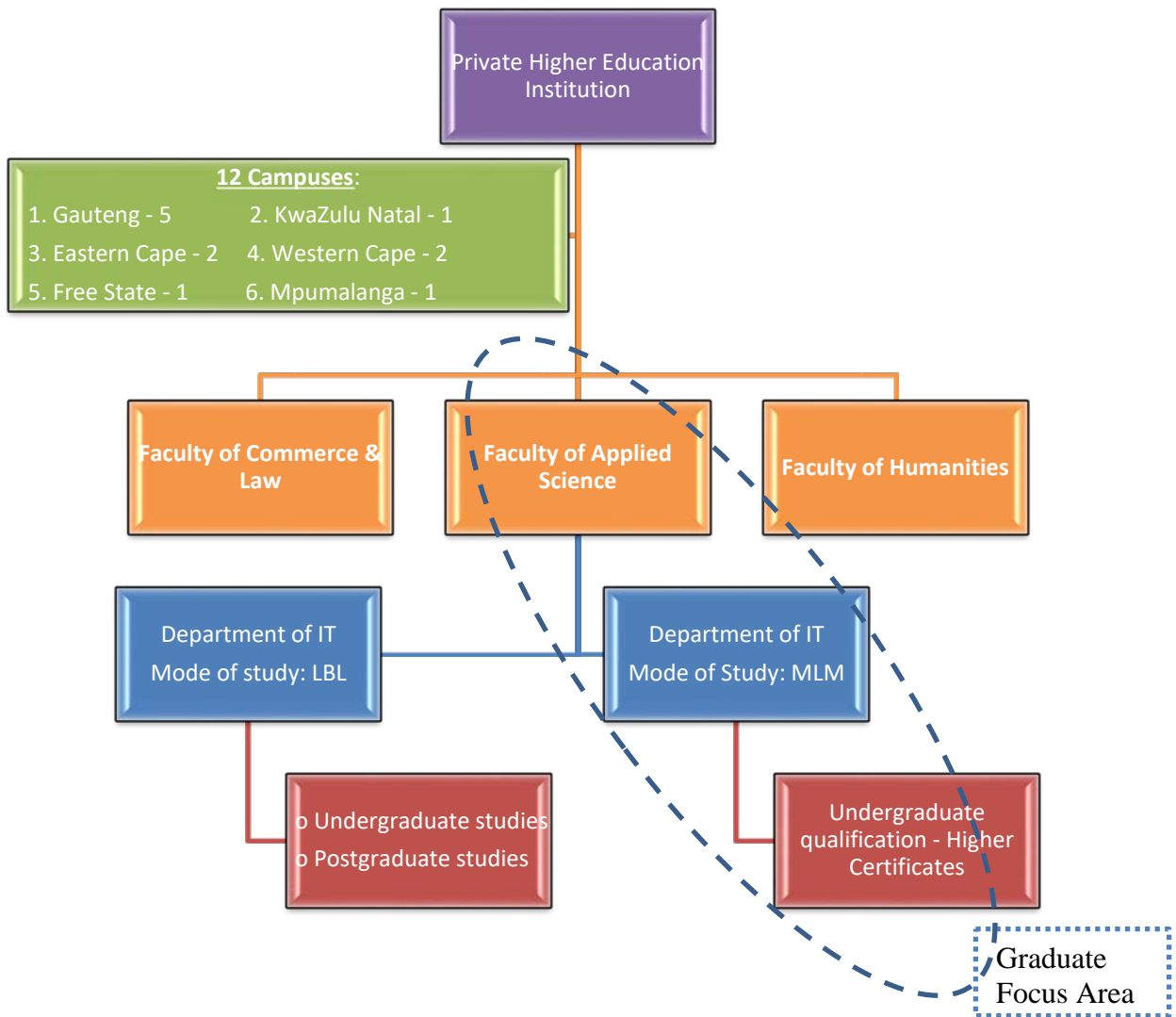


Figure 1.1: The Private Higher Education Institution – Graduate Focus Area

Table 1.1: Information Systems Qualification (Software Stream)

Qualification: Higher Certificate in Information Systems (Software Development) NQF 5		
Module names	Credits	Module duration (in days)
Computer Literacy	12	15
Personal Skills Development	6	5
Processing and Logic Concepts	8	15
Program Design	6	15
Hardware Essentials	6	5
Software Engineering	12	14
Database Design Concepts	12	15
Database Management	16	24
Main Programming Language (A Choice of:)	32	60
Java (Basics and Advanced)		
OR		
C# (Basics and Advanced)		
Second Programming Language (A Choice of:)	16	40
Mobile Development (Android)		
OR		
Java (Basics)		
OR		
C# (Basics)		
Final Practical Exam	0	3
(10 modules) totals:	126 credits	211 days

The module description for each module in this qualification is contained in Appendix A.

Table 1.2: Information Systems Qualification (Hardware Stream)

Qualification: Higher Certificate in Information Systems (Network Engineering) NQF 5		
Module names	Credits	Module duration (in days)
Computer Literacy	12	15
Personal Skills Development	6	5
A+ Preparation	20	43
Network+ Preparation	15	30
Windows Server	15	20
Domain Servers	15	18
Application Services	6	10
Exchange Server	6	10
Introduction to IT Virtualisation	12	12
Security+ Preparation	12	20
Wireless Network and Security	6	10
Server: Network Infrastructure	6	15
Final Practical Exam	0	5
(12 modules) totals:	131 credits	213 days

The module description for each module in this qualification is contained in Appendix A.

Table 1.3: Information Systems Qualification (Software and Hardware Stream)

Qualification: Higher Certificate in Information Systems (Engineering) NQF 5		
Module names	Credits	Module duration (in days)
Computer Literacy	12	15
Personal Skills Development	6	5
Processing and Logic Concepts	8	15
Program Design	6	15
Hardware Essentials	6	5
Software Engineering	12	14
Database Design Concepts	12	15
Database Management	16	24
Main Programming Language (A Choice of:)	32	60
Java (Basics and Advanced)		
OR		
C# (Basics and Advanced)		
Network+ Preparation	15	30
Security+ Preparation	12	20
Final Practical Exam	0	3
(11 modules) totals:	137 credits	221 days

The module description for each module in this qualification is contained in Appendix A.

1.4 Research process

The flowchart depicted in Figure 1.2 indicates the step-by-step stages and processes of the research study from the beginning to the end.

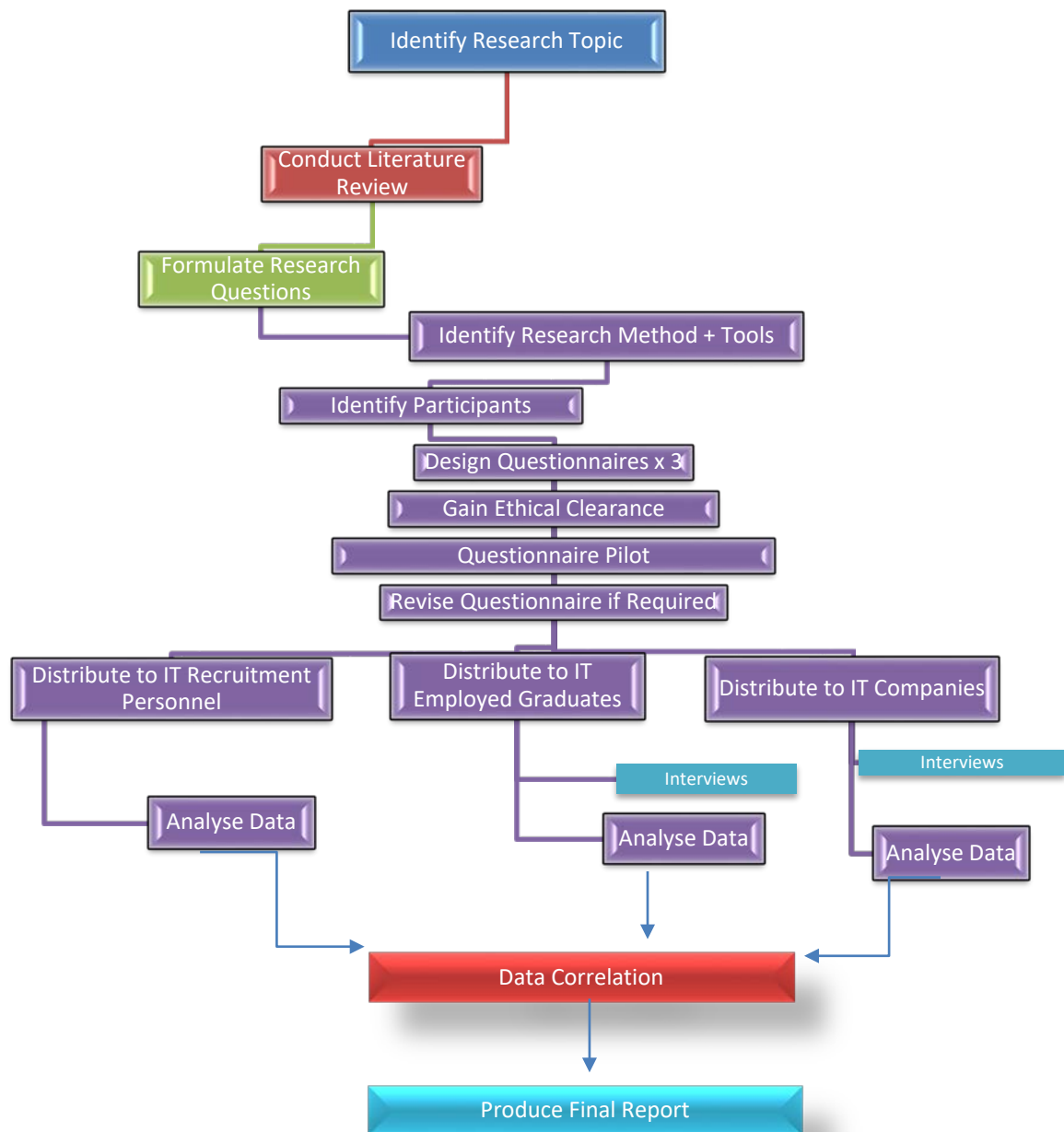


Figure 1.2: Research design flowchart

The predefined criteria in Section 1.3, as depicted in Figure 1.1 (Graduates from the IS stream in the Faculty of Applied Science who studied under the MLM mode), assisted with identifying the participants. Once the participants had been identified, the questionnaires for the groups were designed (see Appendices B to D for the questionnaires). In order to ensure that the questionnaires met the aims of the research, a pilot of the questionnaires was conducted. To conduct the pilot study, the required ethical clearances were obtained (see Appendix F).

Once ethical clearance had been obtained, the pilot phase of the questionnaires commenced, and the questionnaires were then revised where needed. Once the questionnaires were deemed

fit for use in the field, they were distributed to the selected participants. Semi-structured and unstructured interviews were held with the participants from industry to acquire an understanding of their views of graduate employment. Once all the data had been collected from the participants, the data were analysed, correlated and reported.

1.5 Overview of the methodological approach

1.5.1 Research strategy

This study followed a qualitative approach using the interpretivism paradigm with a single-case, descriptive case study as the research strategy. This approach and strategy allowed for an understanding of the different views of industry regarding the performance and experience of employed graduates.

1.5.2 Pilot study

According to Van Teijlingen and Hundley (2001), the purpose of a pilot study in research is primarily to try out the research tool, for example, questionnaires. Accordingly, the pilot study helps to ensure that, firstly, the questions are in the correct order and are easily understood and, secondly, to ensure that the mode in which the tools are distributed is a viable mode (Van Teijlingen & Hundley, 2001). The aim of pilot study conducted in this research study was to pre-test the research tool.

1.5.3 Research participants

The study focused on higher education IT graduates from a specific private higher education institution and specifically from the IT department in the Applied Science faculty. Accordingly, using a purposive technique, only graduates who had completed a higher certificate qualification in the MLM mode of study – as depicted in Figure 1.1 – were considered. In particular, graduates from the private higher education institution employed by IT companies and their line managers participated. In addition, recruiting personnel who place graduates also participated in the study.

As shown in Figure 1.3 the study focused on three IT companies that had employed graduates within the focus area with the participants comprising employed graduates and recruitment personnel who specialise in graduate placements. In addition, the line managers of the employed graduates in the IT companies were interviewed to gather data on the IT companies'

experiences with the employed graduates. These employed graduates also participated in the study to gain an understanding of the experiences from a graduate’s point of view. The recruiting personnel also participated to enable the researcher to gain an insight into their experiences of placing IT graduates. These participants all provided the researcher with different viewpoints of their various experiences involving graduate employment with each participant’s feedback contributing to the recommendations which were to improve the higher education IT curriculum so that it may enhance the graduates’ productivity in the workplace.

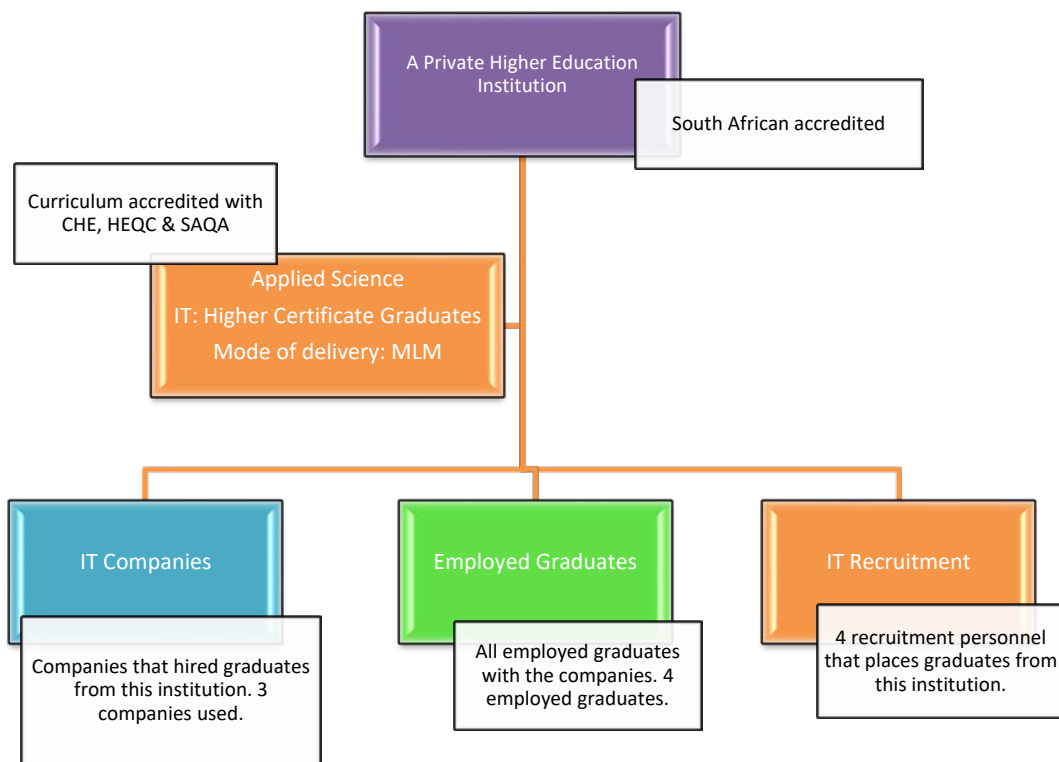


Figure 1.3: Research participants

1.5.4 Data collection instruments

Questionnaires and interviews were used to collect the requisite data. The questionnaires formed part of the initial data gathering stage. Interviews were then used as the data gathering tool to facilitate further understanding of and engagement with the initial data provided by the participants. The data were then analysed. The questionnaires included both open-ended and closed questions with the various participants’ viewpoints being noted.

Three sets of questionnaires were used for the following participants:

- Four employed graduates
- Graduates' respective line managers (four)
- Four recruitment agents who carry out graduate placements.

Recorded, open-ended interviews were also conducted with the employed graduates' line managers as well as with the graduates themselves. These interviews allowed the participants to freely express their experiences of graduate employment.

1.5.4.1 Ethical considerations

Before commencing with the collection of data, ethical clearance was obtained from the relevant authorities of the ethical committee of the University of South Africa (UNISA) as well as the Pearson Institute of Higher Education (PIHE) (see in Appendix F). The participants were issued with a letter of consent which assured both anonymity and confidentiality. This letter is contained in Appendix G. In line with the guarantee of both anonymity and confidentiality, the identities of the participants who completed the questionnaires and were involved in the interviews are not disclosed in the dissertation.

1.5.4.2 Data analysis

The study used thematic analysis of qualitative data with the researcher looking for patterns and themes emerging from the completed questionnaires and the interviews by means of manual colour coding.

1.6 Research contribution

The aim of this study was to make recommendations on the higher education IT curriculum in South Africa to improve the productivity of an IT graduate upon employment. Accordingly, areas on which higher education institutions in South Africa may focus in order to enhance the curriculum, as guided by industry, were highlighted. In addition, the study also uncovered the key aspects and skills that graduates appear to lack and indicated the measures that are taken when skill gaps are found, including the length of time that it takes for a graduate to become productive in the workplace. Table 1.4 indicates the research contributions mapped to the themes that emerged from the study.

Table 1.4: Expected contributions and themes

Research questions	Theme	Expected contribution
What keys skills do South African IT graduates lack upon employment?	Skill set	A better understanding of the key skills lacked by IT graduates who have not been fully prepared for employment.
What is the impact of graduates not being fully prepared to enter the workplace productively?	Skill set	An understanding of the impact on IT companies when underprepared graduates are employed.
What measures does industry take when performance gaps are identified among employed IT graduates?	Skill set	A greater understanding of the actions taken by IT companies to ensure employed graduates attain productive levels.
What is the impact of graduates not being fully prepared to enter the workplace productively?	Employability	A perception of the time taken for the employed graduate to become productive.
What is the impact of graduates not being fully prepared to enter the workplace productively?	Employability	An understanding of whether or not a graduate's pass level contributes to a faster pace to productive levels.
What keys skills do South African IT graduates lack on employment?	Curriculum design	A richer knowledge of the qualities that IT recruitment personnel seek when trying to source a possible graduate for employment.
What does industry recommend to improve the higher education IT curriculum so that graduates are fully prepared to enter the workplace productively?	Curriculum design	A clearer view of the recommendations made to improve the higher education IT curriculum in South African institutions so that more productive graduates may be produced.

It is expected that these contributions will allow for a better and clearer understanding as to why South African IT graduates are ill-prepared for the workplace. They will highlight the way these graduates are then trained in the workplace as well as the training aspects that may be incorporated into the IT curriculum to produce better prepared graduates.

1.7 Research scope and limitations

This investigation was limited to a single case study at a private, higher education institution and involved graduates with a higher certificate level of education in the IT field only. Any qualification involving a NQF level lower than five was not be considered as the study focused on the higher education arena only. In addition, the research did not include any qualifications higher than the certificate level of studies.

International graduates were excluded from the study as international qualifications do not comply with the NQF levels in South Africa. If these qualifications were to be included a vast amount of benchmarking, verification, authentication and authorisation by the South African Qualifications Authority (SAQA) would be required for research purposes. Graduates from public institutions in South Africa were also not included in the study as there are many

variations of elective subjects in the IT curriculum which do not focus on the intended specialisation area.

The specialisation area was limited to the software and/or hardware field and excluded firmware. It also excluded any investigation into the costs incurred by IT companies for further training of the graduates employed.

1.8 Dissertation structure

This dissertation outline is presented in Figure 1.4.

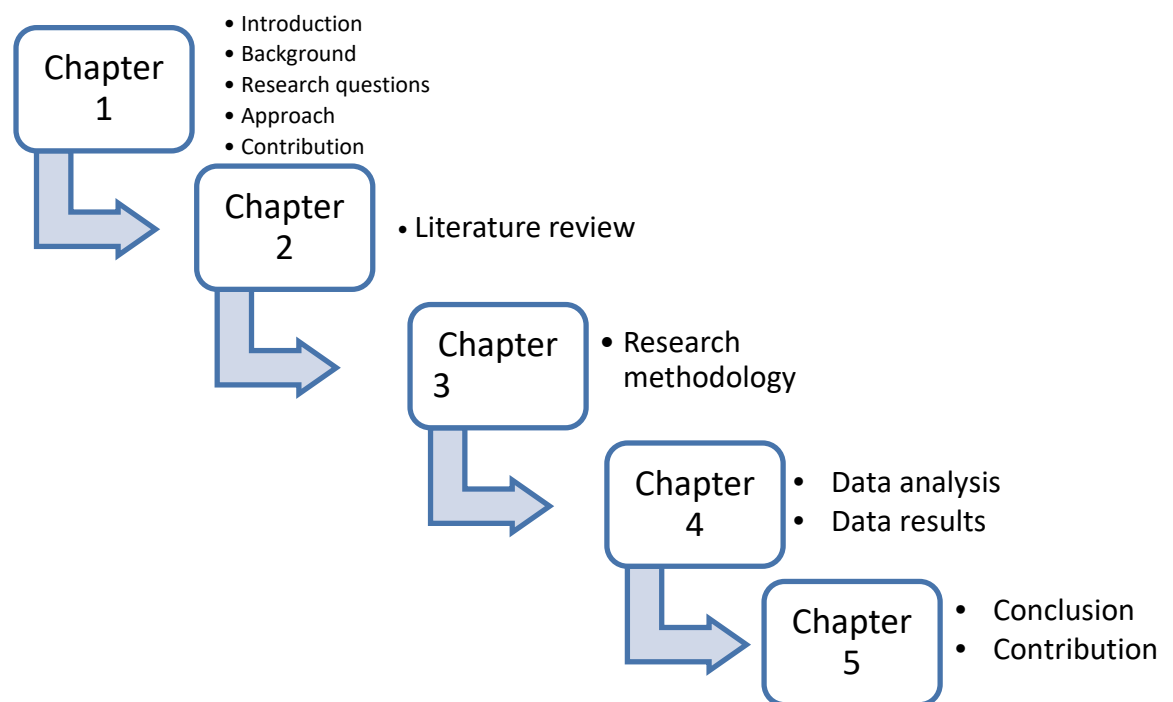


Figure 1.4: Dissertation structure

Chapter 1 presents the introduction and background to the study as well as the research questions, research approach, research objectives, significance and limitations of the study.

Chapter 2 contains a review of relevant literature on the context of employed graduates.

Chapter 3 presents the research methodology used in this study and focuses on the research design, research strategies and research paradigm as well as the data collection and data analysis methods used.

Chapter 4 discusses the data analysis, research results and the understanding of the research findings.

Chapter 5 is the last chapter and presents the conclusions drawn from the study's findings and the suggested recommendations.

This chapter presented a brief introduction to the study, including the background to the study, problem statement, research questions, research aims, and research methods used. The next chapter presents a review of relevant literature pertaining to curriculum design as well as the employability and skill set aspects that impact on the preparation of graduates for the workplace.

CHAPTER 2

Review of Literature

2.1 Introduction

The readiness for employment of South African IT graduates has been a topic of debate in recent years. Key guiding themes in this debate include the graduates' skill sets, employability standing and the IT curriculum covered. Both academics and students tend to focus primarily on enhancing technical skills with little attention being paid to the interpersonal and additional skills that a graduate may need once he/she is employed.

Green, Hammer and Star (2009) highlight the importance of developing graduate attributes. Graduate attributes or gradueness may be defined by the abilities, skills and understandings that academia decides on for students to cultivate during their period of study with an institution. A holistic model entailing the development and support of graduate attributes and qualities is required for an institution to uphold the concept of gradueness. This requires a 'whole-of-university' approach which entails each discipline/faculty within the institution being accountable for the preparation and execution of the holistic model. The accountability aspect lies within the institution's academic system and includes the stages involving conceptualising, planning, designing, executing and assessing the qualities of graduates (Green et al., 2009). Kroeze, Ponelis, Venter, Pretorius and Prinsloo (2012) question the skills that 21st-century graduates require to enable them to function in the rapidly progressing computing environment as well as the advantage(s) which the graduate should possess to stand out in the employment arena. They conclude that gradueness includes learning outcomes and attributes that prepare students to be both inventive and effective in the workplace. This includes their being dynamic and well-versed citizens upon completion of their qualifications (Kroeze et al., 2012).

From an international point of view, Kiener, Ahuna and Tinnesz (2014:109) highlight that "students are not developing these skills in university classes that maintain a focus on low-level thinking such as memorization. As employers are in need of workers who possess critical thinking and problem-solving skills for the new economy, universities are struggling to meet that demand". These are crucial aspects to which academia should pay attention in respect of

the needs and wants of industry that our graduates appear to be unable to meet. The notion of gradueness is also considered to incorporate knowledge, skills and attitude in conjunction with the type of discipline studied during undergraduate studies in order to enhance a graduate's employability level (Dziallas, 2015; Dziallas & Fincher, 2016).

This research aimed to ascertain ways in which the higher education IT curriculum in South Africa may be adapted to improve the productivity of an IT graduate on employment. Accordingly, this literature review focused on curriculum design, employability and skill sets as aspects that impact on a graduate's preparation for the workplace and, therefore, on their gradueness. Section 2.2 presents the purpose of the literature review, while in Section 2.3 the curriculum design aspect is discussed and the curriculum design needs summarised. In Section 2.4, the employability aspect is covered. Section 2.5 discusses the aspect of skill sets and, finally, in Sections 2.6 and 2.7 a summary and conclusion to the chapter are provided. It is important to note that curriculum design, employability and skill sets are interrelated and contain overlapping concepts.

The next section discusses the purpose of a literature review.

2.2 Purpose of a literature review

A literature review aims to assist the researcher in his/her acquisition of knowledge about the intended research topic. Relevant literature indicates what has already been covered in particular areas of the intended field of research, how it was researched and matters which still need to be addressed. A crucial feature of the literature review is that "a successful argument in a literature review is that you make connections between one reference and another, and also explicit links between these sources and your own work" (Ridley, 2008:25).

There are various ways in which to conduct a literature review although, ultimately, there is no prescriptive structure for a literature review as each research topic is unique (Hart, 2018). Conducting a literature review does not happen in a short space of time as in a few weeks as it takes time to find, organise, make connections with the different findings and to amalgamate the arguments and the information found. The researcher in this study took two years to consolidate all the findings and arguments used for the purposes of this literature review with the information relevant to the study spanning from 2001 to 2018. This study covers Higher Certificate graduates and the literature findings included local and global avenues of the study

field, showcasing the various findings, the problems in relation to graduate employment which have yet to be addressed as well as what may be done from an academic standpoint to create and develop better prepared graduates for industry. The next section presents the curriculum design aspects of the literature review.

2.3 Curriculum design

The field of curriculum design has come under pressure to transform at the macro levels according to the needs of the industry, as recommended by the South African higher education policy framework of 1996. However, this reform initiative fell casualty to the resource-intensive task (Jaffer et al., 2007). Lau (2001) argues that the educational institution sector appears to be the most outdated sector when compared to other developments in the latest century of transformation and points out that a ‘modernist’ curriculum is not preparing students to survive and further improve in the ‘postmodernist’ times.

2.3.1 Academia and the curriculum

Higher Education South Africa (HESA) highlights the importance of gathering graduate information that cover aspects pertaining to the graduate’s study path all the way to employment as this would positively impact on changes within institutions (Du Toit et al., 2014). Internationally the collaboration between higher education institutions and industry are increasing as classroom-based facilitation covering technical skills alone does not produce adequately prepared graduates for the workplace (Govender & Taylor, 2015). Jackson (2013a) indicates that in order to enhance work readiness in new graduates, work-integrated learning is a vital tool for graduate readiness and preparation. However, the curricula at South African universities are not evolving at the fast paced rate at which the IT industry is evolving, thus resulting in ill-prepared students entering industry (Moyo, 2013). In the United States, a Faculty in Computer Information Systems concur that the challenge of creating a curriculum that is pertinent to the rapid growing requirements of industry makes it difficult to ensure a curriculum design that meets the constantly evolving requirements of industry, hence causing a lack of proper technical skills (Janicki, Cummings & Kline, 2014).

It is, thus, incumbent on higher education to reassess the work-based activities covered to enhance graduates’ employability. This would entail the addition of curriculum supervision by employers (Cranmer, 2006). According to Jaffer et al. (2007), academic preparedness, large

classes and inadequate curriculum design are some of the challenges South African higher education institutions are facing. Despite the fact that support programmes are offered in South African institutions to assist in eliminating some of the challenges faced, it is suggested that more resources and better expertise may further assist (Jaffer et al., 2007).

2.3.2 Curriculum gaps

Griesel and Parker (2009) argue that we would also need to be realistic about the extent to which tertiary education may minimise the gap between its outcomes and employer expectations. Certain factors such as teaching qualification levels of lecturers, teaching experience, industry experience, employment level, employment load (including full time and part time employment) and employment status are considered to be key influences while also determining the ability to teach the correct technical skills required. Yuksel, Robin and McNeil (2011) advocate that educational institutions implement digital learning and other types of digital storytelling to enhance the teaching experience and learning. De la Harpe and David (2012) add that should academic staff be able and willing to incorporate industry aligned employability into the curriculum, then the focus would have to include coaching and assessments that would strengthen both the technical aspects required as well as work-readiness skills. This also highlights the importance of the employability aspects that need to be taken into account when curriculum enhancements are made.

Policy and practice have now evolved and this has resulted in courseware developers first looking at open educational resources before subsequently building thereon (Weller & Anderson, 2013). Spaul (2013) argues that the educators' knowledge is a key resource in South Africa but also that the education system in South Africa is in crisis. The problems highlighted include educators not being appropriately trained to teach certain subject matters. Thus, proper training should be put into place for those instances. Spaul (2013) concludes that South African education policy and practices should start with the involvement of a nationwide diagnostics system for educators and based on teaching and learning that cover the latest industry-aligned technical skills and work-readiness aspects. This in turn would enable better curriculum design by trained educators, thus resulting in more employable graduates than appears to be the case. Dasuki, Ogedebe, Kanya, Ndume and Makinde (2015) add that it is crucial to identify the curriculum needs but also indicate that significant gaps have been identified in relation to staffing and their skills areas. It is suggested that the country would need to fill the gaps found in education while the universities should also provide in-house training for educators so that

curriculum gaps may be addressed. Ramdass and Masithulela (2016:13) summarise a strategy on pedagogical innovations and indicate that “with support from government, industry and the Setas, academics are required to design their curriculum to meet social and societal needs that would enable job creation”. Thus, a concerted effort should be made to enhance teaching and learning via technological approaches while higher education should encompass an organisational structure that performs efficiently in meeting the requirements of industry (Ramdass & Masithulela, 2016).

2.3.3 Industry

The labour market may be described as a multifaceted domain requiring a combination of inherent and knowledgeable resources. In order to better understand the needs of the labour market, Finch, Peacock, Levallet and Foster (2016) suggest that education bodies should design the curricula based on the employers’ desires. This would involve incorporating the key skills needed with ongoing curriculum refinement characterised by ongoing collaboration between academia and industry (Finch et al., 2016). Howard (2017) concludes that research based on whether the information systems curriculum meets business needs opens up an avenue for further studies on the best ways in which to improve associations between industry and academia, in turn creating graduates who are better geared for the workplace. These points highlight that there would be a greater need for an increase in academia’s budget in order to keep up with industry trends, as well as to satisfy the need for producing better equipped graduates than is currently the case. In addition, the need for extra budget to be in place for all higher education colleges and universities to enable them to place more resources to sustain the supply and demand needs for properly geared IT graduates is also highlighted (Ramdass & Masithulela, 2016; Howard, 2017).

Shay (2017) also points out the importance of increasing the post-graduate cohort. This implies that the academic life progression must not be forgotten. A more ‘fit-for-purpose’ syllabus is required for undergraduates so that it produces first time work-ready graduates with the potential for post graduate study to maintain employability.

It is highlighted that there appears to be a lack of key communication skills included in the curricula, for example, skills related to team proficiencies as well as consolidation and negotiation skills (Howard, 2017). Therefore, the academic fraternity will need to investigate ways in which it may satisfy these needs. This would require measures that would need to be

put in place to ensure that the curricula are constantly changed and upgraded in the interests of alignment with industry needs (Travis, 2017). The qualities and skills that students require at the higher education level have a considerable impact on both overheads and productivity in the workplace (Travis, 2017). It was, thus, deemed essential that the experiences of employed South African IT graduates be investigated.

2.3.4 Curriculum guidelines

Reports on the global project of CC2020 that engages with the maintenance of the computing curricula on a global platform in collaboration with the Association for Computing Machinery (ACM) and the Institute of Electrical and Electronics Engineers (IEEE) Computing Society provide some guidelines for curriculum design (Impagliazzo & Pears, 2018). The CC2020 project group is tasked with identifying new curricula guidelines. Thus far it has found that IT competencies in the curricula for computing across all IT arenas involve three key types of competencies, namely, knowledge, skills and dispositions. The knowledge competency includes core concepts of the discipline of study, the skills competency includes the ability to develop and refine skills via ‘hands-on’ practice and activity while the dispositions competency has to do with attitude, behaviour, social skill and emotional capabilities. Building these competencies into curriculum design should lead to stronger guiding principles in bettering graduates’ skills for the workplace. In 2017 the IT Curricula report by ACM and IEEE (2017) summarised the following guiding principles to be considered in curriculum design:

- Reflection of the integrity and character of IT as an independent discipline. The curriculum is to cover theory, practice, knowledge, and skills. It is to ensure that practice follows both theory and professionalism.
- The design is to follow the fast-paced technical changes. This means that the curriculum must be upgraded on a regular basis to keep up with modern developments.
- Curriculum design is to follow the outcomes of the qualification in order to maintain the outcomes/goals of the qualification to ensure students conclude their studies equipped with the intended capabilities.
- The design is to encourage creativity, professionalism and innovation. This would create a culture for students to adapt.
- Accessibility of the curriculum is to be considered during the curriculum design. This allows for diverse groups of students to gain access, regardless of their background.
- The curriculum is to provide students with a multifaceted understanding that gives

them an opportunity to apply their knowledge and skills to solve challenging problems.

Morris (2018) explains that a curriculum should be logically organised in a step-by-step manner to enable learners to target more challenging learning objectives. In doing so, it is fundamental to facilitate the concept of critical thinking to ensure the learning outcomes are attained successfully. Students are encouraged to appreciate the fact that knowledge is not secured over either time or context due to the change in social contexts and that the use of knowledge is applied in accordance to the societal surrounding (Morris, 2018).

2.3.5 Curriculum design summary

It has been pointed out that increased collaboration between industry and academia is necessary to address the industry needs gaps, such as work-readiness involving interpersonal skills and technical skills, as well as to include the latest technology exposure in relation to further enhancements to the curriculum (Moyo, 2013; Govender & Taylor, 2015; Howard, 2017). This means that the higher education system would require additional resources as well as a budget in place to maintain the support provided to students moving into the work space as graduates (Ramdass & Masithulela, 2016; Howard, 2017).

Figure 2.1 presents a summary of the items lacking in curriculum design according to existing literature, for example, academia and industry collaboration covering the identification of academic gaps as well as the reality that additional academic resource and budget need to be put in place. Collaboration between academia and industry is required so that the curriculum offered to students reflects the latest industry trends and needs and also feeds into the work-readiness skills that graduates require, for example, communication skills as well as exposure to the latest technologies to improve their technical skills. To do so, improvements to the curriculum are needed. In turn, academia would require more dedicated and focused resources and budget to be in place to continuously sustain the curriculum to keep pace with industry requirements to produce better prepared and more employable graduates.

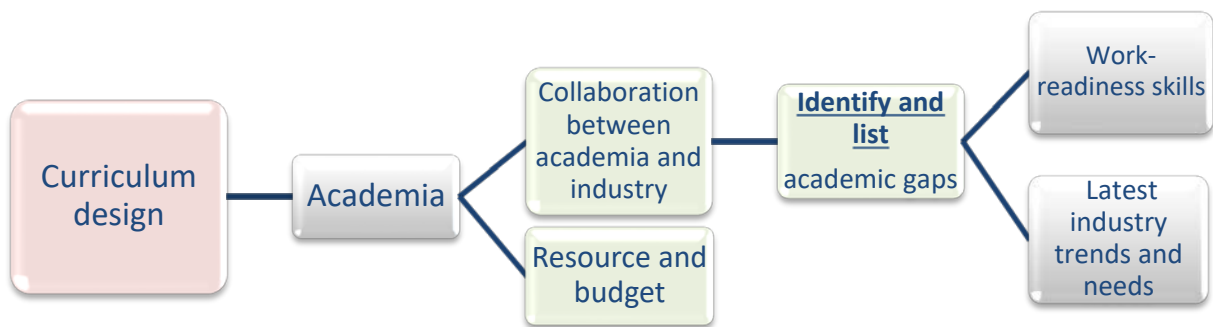


Figure 2.1: Summary of curriculum design needs

Several researchers have pointed out that the higher education IT curriculum lacks the work-readiness skills in relation to people skills, including communication skills, in addition to the technical skills that are taught (Griesel & Parker, 2009; Jackson, 2013a; Govender & Taylor, 2015). These work-readiness skills fall into the wider category of the skill sets that play an important role in curriculum design in its totality. Skill sets are covered in detail in Section 2.5. The elements indicated in Figure 2.1 are suggestive of ensuring a stronger curriculum which, in turn, would create graduates who are better prepared when they enter the workplace.

When the curriculum is enhanced graduates become more employable, thus linking curriculum design to employability. The next section discusses the employability aspects of the study.

2.4 Employability

There are several definitions of the term employability that may be approached from the educational and industry angles. Industry regards employability as the sum of the associated skills, attributes and competencies that assist individuals to secure employment and then to perform based on expectations regarding the technical and discipline competences they have acquired during their studies. On the other hand academia considers employability as transferable attributes and skills which enable graduates to find suitable employment (Lowden, Hall, Elliot & Lewin, 2011). Thus, the term may be summarised as the capability to operate effectively in a position as well as to possess the ability to switch between occupations and, thus, to remain employable throughout one's life. A succinct definition of employability is the abilities and skills that enable an individual to be employed (McQuaid & Lindsay, 2005).

Emphasising employability may result in the growth of tertiary education and its efforts to create employable graduates who would be judged in respect of their adding value to the dynamic work environment. On a global level graduates are required to develop the skills demanded by employers in order to gain an opportunity in the workplace. According to Brown et al. (2003), depending on the acquisition of the knowledge, skills and entrepreneurial passion required in the workplace, employability may be seen as a competitive advantage.

2.4.1 Skills development

Cranmer (2006) suggests that to enhance the employability of graduates, higher education would need to re-examine the skills activities offered with regard to more work-based activities. This would require the inclusion of curriculum guidance by employers. It is anticipated that students would then be able to link between theory and practice as numerous IT qualifications are theory driven. However, students are frequently restricted in their practical exposure which then poses a problem in gauging the theory which has been absorbed. This, in itself, is an additional concern that may render an IT graduate less employable (Jaffer et al., 2007). Archer and Davison (2008) highlight the need for collaboration between government, industry, universities and students in order to address the perception and actuality of shortfalls in the graduates. Findings from industry show that work experience is critical to improve a graduate's employability level and further indicates that industry must be more clear, concise and effective in indicating its requirements to the universities so that the employability levels of graduates may be improved (Archer & Davison, 2008).

Insights into employability from the employers' perspective play a key role in developing graduates suited to the workplace. Close links between higher education and industry must be the norm and maintained in ascertaining the employability skills that need to be established in higher education's offerings. Suleman (2016) explains two approaches that may achieve and maintain a close connection of higher education and industry, namely, the direct approach and the indirect approach. The direct approach would include gathering information on hiring criteria that indicate skills preferences while the indirect approach involves investigating employer satisfaction after graduate employment. These approaches may be utilised as methods to ensure the employability status of graduates in the workplace. According to Jackson (2016), the role of industry stakeholders is critical when compiling market related employability needs.

Waldrop (2017) indicates that finding employment is often a significant issue for the graduates from IT colleges and universities. The main problem relates to whether these graduates have attained the crucial IT abilities and skill sets, including both wide-ranging general skills as well as the technical skills that are required by IT managers. Employers require candidates with an amalgamation of behavioural skills (soft skills), such as writing, team work abilities and self-development and technical skills (hard IT skills) such as designing, programming and troubleshooting skills (Amiruddin, Ngadiman, Kadir & Saigy, 2016; Waldrop, 2017).

Employability is linked to both the skills discussion and the requirement that a university education should equip graduates with the skills and knowledge required to render them employable. Due to the ever changing and flexible market, employability means that it is incumbent on these graduates to maintain the skills that are transferable from one occupation to another (Puhakka, Rautopuro & Tuominen, 2010). Wellman (2010) suggests that both employers and subject specialists in academia should collaborate to identify the employability skills that should be included in the curriculum and that this may be achieved by focusing on best practices and experience from the market itself. With the emphasis on employability, higher education in the United Kingdom (UK) focuses on students' motivation in respect of what to study and suggests that students are attracted to courses that provide career enhancing prospects, for example, more vocational studies as well as academic challenges offering a balance between the theoretical and practical components (Buglear, 2014). Moreau and Leathwood (2006) suggest that students should be subjected to a critical framework that allows the employability concepts of personal skill and industry-required qualities, such as effective communication and technical skills, to be interpreted and understood.

2.4.2 Curriculum enhancements

Pop and Barkhuizen (2010:77) maintain that “studies show that there is a serious mismatch between graduate aspirations and the reality of the labour market and that new graduates are insufficiently prepared for the world of work”. Studies on higher education and employability have shown that both industry and recent graduates agree that undergraduate work experience is extremely advantageous with respect to personal development and efficiency in the workplace. However, it is felt that the qualifications provided to students did not prepare them for the workplace (Pop & Barkhuizen, 2010). Saunders and Zuzel (2010) explain that the latest trends in graduate skills involve subject specific skills and knowledge that may be used to prescribe the upgrading of the higher education curriculum. Upgrades to the curriculum will

enable graduates to then position themselves with a higher employment status in the job market. However, it is pointed out that to achieve a higher employability standing for graduates, the curriculum enhancements should include those employability aspects that pertain to and endorse life-long learning (Saunders & Zuzel, 2010). Jing, Patel and Chalk (2011) agree that learning does not stop after graduation.

Jing et al. (2011) emphasise that to build employability, a support community involving students, academia, employed graduates and key industry members should be established. This community network would provide the vital feedback on experiences in relation to employability that would assist students, graduates and academia in understanding employability needs and experiences. In addition, this would also open up avenues for work-integrated learning for students during their undergraduate study period that would further enhance their employability status as well as enabling graduates to learn from the experiences shared (Jing et al., 2011). Creasey (2013) maintains that it is the responsibility of the students to grasp the concept of employability via exposure to work-related activities. If a student is engaged with the processes required to enhance employability then aspects such as maturity, enthusiasm and confidence will help to build the attributes that graduates require for employment purposes. Higher education institutions may increase the employability awareness of students in a broader sense by ensuring skills development activities such as working in teams, planning, organising and communicating (Tymon, 2013).

Taylor and Govender (2013) place significant emphasis on the work readiness and skills set of South African graduates. One significant area included in the issue of work readiness is that the unemployment rate and a reduction in the rate of unemployment in South Africa are to be addressed by 2030. It has been stated that “workplace and work-readiness skills are considered important to ensure that this process occurs seamlessly: workplace-readiness skills are key to successful entry into the workplace, and to continued employment” (Taylor & Govender, 2013:12). It is also worth noting that to assist graduates in respect of the entry point of employment, a work-integrated learning (WIL) component should be included in the qualifications offered. This WIL component should lead to industry and academia engagements and would steer the component in direction of the requirements of the workplace.

2.4.3 Employability summary

According to annual reports from Statistics SA, the unemployment rate of South African graduates increased to 9.9% in 2013 from 7.6% in 2008, despite the fact that job loss had decreased with improved education levels (Nonyana, 2015). Findings have suggested that, when compared across fields, criminal justice graduates who initially lacked confidence to operate effectively within the workplace proved to be more competitive after graduating once they had been placed in a work-integrated learning environment (Thompson, Bates & Bates, 2016). Rowe and Zegwaard (2017) emphasise work-integrated learning to stimulate graduate employability. The work-integrated aspect may be summarised as skills, attributes, professional-identity and citizenship. It is further highlighted that in order to establish essential employability aspects for the students to grasp, a curriculum redesign is required. This redesign would enable students to link work related activities easily and would increase proficiency in respect of meeting employability needs (Rowe & Zegwaard, 2017). Pheko and Molefhe (2017) highlight that from the employers' perspective, it is academia's duty to ensure that prospective employees are being equipped with the requisite knowledge, skills, attributes and abilities that are important employability factors. In addition, there should be a direct link between the labour market and higher education, as higher education is regarded as a vital stakeholder in the preparation of graduates for the labour market. In order to prepare them adequately, the opinions of the employer should be heard by higher education, thus leading to 'demand-led' education.

Shivoro, Shalyefu and Kadhila (2018) conclude that despite the fact that greater emphasis is being placed on employability within the higher education domain, it is the role of higher education to produce graduates who are able to survive in the 21st-century work space. To do this, higher education would need to align the curriculum to enhance employability attributes through collaboration with industry, thus enabling the students to become productive members of the workforce once they have graduated.

Global bodies such as the ACM and IEEE are also calling for better graduate employability and have joined the CC2020 project to ensure that the main focus areas are included. These main areas include incorporating core concepts of the study discipline, more 'hands-on' activities and an investigation of social behaviour. This would then ensure more employable graduates entering the workspace.

Introducing and maintaining employability attributes as well as a work-integrated learning module in the IT curriculum will help to ensure that graduates attain industry required skills. These include hard skills such as practical and technical skills as well as soft skills that include interpersonal and communication skills. These skills would then be introduced to the graduates in order to better prepare them for the work environment. Figure 2.2 summarises the literature on what is lacking in respect of the employability aspect. Addressing these gaps would help to develop better prepared graduates.

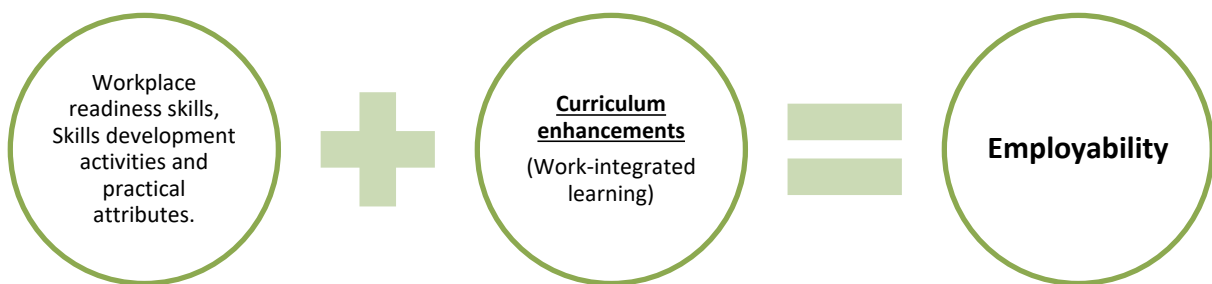


Figure 2.2: Summary of employability needs

Work-readiness skills, practical skills and skills development activities are essential if graduates are to become more employable (Cranmer, 2006; Archer & Chetty, 2013; Taylor & Govender, 2013; Tymon, 2013). If the employability aspect is not addressed and rectified, this has a direct effect on a country's economy. In the case of the South African economy people from outside the country may be employed in the workforce, thus causing further deterioration in the economy.

In order to assist the economy and address employability matters, relevant literature has pointed out that collaboration between academia and industry regarding work-readiness should be established so that further enhancements to the curriculum may be effected (Jackson, 2016; Suleman, 2016). It is also pointed out that including work-integrated learning in the curriculum of tertiary institutions would benefit the graduates' employability levels (Thompson et al., 2016).

The next section discusses the skill sets aspects of the study.

2.5 Skill sets

Skill sets are one of the crucial factors in respect of employment. There is often grave concern when graduates are employed in their respective fields and an in-depth scrutiny of their skill sets is conducted. Such scrutiny is a measure to ascertain whether the graduate would be a right fit for the position or not. Carbery and Garavan (2005) explain that the pattern of attaining lifetime employment has evolved into a pattern of wanting lifetime employability. Those who pursue training and development opportunities identify their skills gaps to ensure they expand their knowledge to enable them to maintain employability within the job market. It was further mentioned that “some of the most important skills that individuals utilised in making the transition were self-development skills. There was a requirement for individuals to engage in more macro-level, strategic thinking, display high levels of creativity, problem solving and innovation skills” (Carbery & Garavan, 2005:18).

Ensuring that students are employable by identifying the required industry skill sets has created an awareness among academics of the need to develop a richer curriculum that meets the demands of employers (Abdullah-Al-Mamun, 2012). This has led to debates in the IT sector around the lack of employee development and skill shortages. These debates have resulted in conflicting views as to whether a lack of employee development and skill shortages emanate from a lack of suitable training (Mohlala, Goldman & Goosen, 2012). Van Dyk and Coetzee (2012) highlight the high cost, increased workload and demands on existing staff members involved when new employees must be trained. These place extra strain on industry as they may affect the company’s productivity levels during the training period while extra expense is often involved in the placing of the new graduates.

There are ongoing complaints in the IT industry space that universities are not producing graduates with the required skill sets. This often results in industry looking beyond a country’s borders to find candidates with the required skill sets. However, placing candidates from outside of a country does not resolve the matter that the curriculum offered is not meeting industry demands in the local context (Cappelli, 2015; Exter, Caskurlu, & Fernandez, 2018). Suleman (2016) suggests that research efforts to gather information that may improve the transition from education to employment, would cause a reduction in the mismatch between industry needs and the curriculum offered.

Soffel (2016) highlights that according to the World Economic Forum report based on ‘New Vision for Education’, the gap between the skills graduates acquire and the skills graduates require for employment is becoming more obvious in that there are shortfalls in equipping students with the knowledge they need to succeed via traditional learning methods. Students require 21st-century skills before they enter the workplace. Figure 2.3 presents the 21st-century skills required divided into three categories portraying life-long learning. These categories are further broken down into a total of 16 skills that are required. The first category covers ‘foundational literacies’ and includes skills in respect of literacy, numeracy, scientific literacy, information communication and technology (ICT) literacy, financial literacy and cultural and civic literacy. These skills would assist students to relate fundamental skills to their daily tasks. The second category of ‘competencies’ would enable students to address multifaceted challenges. In order to meet these challenges, the student needs to acquire the required skills of critical thinking, creativity, communication and collaboration. The third category that helps students within a changing environment includes ‘character qualities’. This category involves skills pertaining to curiosity, initiative, persistence, adaptability, leadership and social and cultural awareness.

The foundational literacies element presented in Figure 2.3 highlights the need for numeracy, science and literacy. Exter et al. (2018) explain that the basic concepts of literacy, including literacy and numeracy, are important skills in order to hone the development of the analytical and logical skills that are vital for graduates within the computing field. Adnan, Daud, Alias and Razali (2012) explain why vital critical thinking skills would assist graduates in problem solving in respect of the complex challenges, thus promoting life-long learning. According to Andrews and Higson (2008), the ability to adapt to the ever-changing demands of the working world is essential for graduates. The 21st-century skills depicted in Figure 2.3 promote life-long learning and would be an advantage if instilled in graduates.

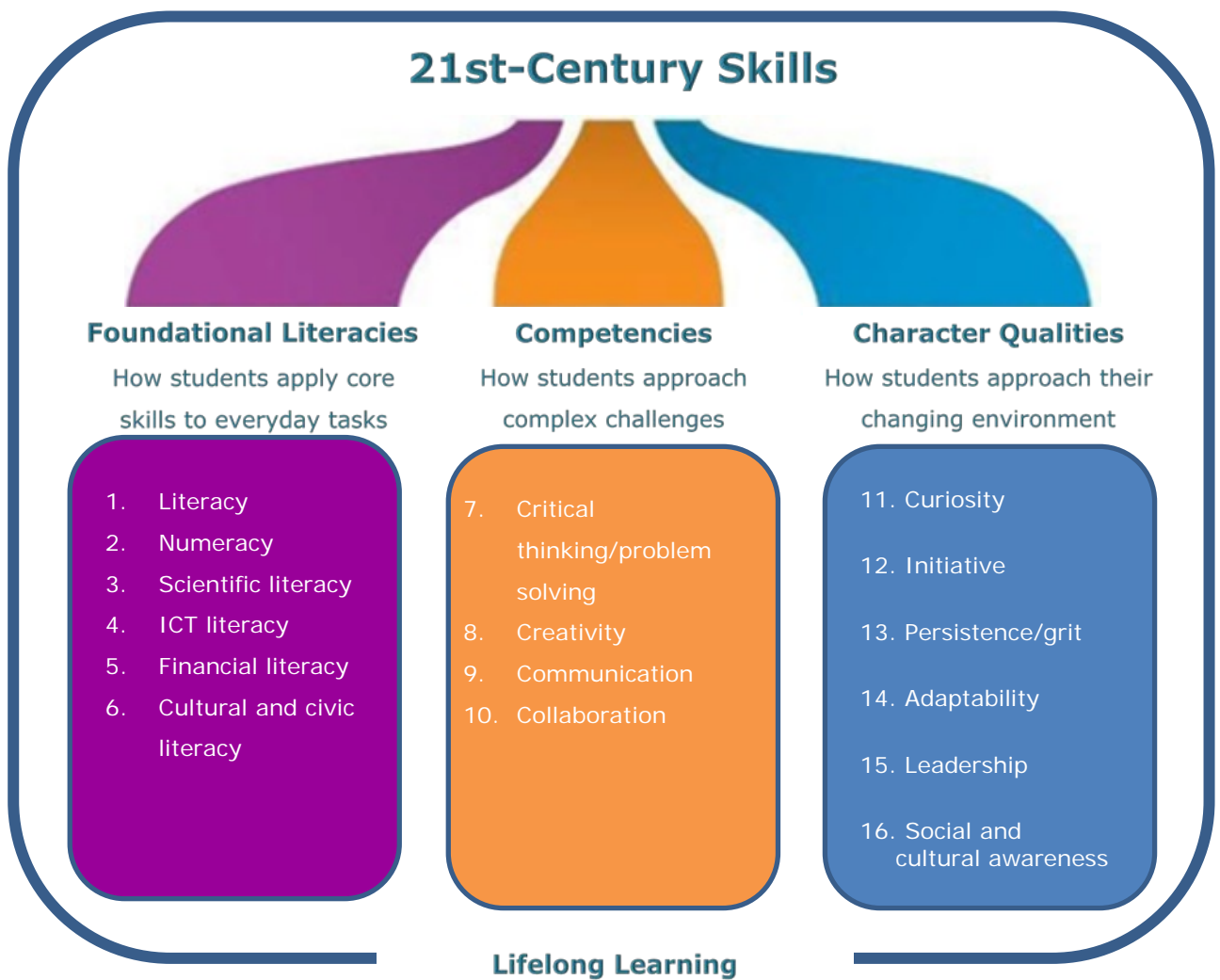


Figure 2.3: 21st century Skills

Adapted from World Economic Forum, *New Vision for Education* (2015)

If students attain these 16 lifelong learning skills, as depicted in Figure 2.3, this would lead to educational fulfilment and the possibility of an improvement in the employment rate. Exter et al. (2018) also support the 21st-century skills and highlight the competency skills involving critical thinking, creativity, communications, literacy and scientific skills. They argue that these skills are important lifelong learning skills that assist in the maintenance of employable status in the job market.

As shown in Figure 2.4 the Future of Jobs Report predicts a shift in skill changes in relation to the top ten ranked skills from 2015 to 2020 (Soffel, 2016).

Top 10 skills

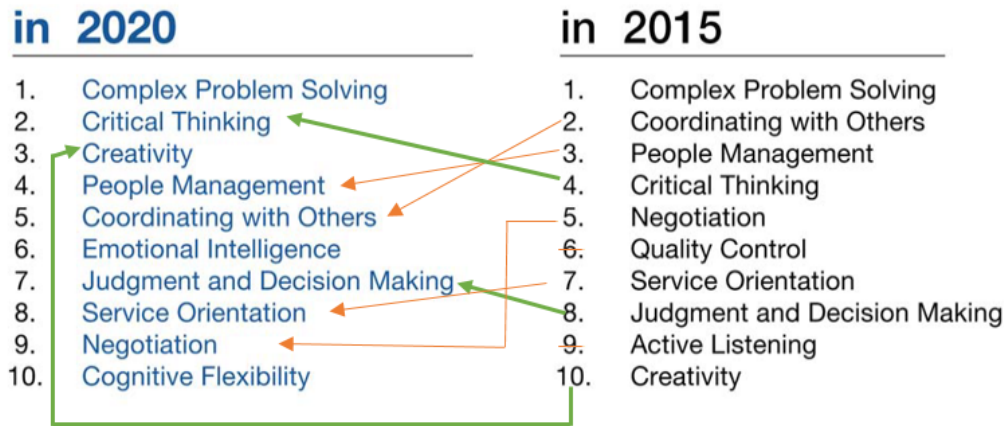


Figure 2.4: Top 10 skills shift from 2015 to 2020

Adapted from World Economic Forum, Future of Jobs Report (2016)

As illustrated in Figure 2.4, the skills shift from year 2015 to 2020, in which two skills (Quality Control and Active Listening) are no longer in the top ten list. There are three major shifts in the skills listing with the Creativity skill demonstrating the biggest jump from position ten in 2015 to position three by year 2020. Two new skills are also included in the top ten list, namely, emotional intelligence and cognitive flexibility. These shifts in the skills in the top listing provides insight into higher education when considering incorporating graduate skill set needs into the curriculum. Rust and Froud (2016) concur with the skills listed in Figure 2.4 and state that regardless of the study discipline, these skills amount to the ‘employability skill’ required by employers. If students are able to gauge their own strengths and weaknesses from these skills, they would also achieve another key skill, namely, critical self-awareness. This skill would enable graduates to aim at and achieve lifelong employability (Rust & Froud, 2016).

Waldrop (2017) highlights the importance of skills in relation to the job offers made to graduates. Ongoing investigation and evaluating the changes that take place in the IT industry would allow tertiary institutions to ensure that their graduates are equipped with the latest required skill set, thus enhancing the productivity of the graduates upon employment.

Sarfraz, Rajendran, Hewege and Mohan (2018) maintain that regardless of the higher education efforts to develop employability skills for the production of better geared graduates, employers

are not yet satisfied with the quality of the latest graduates. They also claim that “it is a joint responsibility of both the academia and industry to help equip graduates with the necessary skills. Academic policy makers should focus on curricula development and updating teaching methods that are relevant to the context of the complex business needs. On the other hand, industry groups should extend their support to academia in preparing work ready graduates who would be the cornerstone for their industry in the future” (Sarfraz et al., 2018:84).

Exter et al. (2018) emphasise that if graduates are to be successful, they require exposure to diverse skill sets, incorporating aspects of soft skills, critical thinking skills, and technical skills pertaining to the field of work is essential. These skill sets form part of the crucial formation of the knowledge to be imparted to graduates to enable them to meet workplace needs. The next subsections focus on each pivotal skill set type, namely, *soft skills*, *hard skills*, and *critical thinking skills* and the importance of *exposure to the latest technology*.

2.5.1 Soft skills

Taylor (2016b) indicates that due to the tacit nature of soft skills and its difficulty to measure, “there is no globally accepted definition of soft skills” and defines soft skills “as intra- and inter- personal skills essential for personal development, social participation, and required to function in a specific employment environment” (Taylor, 2016b:3). For the purpose of this study, Taylor’s definition of soft skills is used.

Joseph, Ang, Chang, and Slaughter (2010) and Taylor (2016b) agree that soft skills can be categorised into four core types that cover managing tasks, career management, self-management and people management. According to Bancino and Zevalkink (2007) these core soft skills sets can be further broken down into aspects of face-to-face communication, nonverbal communication, active listening, writing and presentation skills, self-awareness, social awareness, relationship management, conflict management, leadership, team-work, emotional intelligence, negotiation skills, change management, and team problem solving.

Other important soft skills qualities listed by industry include to work contently with people from different cultures, have the ability to speak and write well, multidisciplinary thinking, problem-solving and being dependable (Gewertz, 2007). González-Morales, De Antonio, and García (2011) add managing clients and their expectations, conflict management and critical thinking to the soft skills required. Business executives indicate that communication skills,

responsibility, professionalism, flexibility, teamwork, and work ethic as important soft skills graduates should possess (Robles, 2012; Liebenberg, Huisman & Mentz, 2015b).

A European-based study on business graduates' employability showed that graduates' perceptions of employability change from a soft versus hard skill angle within their first six months of employment. The study highlights the importance of hard business-related knowledge (core competencies in the field) and the value of soft business-related skills, including the need for work-related experience. The findings show that it is imperative that universities cover more aspects of soft skills involving communication and presentation skills and that they also ensure work-related experiences in the form of internships if they are to produce highly competent, flexible and employable individuals, able to meet the ever-changing demands of current European business (Andrews & Higson, 2008).

It has been generally agreed that the main area of concern of employers is the soft skills gap (Amiruddin et al., 2016; Taylor, 2016b). Taylor (2016b) highlights that according to industry the most important soft skills required entail communication, flexibility, self-management, teamwork, multi-disciplinary thinking, client management, decision making, conflict management, work ethic, interpersonal relations, negotiation, self-confidence, critical thinking, emotional intelligence and professionalism. Taylor (2016b) concludes that further research is required on where/whom the responsibility for the development of soft skills lie and how to develop soft skills as this is seen as a difficult issue.

A further consideration in this context is that of ethics. Diedericks (2012) mentions the importance of promoting ethical behaviour on the part of employees and how this has become an integral agenda of organisations in the IT industry. In a conference paper entitled 'Development of soft skills in accordance with governmental critical outcomes', Taylor (2016a) expresses the need for including work ethic and professional practice in the development of academic programmes. This highlights the issue of soft skills such as communication skills, motivational skills, interpersonal skills, teamwork, people management, work ethic and problem solving and the lack of their incorporation into the learning outcomes of academic programmes (Taylor, 2016a). Thus, those responsible for the development of academic programmes should include more soft skills in the learning outcomes so that this topic is explicitly covered. This would then ensure that the development of soft skills is taken to higher levels during each year of study (Taylor, 2016a).

Simon and Jackson (2013) claim that employees in analyst positions require people skills to enable them to meet the requirements of both users and consumers. Calitz, Cullen and Greyling (2014) and Pradhan (2015) adds communication skills, professional proficiencies, critical thinking, problem solving and information and communication technology (ICT) skills to the significant employability skills that would improve an individual's skill sets, thus enabling the individual concerned to meet the changing demands of the workplace. It is clear that people skills, which fall within the soft skill category, are an important aspect that should be incorporated into a graduate's skill set (Calitz et al., 2014).

It has been argued that key soft skills aspects are required if IT graduates are to be relevant in the job market (Liebenberg, Huisman & Mentz, 2015a; Raman & Koka, 2015). Raman and Koka (2015) draw on research findings and suggest that IT graduates should possess key soft skills that include communication skills, interpersonal skills and motivational skills. Stewart, Wall and Marciniac (2016) highlight that soft skills are just as valuable for IT graduates as the hard (technical) skills that are required for employment. Findings show employers are continuing to complain about graduates not possessing the soft skills and recommend that more research is required to ascertain the soft skills gap (Liebenberg et al., 2015b). Mabiza, Mahlalela and Mbohwa (2017) point out that technical graduates often encounter challenges with soft skills when engaging on a professional level and that communication skills are as important as technical skills.

The skills gap analysis performed by Patacsil and Tablatin (2017) indicate that soft skills, including communication and teamwork aspects, are the most important of the skill sets required by industry in relation to employing IT graduates. These are closely followed by negotiation and critical thinking skills. Thus, in order to meet industry needs, it is recommended that educational institutions assist students to acquire the soft skills as outlined in Figure 2.5. This may be done by investigating what is being developed and taught in institutions (Calitz et al., 2014; Büth, Bhakar, Sihag, Posselt, Böhme, Sangwan & Herrmann, 2017; Patacsil & Tablatin, 2017).

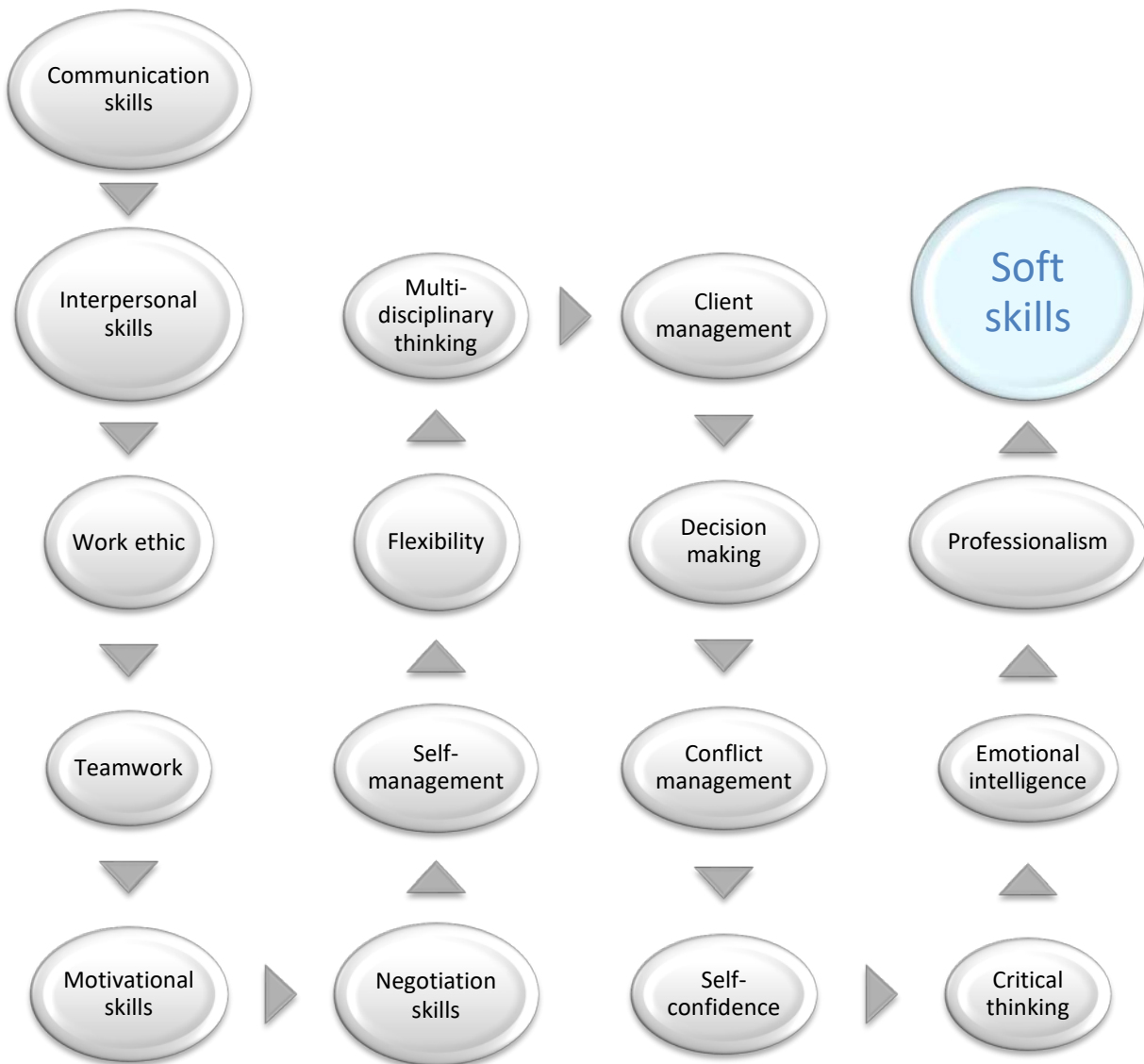


Figure 2.5: Soft skills

Figure 2.5 depicts the combination of each aspect that contributes to soft skills according to the literature as presented in Table 2.1. If these key aspects of soft skills are instilled in graduates by the curriculum, then graduates would be better equipped to satisfy industry's needs.

Table 2.1: Soft skills

Soft skills aspects	References
Communication skills	Andrews and Higson (2008); Robles (2012); Calitz et al. (2014); Liebenberg et al. (2015b); Pradhan (2015); Raman and Koka (2015); Taylor (2016b); Mabiza et al. (2017); Patacsil and Tablatin (2017)
Interpersonal skills	Diedericks (2012); Simon and Jackson (2013); Calitz et al. (2014); Raman and Koka (2015); Taylor (2016b)
Work ethic	Diedericks (2012); Robles (2012); Calitz et al. (2014); Liebenberg et al. (2015b); Pradhan (2015); Taylor (2016b)
Teamwork	Robles (2012); Liebenberg et al. (2015b); Taylor (2016b); Patacsil and Tablatin (2017)
Motivational skills	Raman and Koka (2015); Taylor (2016a); Taylor (2016b)
Negotiation skills	Bancino and Zevalkink (2007); Taylor (2016a); Taylor (2016b); Patacsil and Tablatin (2017)
Flexibility	Andrews and Higson (2008); Robles (2012); Taylor (2016b)
Self-management	Joseph et al. (2010); Taylor (2016b)
Multi-disciplinary thinking	Gewertz (2007); Taylor (2016b)
Client management	Bancino and Zevalkink (2007); González-Morales et al. (2011); Simon and Jackson (2013); Taylor (2016b)
Decision making	Pradhan (2015); Taylor (2016b)
Conflict management	Bancino and Zevalkink (2007); González-Morales et al. (2011); Taylor (2016b)
Self-confidence	Bancino and Zevalkink (2007); Taylor (2016b)
Critical thinking	González-Morales et al. (2011); Calitz et al. (2014); Pradhan (2015); Taylor (2016b); Patacsil and Tablatin (2017)
Emotional intelligence	Bancino and Zevalkink (2007); Taylor (2016b)
Professionalism	Andrews and Higson (2008); Robles (2012); Simon and Jackson (2013); Liebenberg et al. (2015b); Pradhan (2015); Taylor (2016b); Mabiza et al. (2017)

2.5.2 Hard skills

In order to ensure a smooth transition from education to practice, discussions are needed on increased efforts in respect of the hard skills platform required by industry. Zaharim, Omar, Basri, Muhamad and Isa (2009) highlight industry's dissatisfaction with graduates who lack the technical skills of the required discipline. Skill sets required in the IT sector may include fundamental IT knowledge up to the expert knowledge level of either the software or hardware fields. Lotriet, Mathee and Alexander (2010) maintain that further emphasis on the information and communications technology (ICT) technical skills that are needed in the technology sector is mandatory in order to make a positive impact on the economy. Some Information Systems (IS) departments look for mixed skills that include both technical (hard skills) and people-centred skills. Concerns are being expressed that new employees do not carry out their responsibilities as anticipated. The main objective of staffing is to find highly competent individuals at the lowest cost possible (Simon & Jackson, 2013). It would appear that skill requirements have altered to include a combination of technical and people-centred

skills, necessitating IS employees to take on posts of both analysts and programmers (Lotriet et al., 2010).

Hard skills are becoming more field/discipline specific. Technical skills or hard skills include industry product and core discipline knowledge that higher education must include in its teachings for the sake of relevance (Liebenberg et al., 2015b). This requirement is a result of the specialised needs of products that require frequent updating of skills as technology evolves (Jackson, 2010).

Although Radermacher and Walia (2013) highlight that, generally, information systems and IT educationalists do their best to prepare their students for employment in industry, hard skills gaps are often found with industry's expectations not being met. The use of software tools is often used as an example as a broad category of knowledge insufficiency on the part of graduates, posing the question as to how educators could fill this gap, particularly as technology evolves at such a rapid rate. This gap includes technical/hard skills insufficiency in respect of programming aspects (Radermacher & Walia, 2013; Liebenberg et al., 2015b). Raman and Koka (2015) maintain that a perfect balance of technical/hard skills and soft skills would distinguish a candidate for employment purposes and, thus, finding the correct balance of skill sets in higher education's offering is pertinent.

A lack of awareness of the gaps in industry requirements often results in incorrect curriculum updates with graduates bearing the brunt of this. The education systems should instil the discipline's core knowledge and skill in graduates to allow them to maintain lifelong employability in the face of the competitive nature of the economy. The improvement of technical skills or hard skills in the IT sector is, however, challenging due to the rapid changes in technology and its fundamentals (Hamilton, Carbone, Gonsalvez & Jollands, 2015). Gowsalya and Kumar (2015:359) state that being "good at the one skill cannot facilitate the competency in other". They indicate that in order to gauge the technical skills that graduates need to possess, industry-academic liaison should be maintained as this would assist preparing graduates with the hard skills required and would improve employability rates (Gowsalya & Kumar, 2015; Hamilton et al., 2015). Figure 2.6 depicts the components of the required hard skills. The practical aspects include the practical use of software and tools while the core discipline aspect includes the theoretical understanding of the discipline or subject matter.

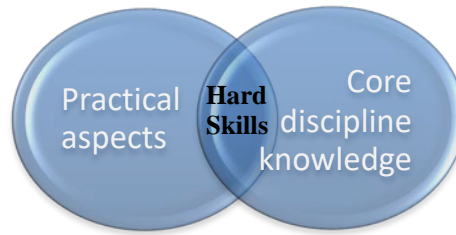


Figure 2.6: Hard skills

Table 2.2: Hard skills

Hard skills aspects	References
Technical/practical aspects	Zaharim et al. (2009); Jackson (2010); Lotriet et al. (2010); Radermacher and Walia (2013); Gowsalya and Kumar (2015); Hamilton et al. (2015); Liebenberg et al. (2015b); Raman and Koka (2015)
Core discipline knowledge	Jackson (2010); Radermacher and Walia (2013); Simon and Jackson (2013); Hamilton et al. (2015)

As per the literature findings (depicted in Figure 2.6 and Table 2.2), if the hard skills are included in the curriculum, then it would help in producing better prepared graduates for industry.

2.5.3 Critical thinking skills

Critical thinking enables independent thinking. It also allows one to reflect on a specific situation and apply one’s knowledge to find a solution to the problems faced (Lau & Chan, 2004). A critical thinker possesses the ability to deduce consequences by using judgement based on knowledge acquired and would know how to solve problems using decision making. However, accumulated knowledge itself does not constitute critical thinking and, instead, what is important is *how* the accumulated knowledge may be used to solve a problem on hand (Lau & Chan, 2004; Buckley, Archibald, Hargraves & Trochim, 2015).

When reflecting on industry needs, proper judgement and decision-making skills form the crux of the critical thinking skill. It is vital that graduates acquire the skill of critical thinking as critical thinking leads to the problem-solving skills that most graduates appear to lack. It is the responsibility of the education sector to produce critical thinkers as they will then possess one of the 21st-century lifelong learning skills (Adnan et al., 2012).

Critical thinking skills were highlighted by Flores, Matkin, Burbach, Courtney and Harding (2012) who explain that if critical thinking is not developed through the educational system, leadership abilities will be hampered, thus resulting in poor decision making in the workforce. According to Asonitou (2015), in order to strengthen the employability status of graduates, academia would require to reinforce the key skill sets. This means that academia must include the problem-solving and decision-making skills that encompass the critical thinking skill.

Jackson (2013b) believes creativity stems from critical thinking. Osmani, Hindi, Al-Esmail, Weerakkody, Kapoor and Eldabi (2016) found that there is a demand for creative thinking skills on the part of IT graduates. The critical thinking skill, including creative thinking, has been listed as a skill which many graduates do not possess (Soffel, 2016).

As pointed out in the World Economic Forum, Future of Jobs Report in 2016 (Soffel, 2016), critical thinking skills and creativity skills will move up into the top three skills required for employment by 2020. Exter et al. (2018) also found that there is a vital need for higher education to incorporate critical thinking into their curricula due to market demands.

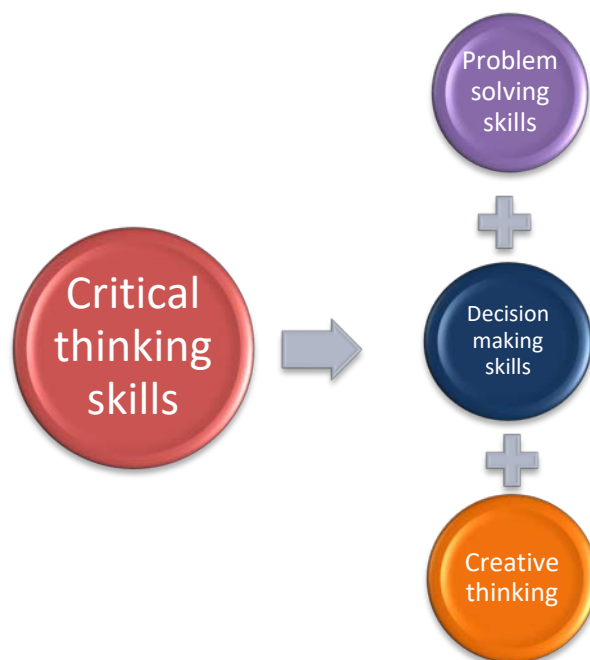


Figure 2.7: Critical thinking skills

Based on the literature Figure 2.7 and Table 2.3 illustrate how the ability to problem solve, make sound judgements for proper decision making as well as creative thinking stems from the ability to think critically – a viewpoint with which industry tends to agree (McMurray, Dutton,

McQuaid & Richard, 2016; Osmani et al., 2016; Sarkar, Overton, Thompson & Rayner, 2016; Exter et al., 2018). The fact that these aspects are highlighted in the literature findings indicates the need to include the critical thinking skill in the curriculum as this would certainly benefit IT graduates and increase their employability status.

Table 2.3: Critical thinking skills

Critical thinking aspects	References
Problem solving	Lau and Chan (2004); Adnan et al. (2012); Buckley et al. (2015)
Creativity	Jackson (2013b); Osmani et al. (2016); Soffel (2016)
Decision making	Lau and Chan (2004); Flores et al. (2012)

2.5.4 Latest technology exposure

The situation concerning the technology skills gap is becoming complex as technology evolves at an increased pace. Nevertheless, this rapid rate of innovation is crucial and necessary if a country is to remain competitive. Hence, to remain abreast of ground-breaking technology, skilled employees require ongoing training with such training including the latest technologies used both locally and globally. This would ensure the global competitiveness of employees (Lotriet et al., 2010). With this in mind, in order to better prepare graduates, higher education should include aspects of ground-breaking technologies in its curriculum while also ensuring that its curriculum is aligned to global needs. This would give new graduates the advantage of having been exposed to the latest technologies and trends that would then provide them with better employment opportunities.

Exposure to the latest trends and technology at the graduate level would tip the scale in the supply and demand chain. This means that if graduates were exposed to the latest trends, it would weigh better in the supply and demand chain for graduates meeting the needs of industry. Fisher and Scott (2011) identified the demand side of the scale in relation to which employers constantly cite the lack of skilled workers as one of its most serious concerns. In order to enhance the innovative capacity of the economy, raising both education and skills levels are not the only crucial items for consideration as a third factor is required which involves the facilitation of new technology dissemination and engagement. This suggests that the interaction of these factors together with quality education may drive economic growth (Fisher & Scott, 2011). To maintain relevance for employment purposes Fagnot and Stanton (2015) highlight

the need to keep up with developing advancements in technology and trends on an ongoing basis.

In incorporating the latest technology and trends into the IT curriculum, industry may play an integral role by advising on both the latest technologies used as well as on possible future trends. To have this relationship between industry and academia in place Tulsi and Poonia (2015) advise that a stable academic-industry association be maintained. This association may be beneficial in the following two ways: Firstly, to advise on curriculum design and development and, secondly, it could serve in creating work-integrated learning for students who could spend some time in industry being exposed to the working environment and gaining some practical experience (Fagnot & Stanton, 2015; Tulsi & Poonia, 2015).

Industry could also provide guest lectures, presentations and demonstrations to students based on the latest trends and technology in order to enhance their employability (Fisher & Scott, 2011). To ensure that industry demands are always met Tulsi and Poonia (2015) suggest that academia institute a 'Technology Forecasting Committee'. This committee could facilitate academia's liaison with industry personnel to acquire forthcoming/forecasting plans (covering a four to five-year period) pertaining to possible technology needs and uses. Having these forecasts in place would strengthen the curriculum on offer and increase graduate employability.

Qu and Weston (2015) describe keeping abreast of industry developments as a daunting and costly exercise. Subramanian (2015) agrees with the cost factor and summarised the following issues that academia faces in its attempts to keep pace with the perpetually evolving industry trends:

- State of the art laboratories and specialised teaching areas are required.
- Useful textbooks are needed. However, not all textbooks have caught up with the latest trends and tools used.
- Lecturers are not up to date on the skill sets required to enable them to teach the latest topics.

Subramanian (2015) recommends the following solutions to each of the issues highlighted above:

- Simulations of the latest laboratory tools and technology via the cloud computing teaching concept.
- Using industry references and the most recent research findings to teach the latest trends and concepts.
- Industry specialists may be called on to present guest lectures and demonstrations.

Tulsi and Poonia (2015) agree with the recommendation that industry specialists could present guest lectures but caution that it would not be fair to expect industry personnel to provide the level of meticulousness expected of lecturers. Anshari, Alas, Yunus, Sabtu and Hamid (2016:124) maintain that “cloud computing has fundamentally changed the ability of higher-education institutions to adopt online learning tools. Cloud computing gives them the ability to adopt the latest online learning systems without investing heavily in IT infrastructure”.

It has been mentioned that simulations may play a major role in integrating the latest trends and technologies into the curriculum taught (Subramanian, 2015). Mabiza et al. (2017) note that the South African economy is faltering due to, inter alia, an increase in the unemployment ratio. In addition, knowledge is often inadequate because of the fast pace advancement of technology. It is suggested that technology advancements be incorporated into the curriculum development cycle as this is critical to enable graduates to find employment and to grow the economy. Figure 2.8 and Table 2.4 depict aspects identified from the literature that may contribute to the latest technology exposure skill set being incorporated into the curriculum and this in turn should benefit graduates as they would be equipped with better skill sets in relation to finding employment.

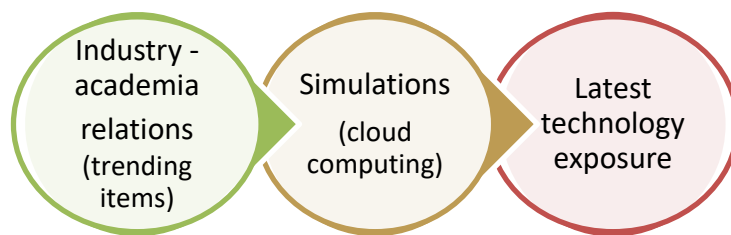


Figure 2.8: Latest technology exposure

Table 2.4: Latest technology exposure

Latest technology exposure	References
Industry-academia relations	Fisher and Scott (2011); Qu and Weston (2015); Tulsi and Poonia (2015)
Simulations	Subramanian (2015); Anshari et al. (2016)

2.5.5 Skill sets summary

Figure 2.9 presents a summary of the skill sets identified in the literature that are required to produce better prepared graduates. The figure illustrates the many types of soft skills that play a pivotal role in developing graduates for the workplace (Amiruddin et al., 2016; Taylor, 2016b). Amiruddin et al. (2016) emphasise the necessity for the further development of soft skills, such as teamwork and critical thinking skills to produce better prepared graduates for the workforce.

Taylor (2016b) points out that both academia and industry agree that the soft skills required by graduates are not sufficiently covered in their study lifecycle and that exposure to work situations during the study period would be beneficial. Cooperative work (teamwork) and communication skills are also areas that should be further investigated in the interests of the further development of graduates.

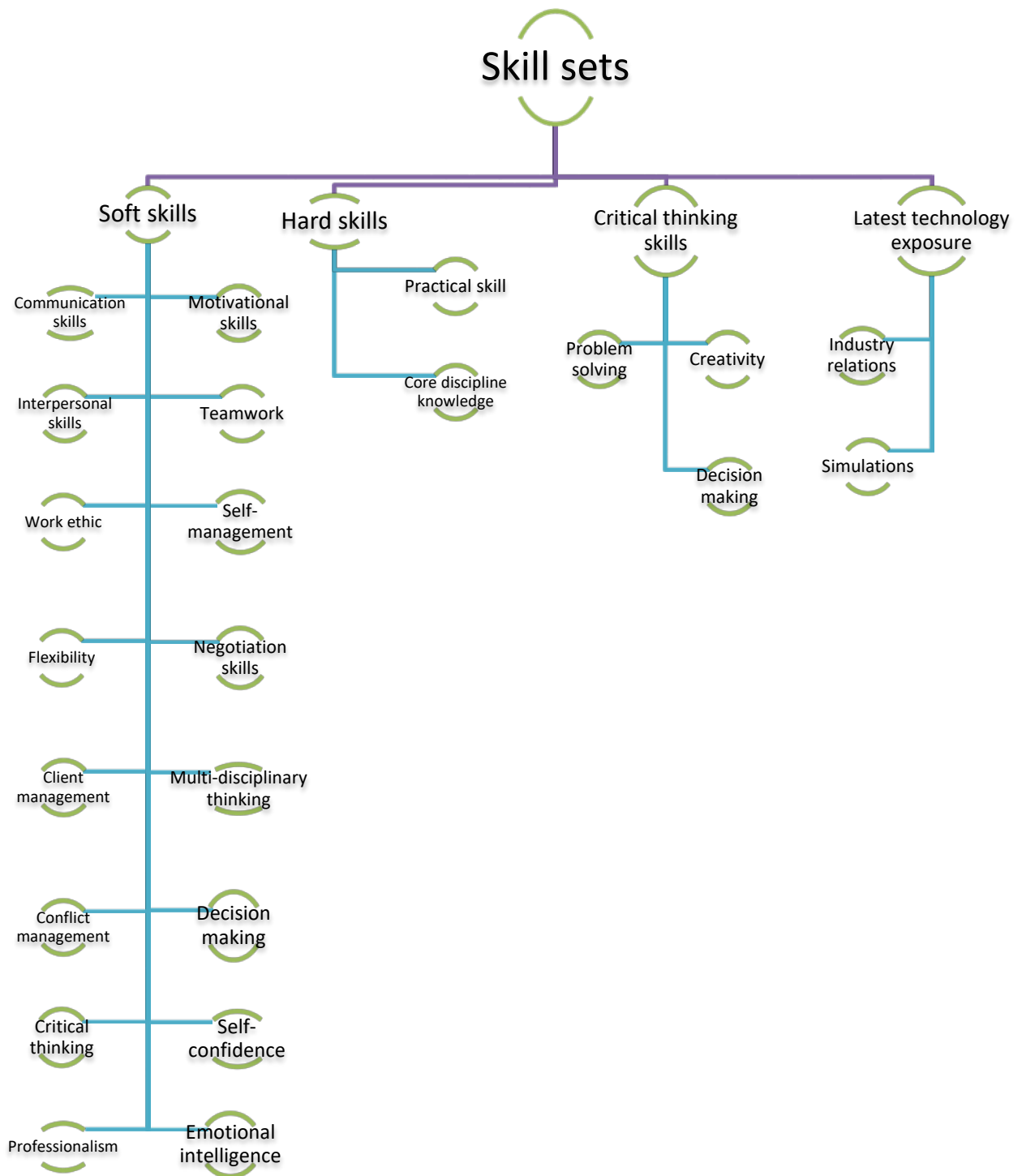


Figure 2.9: Summary of skill sets needs

Various role players have mentioned that the much-needed skill sets incorporate a variety of skills ranging from soft to hard skills, for example, critical thinking skills, and exposure to the latest technology. The literature indicated that the soft skills that graduates lack include communications skills (Andrews & Higson, 2008; Liebenberg et al., 2015b; Pradhan, 2015; Raman & Koka, 2015; Mabiza et al., 2017; Patacsil & Tablatin, 2017), interpersonal skills

(Diedericks, 2012; Simon & Jackson, 2013; Calitz et al., 2014; Raman & Koka, 2015), work ethic (Calitz et al., 2014; Liebenberg et al., 2015b; Pradhan, 2015), teamwork (Liebenberg et al., 2015b; Patacsil & Tablatin, 2017), motivational skills (Raman & Koka, 2015; Taylor, 2016a), negotiation skills (Patacsil & Tablatin, 2017), flexibility (Andrews & Higson, 2008; Robles, 2012; Taylor, 2016b), self-management (Joseph et al., 2010; Taylor, 2016b), multi-disciplinary thinking (Gewertz, 2007; Taylor, 2016b), client management (Bancino & Zevalkink, 2007; González-Morales et al., 2011; Simon & Jackson 2013; Taylor, 2016b), decision making (Pradhan, 2015; Taylor, 2016b), conflict management (Bancino & Zevalkink, 2007; González-Morales et al., 2011; Taylor, 2016b), self-confidence (Bancino & Zevalkink, 2007; Taylor, 2016b), critical thinking (González-Morales et al., 2011; Calitz et al., 2014; Pradhan, 2015; Taylor, 2016b; Patacsil & Tablatin, 2017), emotional intelligence (Bancino & Zevalkink, 2007; Taylor, 2016b) and professionalism (Andrews & Higson, 2008; Robles, 2012; Simon & Jackson, 2013; Liebenberg et al., 2015b; Pradhan, 2015; Taylor, 2016b; Mabiza et al., 2017). Taylor (2016a) confirms that these various soft skills aspects are required in the workplace. Soft skills play an important role in the skill sets platform required while the academic programme requires development so it may better prepare graduates for employment (Diedericks, 2012; Simon & Jackson, 2013; Liebenberg et al., 2015a; Taylor 2016a).

Simon and Jackson (2013) report that within the IS space, a combination of skill sets is required. These skill sets, as indicated by literature, include hard skills with the focus area on both practical aspects (Zaharim et al., 2009; Jackson, 2010; Lotriet et al., 2010; Radermacher & Walia, 2013; Liebenberg et al., 2015b; Raman & Koka, 2015; Gowsalya & Kumar, 2015; Hamilton et al., 2015) and the core discipline knowledge aspect (Jackson, 2010; Radermacher & Walia, 2013; Simon & Jackson, 2013; Hamilton et al., 2015). Incorporating hard skills into the curriculum is essential if work ready graduates are to be produced.

Skill sets encompass numerous aspects of the critical thinking skill. As shown in the literature the critical thinking skills lacked by graduates include problem solving (Lau & Chan, 2004; Adnan et al., 2012; Buckley et al., 2015), creativity (Jackson, 2013b; Osmani et al., 2016; Soffel, 2016) and decision making (Lau & Chan, 2004; Flores et al., 2012). In order to strengthen the curriculum to enable graduates to meet the market demand, it is imperative that the skill set of critical thinking be reinforced in higher education (Adnan et al., 2012; Asonitou, 2015; McMurray et al., 2016; Sarkar et al., 2016; Exter et al., 2018).

Exposure to the latest technology is also an important requirement in the education of graduates. As shown in the literature, graduates require exposure to the latest technologies and trends and this may be facilitated by both an industry-academia relationship (Fisher & Scott, 2011; Qu & Weston, 2015; Tulsi & Poonia, 2015) and simulations (Subramanian, 2015; Anshari et al., 2016). The South African economy should benefit significantly if the curriculum offered to graduates included the advancements in technologies and trends (Mabiza et al., 2017).

An examination of the elements that are involved in skill sets and the link to employability, as identified in the literature, makes it become evident that graduates should be better prepared in all aspects. Ensuring that these key skill sets elements are incorporated into a student's study life cycle would lead to better and more employable graduates entering the workspace. The next section presents a summary of the literature relevant to the study.

2.6 Summary of literature

This section contains a summary of the literature relevant to the research topic. It highlights the link between the research sub-questions and the three distinct themes that emerged from the literature review, namely, curriculum design, employability and skill sets.

Table 2.5: Sub-questions linked to themes

Sub-question 1	Theme	Finding / gaps according to literature	Recommendations
<p>What keys skills do South African IT graduates lack upon employment?</p>	<p>Skill sets</p>	<ul style="list-style-type: none"> • Soft skills <ul style="list-style-type: none"> ○ Communication skills ○ Interpersonal skills ○ Work ethic ○ Teamwork ○ Motivational skills ○ Negotiation skills ○ Flexibility ○ Self-management ○ Multi-disciplinary thinking ○ Client management ○ Decision making ○ Conflict management ○ Self-confidence ○ Critical thinking ○ Emotional intelligence ○ Professionalism 	<p>Soft skills deployment in the education system should be carried out effectively. To close this skills gap, higher education should improve on specific strengths such as core skills while bearing in mind local market needs. Soft skill-based courses that endorse general, transferable and core competence should be developed (Diedericks, 2012; Simon & Jackson, 2013; Liebenberg et al., 2015a; Taylor 2016a).</p> <p>The learning outcomes of the curriculum must include more elements of soft skills, including work ethic and professional practices (Andrew & Higson, 2008; Liebenberg et al., 2015b).</p> <p>Emphasis must be placed on soft skills, including communication skills, negotiation skills, flexibility, self-management and confidence, emotional intelligence, teamwork and critical thinking, to enable graduates to be successful in the workplace (Bancino & Zavalkink, 2007; Robles, 2012; Calitz et al., 2014; Taylor, 2016b; Patacsil & Tablatin, 2017).</p>
		<ul style="list-style-type: none"> • Hard skills <ul style="list-style-type: none"> ○ Technical/practical aspects ○ Core discipline knowledge 	<p>There must be a focus on the core competencies of the field of study and how to transfer those competencies within the workplace (Jackson, 2010; Radermacher & Walia, 2013; Hamilton et al., 2015).</p>

		<ul style="list-style-type: none"> • Critical thinking skills <ul style="list-style-type: none"> ○ Problem solving ○ Creativity ○ Decision making 	<p>Critical thinking skills must be incorporated in the entire education system so that better leadership skills may be honed, thus enabling better decision making within the workforce (Flores et al. 2012).</p> <p>In order to meet market demands, the curriculum must incorporate complex problems to foster creative and decision making skills (Adnan et al., 2012; Asonitou, 2015; Soffel, 2016; Exter et al., 2018).</p>
Sub-question 2	Theme	Finding / gaps according to literature	Recommendations
What is the impact of graduates not being fully prepared to enter the workplace productively?	Employability	<ul style="list-style-type: none"> • Workplace readiness • Skills development activities • Technical attributes • Curriculum enhancements 	<p>In order to produce employable graduates tertiary education requires a focus on strengthening key knowledge aspects, skills and business readiness for employment (Brown et al., 2003).</p> <p>Students must be exposed to more effective technical and communication skills (Moreau & Leathwood, 2006).</p> <p>Higher education must include increased teamwork, communication, planning and organising aspects for students so as to create better employability awareness (Tymon, 2013).</p>
Sub-question 3	Theme	Finding / gaps according to literature	Recommendations
What measures does industry take when performance gaps are identified among employed IT graduates?	Skill sets	<ul style="list-style-type: none"> • Latest technology exposure • Soft and hard skills 	<p>In order to ensure quality education exposure to the latest technology is important. This would also help to meet the employer demand for better skilled employees (Fisher & Scott, 2011).</p> <p>Both soft and hard skills must be well structured in tertiary education to produce better skilled graduates for the workplace (Waldrop, 2017).</p>

Sub-question 4	Theme	Finding / gaps according to literature	Recommendations
<p>What would industry recommend to improve the higher education IT curriculum so that graduates are fully prepared to enter the workplace productively?</p>	<p>Curriculum design</p>	<ul style="list-style-type: none"> • Collaboration between academia and industry • Work-readiness • Latest industry trends and needs 	<p>The inclusion of industry input in the curriculum design for higher education is crucial as it will better prepare graduates for meeting industry needs upon employment (Griesel & Parker, 2009).</p> <p>To strengthen the work-readiness of graduates, it is recommended that academia incorporate industry aligned needs into the curriculum. This could also include digital learning (De la Harpe & David, 2012).</p> <p>Work-readiness should be enhanced in new graduates with work-integrated learning to be incorporated (Jackson 2013a).</p> <p>Academics responsible for curriculum development should include more software development languages and principles in the academic programme (Janicki et al., 2014).</p> <p>Maintenance to basic concepts of databases, systems analysis, networking and security (Janicki et al. 2014).</p> <p>Measures to be put into place to update the curriculum through ongoing contact with industry to keep up date with industry demands. This would ensure regular curriculum updates so that graduates would be equipped to meet the requirements of industry (Howard, 2017).</p> <p>Improve academia-industry liaison to strengthen the curriculum (DHET, 2017).</p> <p>Proper quality assurance measures to be put in place for curriculum enhancements (DHET, 2017).</p>

The first and third research sub-questions linked to the skill sets theme. It is generally agreed that graduates do lack skills upon employment (Abdullah-Al-Mamun, 2012; Flores et al., 2012;

Amiruddin et al., 2016; Taylor, 2016a). Skill sets may assume various forms and, thus, it is necessary to ascertain which key factors influence the apparent skills lack upon employment (Flores et al., 2012). A richer curriculum is required in order to fully prepare for industry (Abdullah-Al-Mamun, 2012) with the curriculum including work ethic and professional practices (Liebenberg et al., 2015b). Life-long learning skills, as summarised and depicted in Figure 2.3, will lead to both increased employment rates and educational fulfilment (Soffel, 2016).

The second research sub-question of the study linked to the employability theme which emerged from the literature review. There is agreement that the lack of employability of the graduate labour market places strain on the economy on a global scale (Brown et al., 2003; Pop & Barkhuizen, 2010). There is a severe discrepancy between the reality of the labour market needs and graduate expectations of what is required (Brown et al., 2003). It is, thus, vital that graduates develop the skills demanded by employers but which may not have been included in the graduates' studies with new graduates being inadequately prepared for the work environment (Pop & Barkhuizen, 2010).

The curriculum improvements covering skill sets, as highlighted in Figure 2.9, would be required to improve the employability standing of graduates. The curriculum would need to be adapted in collaboration with students, academia, employed graduates, and key industry members with the development of an improved curriculum preparing appropriately skilled graduates to enter the economy (Saunders & Zuzel, 2010; Jing et al., 2011; Archer & Chetty, 2013).

In short, with the increased awareness of the issue of employability in the higher education area, the responsibility falls on the shoulders of higher education to produce graduates who are able to keep up with the 21st-century workspace. It is, thus, incumbent on higher education to develop a curriculum that will include employability elements through appropriate industry collaboration.

The fourth research sub-question linked to the curriculum design theme. The immense task of redesigning the higher education curriculum in South Africa to meet industry needs proved to be unsuccessful in 1996 due to the task being resource intense. Since then, however, practices and policies are now catering for developers to utilise open educational resources to enhance

the curriculum (Jaffer et al., 2007; Weller & Anderson, 2013). It is generally agreed that higher education requires curriculum transformation and that the curriculum status at the time of this study was not resulting in appropriately prepared graduates while the work-readiness aspect should be introduced on a larger scale than would appear to be the case. (Jackson, 2013b; Du Toit et al., 2014; Govender & Taylor, 2015). It was found that university curricula were not progressing in line with the rapid pace of industry and that the knowledge of education in South Africa was in a state of crisis as educators are not properly skilled to teach certain subjects. Thus, education policies in the country should commence with a nation-wide analysis on the educators (Moyo, 2013; Spaul, 2013).

The impact on expenses and throughput in the workplace as caused by unprepared graduates is a critical aspect that must be investigated. Thus, more studies are required on the best ways to develop an association between industry and academia to ensure that better geared graduates for the workplace are produced. This means that the academic community will need to consider ways in which it may meet the needs of industry by improving the curriculum offered (Howard, 2017; Travis, 2017).

2.7 Conclusion

It emerged from the investigation into the three issues of curriculum design, employability and skill sets, that there is a need for better collaboration between industry and academics so that graduates are better skilled for employment. Figure 2.10 presents the conceptual framework that underpinned this study.

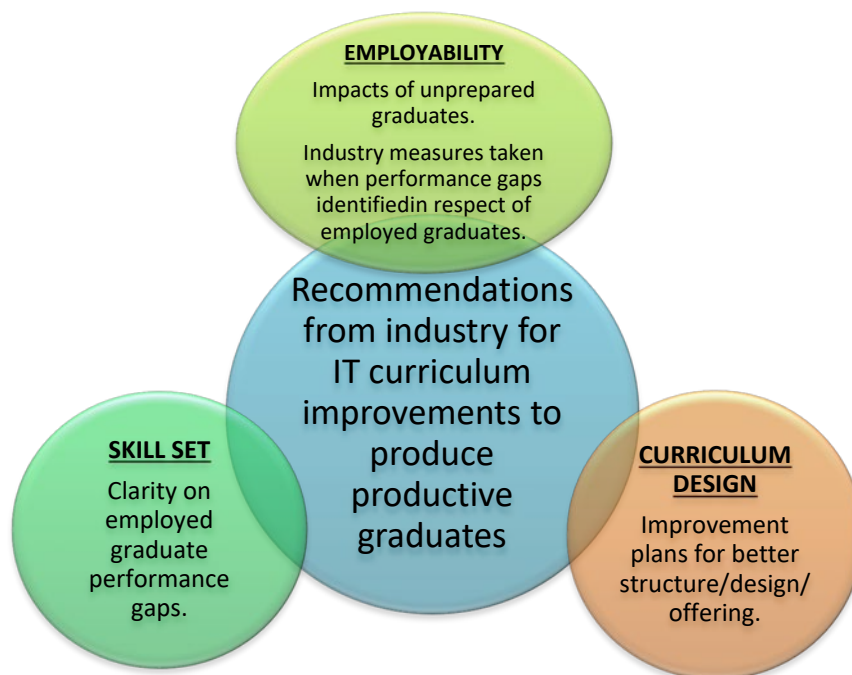


Figure 2.10: Conceptual framework

Each aspect in the conceptual framework plays an important role in relation to both the main research question and the research sub-questions. Those aspects within the framework (Figure 2.10) that cover the research questions are listed below:

The first aspect of *skill sets* covers:

- Sub-question 1: What keys skills do South African IT graduates lack upon employment?
- Sub-question 3: What measures does industry take when performance gaps are identified among employed IT graduates?

The second framework aspect of *employability* covers:

- Sub-question 2: What is the impact of graduates not being fully prepared to enter the workplace productively?

The third framework aspect of *curriculum design* covers:

- Sub-question 4: What would industry recommend to improve the higher education IT curriculum so that graduates are fully prepared to enter the workplace productively?

It may be seen that the three aspects of the conceptual framework would contribute to answering the main research question formulated for the purposes of this study, namely:

What recommendations for improvement to the IT curriculum in South Africa could be extracted from an understanding of new graduates' first year of employment?

It was anticipated the conceptual framework and the answers to the study's research questions would contribute to producing stronger graduates able to meet the demands of industry. This would also contribute to the growth of the South African economy that, at the time of the study, was in a major decline. The next chapter discusses the research methodology employed in the study, focusing on the research design, strategies, methods and approaches used.

CHAPTER 3

Research Methodology

3.1 Introduction

This study focuses on the experiences of various industry participants in relation to their employment of new graduates. The interpretivism strategy used in this qualitative study explored, and engaged with the concerns of industry in relation to employed graduates. Questionnaires and interviews were the primary source for the data that were collected in the quest to investigate the experiences of industry.

This chapter presents the methodological approach used in the study. Section 3.2 and its subsections cover the research design, including the research paradigm, research approach, methods, strategies, time horizon, data collection method and data analysis method, Section 3.3 focuses on the research participants, Section 3.4 presents ethical clearance procedures and, finally, Section 3.5 contains the conclusion to the chapter.

3.2 Research design

The research design for this study was in accordance with the research onion structure of Saunders, Lewis and Thornhill (2016). The highlighted areas in Figure 3.1 indicate the research design used. A qualitative approach using a descriptive case study was used as the study focused on graduates from a single, accredited, private higher education institution. Graduates with an undergraduate qualification in the information systems (IS) streams at NQF level five only were considered.

The following subsections discuss each area of the research design selected, namely, the research paradigm, approach, method, strategy, data collection method and data analysis method.

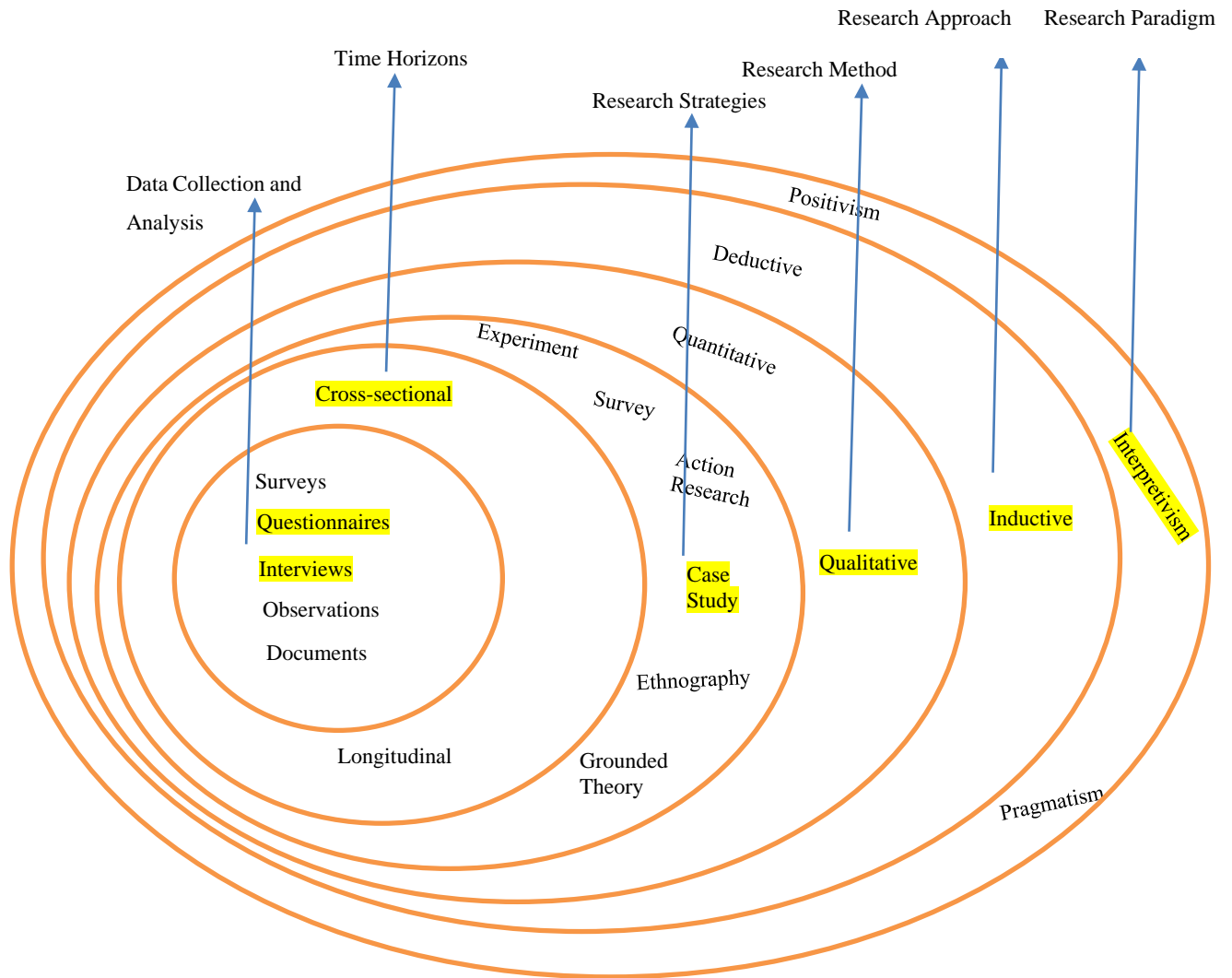


Figure 3.1: Research onion

Adapted from Saunders, Lewis and Thornhill (2016)

3.2.1 Research paradigm

A paradigm may be seen as a mutual global understanding that symbolises the philosophies and values within a discipline that direct how problems may be solved (Schwandt, 2001). The three main models of the research philosophies may be summarised as ontological, epistemological and axiology. The ontology refers to both the researcher’s assumptions about the nature of the world and the researcher’s reality. Epistemology is associated with the notion of knowledge (Patton, 2002) with this branch of philosophy being concerned with the nature and source of knowledge. Saunders et al. (2016:151) describe epistemology as “how we know

what we say we know”. Epistemological philosophies are dependent on the type of contribution made to knowledge as a result of the relevant research conducted. Axiology refers to the ethical role and values in the process of research, including questions on the way in which the researcher addresses his/her values and those of the research participants (Patton, 2002; Saunders et al., 2016). These axiological philosophies are differentiated into either objectivism or subjectivism. Objectivism relates more to the natural sciences that cover realist ontology with the epistemology being focused on the discovery of truth by measurable and observable facts. On the other hand, subjectivism relates more to the humanities and arts and comprises nominal ontology on the epistemology covering the opinions, perceptions, narratives and interpretations of social realities. This research study tended towards subjectivism in relation to the viewpoints of industry members on the employment of graduates.

The philosophical paradigms typically used in computing research include positivism, interpretivism and critical research. Positivism adopts the scientific method that formulates a theory, derives and tests a hypothesis, observes the results, confirms or contests the hypothesis and accepts, edits or rejects the formulated theory. Interpretivism requires the researcher to understand the elements of the study that has numerous subjective realities. It also covers the study of people in their natural environments and offers more than one explanation of a situation. It aims to classify, discover and describe how all the aspects in a specific social situation are linked and interdependent. On the other hand, critical research is concerned with recognising power relations, clashes, logical inconsistencies and engaging individuals to dispense with such power relations, clashes and logical inconsistencies (Oates, 2006).

Interpretivism was deemed to be the paradigm best suited to this study. Interpretivism lends itself to the qualitative approach due to the emphasis on understanding the focus on the respondents’ viewpoints, and the interpretive and subjective nature of the study (Dudovskiy, 2016). It was felt that the interpretive approach would allow for the understanding and exploration of the various industry viewpoints held regarding the graduates employed. In addition, it also allowed for the study of graduates when in their natural environment in the workplace.

3.2.2 Research approach and method

The research onion approach, as indicated in Figure 3.1, showed that there are two types of research approaches, namely, deductive and inductive. Saunders et al. (2016) describe the deductive approach as an approach to testing a hypothesis or theory using the research conducted whereas the inductive approach does not require a theory to advise the research process. The inductive approach is also used in interpretive research and minimises possible bias on the part of the researcher during the data collection stage (Creswell, 2014). This study followed an inductive approach as there was no hypothesis or theory that had to be tested. Instead, the study involved the interpretation of the data that had been collected in order to answer the research questions.

Creswell (2014) cites three types of research methods, namely, the quantitative, qualitative and mixed methods. The quantitative method makes use primarily of numerical data with the data analysis requiring the use of statistical analysis tools. It is also used when there is a large number of participants and is associated with the positivist paradigm. The qualitative approach emphasises understanding and focus on the respondents' viewpoints and is both interpretive, and subjective. Furthermore, qualitative research is conducted when there is a problem or a matter that requires exploration (Creswell & Poth, 2017). According to Thomas (2010), qualitative methods consider the researcher to be the main instrument of data collection and data analysis. The researcher engages with situations and is required to make sense of multiple interpretations from the participants.

Creswell (2013) highlights the useful points of qualitative studies as follows:

- Understanding the events, circumstances and activities associated with the participants and activities in which they are involved as well as explanations of their lives and encounters.
- Finding unexpected phenomena and impacts and creating new theories.
- Understanding the course of proceedings and activities.
- Developing causal explanations.

This study used the qualitative research method as the aim of the study was to understand the various participants' viewpoints while capturing their feedback in the interests of the

improvement of the IT curriculum. The next subsection describes the research strategy used in the study.

3.2.3 Research strategy

The two possible research strategies were considered for this study – either a survey or a case study. A survey covers a large population from which data are gathered (Mouton, 2001), whereas a case study is defined as “an in-depth exploration of one situation” (Cornford & Smithson, 2006:71). Surveys involve low costs, offer various convenient ways of gathering the requisite data and eradicate researcher bias. However, surveys may also become time-consuming due to the length of time required to conduct them and the need to engage with a large population in order to collect the data (Leedy & Ormrod, 2014). With case studies, the perceptions of different people per instance are gathered and the researcher is the sole instrument used for analysing the data. In addition, case studies simplify complex notions, subject the participants to real life conditions, obtain different views of the same situation, and provide various solutions when the same problem is being experienced (LinkedIn Corp, 2014).

The survey strategy was initially considered for the study. However, due to time constraints and a small group of people being considered for the purposes of the data collection, a case study strategy was deemed to be the better strategy for the study. Case studies focus on an occurrence in a scenario that needs to be investigated with the aim of acquiring a comprehensive understanding of the natural conditions pertaining to the case (Oates, 2006).

The most important elements of a case study include a focus on depth, natural setting, multiple sources and multiple methods (Yin, 2014). Oates (2006:300) indicated that case studies “provide an account of what occurs in a social setting, which may be unique to that particular situation”. This applied directly to this study which investigated the performance of employed graduates within their natural work environment and obtained feedback from the IT companies that had employed these graduates using more than one data gathering tool. One of the main advantages of using a case study is the value of the data that may be gathered by multiple resources when the case study is limited to a single situation (Cornford & Smithson, 2006). This was directly applicable to this study as the study investigated only the IT graduates from one private higher education institute who were employed in different IT companies. These companies shared their experiences on the employed graduates.

Case study research involves the exploration of an issue via one or more cases within a restricted setting (Creswell, 2013). Case studies are divided into three types, namely, exploratory studies, descriptive studies and explanatory studies (Yin, 2003; Oates, 2006). Oates (2006) explains that explorative studies are used when there is limited literature on a subject that may be used to assist the researcher in grasping the problem while a descriptive study provides a comprehensive insight into a specific occurrence and includes gaining perceptions from various people involved in the situation. On the other hand, an explanatory study provides an explanation as to the reason why certain events took place using inter-related factors that had an effect on the outcome or else it attempts to match theories from existing literature to the outcomes (Oates, 2006).

Mouton (2001) highlights that a case study involves an empirical examination that explores a phenomenon in a real-life context. Oates (2006:141) defines the aim of case studies as “to obtain a rich, detailed insight into ‘life’ of that case and its complex relationships and processes”. A researcher may use either single-case or multi-case studies depending on the phenomenon in question. Multi-case study involves a comparison and cross-case analysis which may occur in diverse settings of a specific phenomenon (Yin, 2014). Walsham (1995) refers to a single-case study as a study that allows for the researcher to engage with the phenomena in question in great detail in order to offer a ‘rich description and understanding’ of the phenomena.

A single-case descriptive case study was used for the purpose of this research study. As depicted in Figure 1.1 the study focused on one institution with graduates from a specific qualification stream only. Figure 1.3 presents the participants in the study who provided the researcher with an understanding of and various viewpoints pertaining to the graduates employed and who had studied at the institution selected for the purposes of the study. The next subsection discusses the time horizon of the study.

3.2.4 Time horizons

In research, the time horizon aspect, as depicted in the research onion depicted in Figure 3.1, covers both the cross-sectional and longitudinal categories. Saunders et al. (2016) describe the longitudinal time horizon as the repeated collection of data over a long period of time and the cross-sectional time horizon as a study in which the requisite data are collected at one point in time with no repetition of the data collection needed.

This study used the cross-sectional time horizon as it investigated only the graduates' first time of employment and gathered industry's experiences with these graduates. The next subsection focuses on the data collection process and the tools used to collect the data required for the study.

3.2.5 Data collection

Data collection is an important aspect in research. There are various tools that may be utilised, for example, interviews, questionnaires, surveys, observation, focus groups and narratives (Kumar, 2014; Saunders et al., 2016). Either quantitative or qualitative data may be collected and analysed. Surveys may be used to collect statistical data that may then be analysed quantitatively especially if the survey question types are in a structured format. Observations and statistical data may prove difficult to use if the researcher's aim is to provide the participants with an opportunity to express their feelings (Olivier, 2004).

An interview may be seen as a certain type of discussion between people. Such a discussion may take place either one-on-one or within a group of participants. Interviews may be structured, entailing pre-defined questions posed to all the participants; semi-structured interviews that include some pre-defined questions and also open questions that allow the participants to express their feedback and also provide additional details on their views of the issues raised and unstructured interviews which allow for a free flowing conversation once the researcher has introduced the topic on which he/she wishes the participant's views. This latter interview type is valuable for exploring and looking deeply into a situation or phenomenon (Oates, 2006).

Another common tool used to collect data is the questionnaire. Questionnaires comprise a set of pre-defined questions based on the research topic and containing both open-end and closed questions. Questionnaires may be administered face-to-face or online. Cornford and Smithson (2006) describe questionnaires as an appropriate way of gathering data from a large population group in a limited time period. Kumar (2014) cautions that questionnaires should be clear, simple, and easy to read and grasp if they are to deliver the information required. Oates (2006) concurs with this view, adding that reliable and valid data may be produced at an equitable cost.

This study used questionnaires and interviews to gather data on the employment of graduates from a private higher education institution in South Africa. The questionnaires used included both open-ended and closed questions to allow the researcher to gain an insight into the various participants' experiences and viewpoints. The researcher decided to use questionnaires as a data collection tool for the following reasons:

- To save the respondents' time by not administering the questionnaires in person but, instead, delivering the questionnaires electronically and collecting them automatically. It is believed this may result in a higher response rate in view of the time constraints in industry.
- Require less time and energy to administer.
- Offer the possibility of anonymity as the respondents are not required to put their names on the questionnaires.
- Less opportunity for bias as questionnaires may be presented in a consistent manner, without any influence on the part of the researcher.

Three different questionnaires were created for each of the three types of participants, namely, a questionnaire for the line managers, one for the employed graduates and one for the IT recruitment personnel questionnaire. Google forms were used as the online platform to administer these questionnaires to the various participants. The questionnaires are presented in Appendices B to D. The questions in the questionnaires related to the productivity time line of the employed graduate, whether there were any measures in place for the further upskilling of the employed graduate and steps that could be taken to improve graduates' preparedness for the workplace.

Interviews were also used as data gathering tool to acquire further information. For the face to face interviews the researcher utilised a cell phone voice recorder to store the interviews conducted while, for the virtual interview option, the recording feature was used. These tools were used to obtain the IT companies' view of their experiences with the graduates employed and to acquire information about the measures taken to enable the graduates to become productive within their work environments. The questions used in each questionnaire type were used as guiding questions during the face-to-face or virtual interviews as needed. The semi-structured interview questions may be viewed in Appendix E.

The next section describes the data analysis and includes a discussion on the validity and reliability of the data analysis process.

3.2.6 Data analysis

Qualitative data require that both textual and non-textual data be analysed. This type of analysis involves deducing themes and patterns from the information which has been collected (Oates, 2006). The data gathered from the questionnaires and interviews were prepared in a systematic manner to facilitate the analysis. This included transcribing all the audio and/or visual recordings. The research themes identified for further exploration comprised skills, employability and curriculum design. Table 3.1 presents the research themes linking to the questions posed in the questionnaires and the interviews.

Table 3.1: Research themes

Research questions	Theme	Questionnaire questions	Interview questions
1. What keys skills do South African IT graduates lack upon employment?	Skills	<ul style="list-style-type: none"> • What key strength(s) / skill(s) did the graduate lack upon their first year of employment? • How would you classify the key strength(s) / skill(s) lacked? 	<ul style="list-style-type: none"> • What skills did the employed graduate lack? • How would you describe the skills lacked by the graduate?
2. What is the impact of graduates not being fully prepared to enter the workplace productively?	Employability	<ul style="list-style-type: none"> • How long (in weeks) did it take for the employed graduate to become productive upon employment? • Do you feel that the employed graduate's attained higher education results affected the time taken to become productive? • Was your company / department impacted by the unproductivity level of the employed graduate? • If yes, please describe the impact. 	<ul style="list-style-type: none"> • Was the graduate immediately productive when he/she commenced with work? • How long did it take for the graduate to become productive within the workspace? • Did the graduate's attained higher education results affect the time taken to become productive in the workspace? • How was the company impacted upon the graduate's employment?
3. What measures does industry take when performance gaps are identified among employed IT graduates?	Skills	<ul style="list-style-type: none"> • Were any measures put into place when performance gaps were found with the employed graduate? • If yes, please describe what was done to further upskill the graduate. 	<ul style="list-style-type: none"> • Describe some measures put in place to assist the graduates to become productive.
4. What would industry recommend to improve the higher education IT curriculum so that graduates are fully prepared to enter the workplace productively?	Curriculum design	<ul style="list-style-type: none"> • What recommendations would you make from industry's viewpoint to add to the higher education IT curriculum to better prepare graduates for the workplace? 	<ul style="list-style-type: none"> • What are some of the aspects/topics you would recommend to higher education institutions in order to further enhance their curriculum so that IT graduates are better prepared for the workplace?

Triangulation was used to check whether the same or similar data sets and patterns had emerged from multiple sources by means of manual colour coding. The following subsections focus on the validity and reliability of the study.

3.2.6.1 Validity

Triangulation is used to validate the qualitative data collected (Scandura & Williams, 2000). Content validity is ensured by consistency in administering the questionnaires and attaining the requisite data about the topic of interest (Oates, 2006). In order to ensure content validity, the questions were formulated in clear, concise and simple language for clarity and ease of understanding. Instructions and questions contained in the questionnaires steered away from ambiguity and were clear, direct and brief.

According to Van Teijlingen and Hundley (2001), a pilot study may involve a trial running of the research method or tools to be used. The pilot study will also demonstrate whether or not the items used in the research are appropriate and whether the methods used are too complicated. A pilot study may address the issue of content validity and also test various ways of distributing and collecting the data collection tools. The pilot study conducted ensured that clear and concise questions were posed to the various participants and that the objectives of the study were addressed throughout the data gathering process. The pilot study conducted in the study involved three different individuals with different designations ranging from non-management to senior management levels. The individuals looked through all the questionnaires and provided feedback with suggestions about their interpretations in relation to the research questions and research objectives. All questionnaires were personally distributed to the participants in the pilot study and collected by the researcher.

3.2.6.2 Dependability

Reliability refers to the consistency of the research results in *quantitative* studies. It tests whether the study meets the research aim which has been formulated (Brink, 1993). Kumar (2014) points out that in *qualitative* studies, dependability bears certain similarities to reliability and that in order to demonstrate the dependability of a study, the same results should be attained with the same observation being made more than once. In this *qualitative* study, dependability was deemed to be more applicable, as reliability becomes problematic because human behaviour is not static. The constant factor in this study was the IT graduates from only one private institution was used.

Dependability was ensured by comparing the positions in which the graduates had been placed. All the graduates had been placed in similar entry-level positions. The *internal consistency reliability* of the questionnaires was determined by comparing the feedback from the industry participants for similar results. The next section in the chapter provides information on the research participants.

3.3 Research participants

There are two types of data collection methods, namely, probability and non-probability sampling. Probability sampling entails each member of population having a known chance of contributing to a study whereas non-probability sampling “ means that the researcher does not know whether the sample of people (or events) are representative – each member might have unique characteristics not shared with others in the overall population” (Oates, 2006:97).

Quota sampling falls within the non-probability sampling band which was considered for the purposes of this study, as it involves collecting representative information from a group where the sample group in question represents certain characteristics of the population selected by the researcher (Dudovskiy, 2016). Kumar (2014) argues that quota sampling may not reflect the true representation of the total sampling population due to individuals being selected who may have distinct characteristics as compared to that population and may not be a true representation of the total sampling population. This reason was a deterrent in respect of using the quota sampling technique for this study.

The data collection method considered for the purposes of the study fell within the non-probability sampling framework using the purposive technique. This technique involves participants being selected according to the requirements of the study in question. This means that the criteria for the participants to be involved are predefined for the data collection purposes. The purposive technique includes several sub-types, including the critical case sampling which was chosen for this study. Critical case sampling involves collecting samples that are the most likely to provide the information required for the study and is particularly beneficial if a small number of cases may be sampled (Struwig & Stead, 2001). For this study, only higher education IT graduates from a specific private institution who had completed the MLM mode of study were considered as participants.

Three IT companies was used for information gathering with the participants from these IT companies being directly linked to the employed graduates, for example, a graduate's line manager or mentor. These participants completed the IT company's questionnaire that was followed by individual interviews. All the employed graduates at these companies completed the graduate questionnaire that was also followed by individual interviews. Data from IT recruitment personnel were also collected in order to determine their experiences during the recruiting and placement of graduates in positions. Four recruitment personnel were involved in the recruiter questionnaire. It was estimated that it would take twenty minutes or less to complete the questionnaires while each interview session lasted for a maximum of one hour. The next section discusses the ethical clearance procedure in the study.

3.4 Ethical clearance procedures

Although conducting research involves proficiency and meticulousness it is essential that a level of integrity, honesty and dignity be maintained. In order to observe this within the context of this study the following principles were upheld:

- Ethical considerations involve obtaining participant consent before the study, questionnaires and/or the interviews commence.
- Ensuring the confidentiality of the participants' information.
- Attaining permission to record any interview sessions.

In this study the participants' details were not requested nor were they disclosed in the research report to ensure that anonymity and confidentiality were maintained. In addition, the data that was collected was kept in a secured environment to ensure privacy with the information provided by the participants not being publicly accessible. It will be stored for a period of five years and then will be destroyed. Ethical clearance to conduct the study was applied for and obtained from UNISA's College of Science, Engineering and Technology's Research and Ethics Committee as well as from the private higher education institution attended by the graduates.

3.5 Conclusion

This chapter covered the research approach, the research design, the research participants as well as the data gathering tools and techniques used. It also discussed how validity and reliability were maintained in relation to the data analysis purposes, thus ensuring the data obtained would be of value. The next chapter addresses the analysis of the data and the study's results.

CHAPTER 4

Data analysis and results

4.1 Introduction

This chapter explains how the research approach described in the Chapter 3 was carried out. The requisite data were collected by means of questionnaires and semi-structured interviews with selected participants. This chapter discusses both the data analysis and the interpretation of the data and offers pertinent conclusions. The chapter commences with an examination and analysis of the opinions and views of industry line managers, employed graduates and recruitment personnel as articulated in their responses to the respective questionnaires. The chapter then proceeds to offer an assessment of the selected participants' interview transcripts.

The chapter comprises six sections, Section 4.2 contains subsections focusing on the questionnaire and analysis based on the views of the participants from industry. Section 4.3 discusses the interviews and provides a summary of each interview held. Section 4.4 presents an analysis of all interviews held. Section 4.5 outlines the study's results and, finally, the last section, Section 4.6, contains a conclusion to the chapter with a holistic view of the study results.

The next section presents the data from the questionnaires completed by the various participants.

4.2 Questionnaires

4.2.1 Questionnaire participation

Three types of questionnaires were administered, namely, to the employed graduates, the line managers of the employed graduates and the recruitment personnel involved in IT graduate placements. The questionnaires were found to be fairly effective as an information gathering tool as they allowed the industry participants, all of whom worked at various levels in industry, to reflect on their experiences with the new graduate employment and how graduate issues were handled and provided feedback on ways in which the IT curriculum could be enhanced to better prepare new graduates. The graduate and recruitment personnel questionnaires were

also useful as the responses to the questions reflected their perceptions, approaches, opinions, and comments on specific aspects of IT graduate employment.

Five participants were requested to complete the industry line manager questionnaire. However only four participated by completing and returning their feedback. Only one line manager opted not to answer the three open-ended questions in the questionnaire although this participant did provide feedback in respect of these questions during the follow-up interview. The employed graduate questionnaire and questionnaire participation consent sheet were sent to six participants. However, four participants only returned the employed graduate questionnaire. Six participants were invited to complete the recruitment questionnaire. However, only four were willing to participate and completed the questionnaire. Table 4.1 presents a summary of the participants who completed the three types of questionnaires. It shows the number of participants who were invited to participate and the number who did participate. Latham (2014) indicate that to ensure open and frank conversations in qualitative studies fewer than 20 participants is ideal. In addition, this helps to alleviate some of the validity threats and bias inherent in qualitative research. It is also mentioned by many experts that for qualitative studies, there is no set number in respect of the actual number of participants required (Yin, 1981; Flick, 2009; Creswell, 2014). In this study, regarding the participant selection, practical issues such as the availability of participants and their limitations were taken into account (Baker & Edwards, 2012). With this in mind, the researcher was of the opinion that 17 participants would be ideal. However, due to a lack of availability 12 participants only were willing and available. Of these 12 participants, eight were interviewed to gain further insight to answer the research questions.

Table 4.1: Summary of questionnaire participants

Questionnaires	No. of participants invited	No. of respondents
Industry – line managers	5	4
Employed graduates	6	4
Recruitment personnel	6	4

The next section presents a summary of the questionnaire based on the responses from the line managers of the employed graduates.

4.2.2 Summary of questionnaire – line managers

Table 4.2 presents the opinions of the industry members in line management positions regarding the employment of IT graduates. It also depicts the various perceptions of the line managers of the skills that were lacking during the graduates’ first year of employment as well as their recommendations for curriculum enhancements. The responses seen in the table shows verbatim responses from the participants.

Table 4.2: Line manager questionnaire response output

1. What education level does your company generally consider when hiring an IT graduate for entry level positions?				
Participant responses:				
Professional Certifications	Higher Certificates	Diplomas	Degree	Other: (Diploma / Degree / Experience)
-	-	2	1	1
2. Is the attained higher education results of the graduate considered for placement?				
Participant responses:				
Yes			No	
3			1	
3. How long (in weeks) did it take for the employed graduate to become productive upon employment?				
Participant 1 response:	1 week			
Participant 2 response:	26 weeks			
Participant 3 response:	16 weeks			
Participant 4 response:	36 weeks			
4. Do you feel that the employed graduate’s attained higher education results affected the time taken to become productive?				
Participant responses:				
Yes		No		Not considered
1		1		2
5. Do you feel the qualification completed by the graduate fully equipped the person for employment at your company?				
Participant responses:				
Yes			No	
1			3	
If No, please indicate what do you feel the curriculum lacked in preparing the graduate?				
Participant 1 response:	N/a			
Participant 2 response:	The difference between the practice and what is taught is significant.			
Participant 3 response:	Typical/common tools and processes used in the workplace.			

Participant 4 response:	-			
6. What key strength(s) / skill(s) did the graduate lack upon their first year of employment				
Participant 1 response:	The graduate was highly technical and had the ability to learn new things fast.			
Participant 2 response:	Problem solving; Implementer and Completer Finisher roles ² .			
Participant 3 response:	Sense of urgency & Communication.			
Participant 4 response:	-			
7. How would you classify the key strength(s) / skill(s) lacked? *(Soft skills are generally referred to as professional skills. Some examples of soft skills are communication skills, motivation skills, interpersonal skills, teamwork, work ethic and problem solving.)				
Participant responses:				
Soft skills	Practical skills	Lack of subject knowledge	Combination of all	Other: <i>(Graduate had a good balance of Soft and Practical skills that developed further with work experience.)</i>
2	2	1	0	1
8. Was your company / department impacted by the unproductivity level of the employed graduate?				
Participant responses:				
Yes		No		
3		1		
If Yes, please describe the impact.				
Participant 1 response:	n/a			
Participant 2 response:	Yes but we minimize the effect as we expected the tendency			
Participant 3 response:	At least 3 months' worth of salary plus placement fee			
Participant 4 response:	-			
9. Were any measures put into place when performance gaps were found with the employed graduate?				
Participant responses:				
Yes		No		
3		1		
If Yes, please describe what was done to further upskill the graduate.				
Participant 1 response:	N/a			
Participant 2 response:	Internal training and coaching.			
Participant 3 response:	Consultations to inform the employee of the expectation with review period.			
Participant 4 response:	Courses, coaching and self-growth.			

² Implementer and Completer Finisher roles – refers to an individual who is assigned a task in respect of which the individual is required to complete the process from start to finish by him/herself.

10. What recommendations would you make from industry’s viewpoint to add to the higher education IT curriculum to better prepare graduates for the workplace?	
Participant 1 response:	The curriculum should include more practicals for hands on experience. Practical knowledge will increase the chances for a graduate to pass an interview and reduce the time it takes to be productive once employed.
Participant 2 response:	Align more with SA industry trends and include aspects that will result in graduates being more Problem solvers; Implementers and Completer Finishers.
Participant 3 response:	Introduce a course that exposes graduates to typical tools and processes used in industry (code version control, issue management, build automation etc.)
Participant 4 response:	Structure standards at the institution, I however do not think that state institutions have the capability or integrity to deliver quality graduates.

4.2.3 Analysis of questionnaire summary – line managers

This subsection analyses and presents a summary of the line managers’ responses to the questionnaire (Table 4.2). The summary is provided as per the research themes outlined in Table 3.1:

Employability

- Two of the participants indicated that diploma graduates are considered when hiring for entry level positions. One participant indicated that the company would opt for a degree level graduate while the remaining participant indicated that the company would opt for a graduate with either a diploma or degree or with some experience.
- Three of the participants indicated that the higher education results attained by graduates were considered for placement purposes, whereas one participant indicated that company did not consider the results attained by graduates for placement.
- There was a considerable difference in the opinions expressed on the length of time in weeks that a graduate required to become productive upon employment. The length of time included one week, 16 weeks, 26 weeks and 36 weeks.
- One participant indicated that the results attained by a graduate did affect the time taken to become productive while one participant believed that the results attained by a graduate did not affect the time taken to become productive. The remaining participants indicated that they were not sure whether the higher education results attained by employed graduates affected the time taken to become productive.
- Three participants indicated that their company/department was impacted upon by the productivity level of the employed graduate while one participant indicated the

opposite. One of the participants mentioned that deadlines had to be extended which impacted on the product's delivery date while another participant indicated that the impact amounted to at least three months' salary in addition to the placement fee paid to the recruiters.

Skills

- Regarding the key strengths/skills that graduates lacked upon their first year of employment, one participant highlighted the positive aspect of a graduate possessing a high level of technical skill and the ability to learn new concepts quickly. In contrast, the other participants highlighted a lack of problem-solving skills, issues with starting and seeing a task to its end, communication issues and a lack of urgency for tasks at hand.
- In respect of classifying the strengths/skills lacking there was an equal split between soft skills and practical skills, with one participant indicating a lack of subject knowledge on the part of the graduate. One participant chose the 'other' option, stating that the graduates employed possessed a good balance of both soft and practical skills that developed further with work experience.
- One of the participants indicated that no measures were put into place when performance gaps were found in relation to the employed graduates although the majority of the participants indicated that such measures were put into place. The measures put into place to improve performance included coaching, training, courses and consultations.

Curriculum design

- One participant felt that the qualifications that the graduates had completed equipped them for employment while the other three participants disagreed. Those who disagreed felt that the curriculum was lacking, that there was a significant difference between what was taught and practice, and that the common tools and processes used in the workplace were missing.
- Lastly, there were similar themes in the recommendations made by these line managers, namely:
 - More practical work that related to the workplace environment is required in the curriculum.

- To structure standards and to align with the industry trends, including the uses of certain tools used in industry.

The next section presents a summary of the questionnaire responses completed by the employed graduates.

4.2.4 Summary of questionnaire – employed graduates

Table 4.3 presents the biographical background to the participants who responded to the employed graduate questionnaire. The table indicates each graduate’s field of study, duration of study, employment duration at the time of the study, age range and gender.

Table 4.3: Employed graduates’ background

Graduate	Field of study	Duration of study	Duration of employment	Age range	Gender
Graduate 1	IS – Software and hardware	1 year	2 years 4 months	21–24	Male
Graduate 2	IS – Software	1 year	1 year 8 months	21–23	Male
Graduate 3	IS – Software	1 year	3 years 6 months	22–25	Male
Graduate 4	IS – Software	1 year	1 year 10 months	21–23	Female

Table 4.4 illustrates the opinions of the employed graduates in entry level IT positions. Each graduate’s perception of the items lacking within the first year of employment as well as recommendations for curriculum enhancements are presented. The responses seen in the table shows verbatim responses from the participants.

Table 4.4: Employed graduate questionnaire response output

1. Which field within IT did you complete your studies in?		
Participant responses:		
Software	Hardware	Combination
3	0	1
2. Were your attained higher education results considered for your graduate employment?		
Participants responses:		
Yes	No	
3	1	
3. How long (in weeks) did you take to become productive upon employment as a graduate?		
Participant 1 response:	20 weeks	
Participant 2 response:	2 weeks	
Participant 3 response:	8 weeks	
Participant 4 response:	6–8 weeks	

4. Did your attained higher education results assist / aid in the length of time you took to become productive upon employment?					
Participant responses:					
Yes			No		
2			2		
5. Indicate your emotions/feelings during the first year of your employment as a graduate?					
Participant responses:					
Confident	Slightly confident	Comfortable	Slightly comfortable	Slightly overwhelmed	Extremely overwhelmed
0	0	2	1	1	0
Please indicate why you felt the way you indicated above.					
Participant 1 response:	I was made to feel welcome and part of the team.				
Participant 2 response:	I was excited.				
Participant 3 response:	It was a totally new environment to what I was use to and failing to be successful in the role that I was appointed to was not an option, so a combination of those two feelings was slightly overwhelming.				
Participant 4 response:	Was my first position and my study material was not on the same level than the projects I was assigned to. I was assigned to correct current issues on the application, not build your own code. Working on other person's code was a bit different than writing your own.				
6. Did you feel the qualification you studied for fully prepare you to be productive within your first year of employment as a graduate?					
Participant responses:					
Yes			No		
2			2		
If No, please indicate what the curriculum lacked in preparing you for the workplace?					
Participant 1 response:	Not enough real life/work practicals were done, it was just theory all the way.				
Participant 2 response:	N/A				
Participant 3 response:	-				
Participant 4 response:	Debugging issues in detail, different tools that you use in the work environment and different in versions of Tools and Java Language.				

7. What key strength(s) / skill(s) you lacked as a graduate upon your first year of employment?				
Participant 1 response:	Discipline. I was behaving like I'm still at University			
Participant 2 response:	IT Hardware skills			
Participant 3 response:	People skills			
Participant 4 response:	Soft skills			
8. How would you classify the key strength(s) / skill(s) lacked?				
Participant responses:				
Soft skills	Practical skills	Lack of subject knowledge	Combination of all	Other:
2	0	0	2	0
9. Was your company / department impacted by your lack of productivity as a graduate within your first year of employment?				
Participant responses:				
Yes			No	
0			4	
If Yes, please describe any impact(s) felt.				
Participant 1 response:	No impact felt.			
Participant 2 response:	n/a			
Participant 3 response:	-			
Participant 4 response:	n/a			
10. Were any measures put into place by the company upon finding performance gaps within your first year of employment as a graduate?				
Participant responses:				
Yes			No	
2			2	
If Yes, please describe what was done to further assist you?				
Participant 1 response:	They took me to software development training courses to equip me.			
Participant 2 response:	Key Performance Areas			

Participant 3 response:	-
Participant 4 response:	n/a
11. Were any measures put into place by yourself upon finding performance gaps within your first year of employment as a graduate?	
Participant responses:	
Yes	No
4	0
If Yes, please describe what you have done to further skill yourself?	
Participant 1 response:	I used to practice tutorial after hours.
Participant 2 response:	Study more, get more certified
Participant 3 response:	YouTube and Google for research purposes on gaps that I had identified.
Participant 4 response:	Java Certifications
12. In your view, what would you add to the higher education IT curriculum to better prepare graduates for the work place?	
Participant 1 response:	More practicals, real work like practicals and less Theory.
Participant 2 response:	Masters degree
Participant 3 response:	I think that the program does give you a good base to start with if I could add something that would better prepare someone I would add a module on "General Business Practices" basically just an overview of the manner and the character in the working environment.
Participant 4 response:	Different Tools and Apps to use for development Debugging tools and Performance Measurements.

4.2.5 Analysis of questionnaire summary – employed graduates

The following findings in relation to the research themes outlined in Table 3.1 emerged from the analysis of the questionnaire summary presented in Table 4.4:

Employability

- Three of the participants indicated that they had completed the software stream while one participant had completed a combination of the software and hardware streams.
- Three participants believed that higher education results they had attained had been considered when they were employed while one participant noted that his/her results had not been a factor in his/her employment.
- The participants' feedback on the time taken to become productive after employment ranged between two, six, eight and twenty weeks.
- Half of the participants indicated that the higher education results they attained had reduced the length of time it had taken them to become productive upon employment while the other half indicated that the higher education results they attained had not reduced the length of time it had taken them to become productive upon employment.
- In relation to the participants' feelings/emotions during their first year of employment, half of the them indicated that they had felt comfortable, one participant stated that he/she had felt slightly comfortable while the last participant noted feeling slightly overwhelmed.
- When asked why they had felt the way they did, the participants who had indicated that they had felt comfortable alluded to feelings of excitement and being welcomed and made part of a team. The participant who had indicated feeling slightly comfortable mentioned that this was due to a completely new environmental experience and that failing in the position to which he/she had been appointed had not been an option. The last participant indicated that the material and projects covered during his/her study period and the position to which he/she had been appointed had not been on the same level and that having to modify an application developed by someone else instead of building code on his/her own had resulted in a feeling of being slightly overwhelmed.
- Half of the participants specified that the qualification for which they had studied had fully prepared them to be productive within the first year of their employment while the remaining half indicated that the qualification for which they had studied did not fully prepare them to be productive within their first year of employment.
- All the participants believed that the company/department where they were employed had not been impacted upon by their lack of productivity within their first year of employment and that no impact has been felt.

Skills

- When asked about the key skills/strengths they had lacked during their first year of employment, the participants cited discipline, IT hardware skills, and people/soft skills.
- Half of the participants classified the skills they had lacked as soft skills, whereas the remaining half indicated a combination of soft skills, practical skills and a lack of subject knowledge.
- Half of the participants reported that measures had been put in place by the company for which they worked on the company's finding performance gaps within their first year of employment while half indicated that no measures had been put in place by their companies upon finding performance gaps.
- When the participants were asked to describe what had been done to assist them after the performance gaps had been found, the participants mentioned that they had been taken on software development training courses and there had been discussions held on key performance areas.
- All the participants indicated that they themselves had put measures in place on finding performance gaps within their first year of employment.
- Some of the participants had practised tutorials after hours, some had studied further to obtain further qualifications while some had used YouTube and Google for research purposes in relation to the gaps identified in their performance.

Curriculum design

- One participant who felt that the qualifications attained did not prepare them for the workplace mentioned that the curriculum lacked real life, work-based, practical work and that it consisted primarily of theory. The participant also pointed out that details taught on debugging issues, various tools and programming languages did not map to what is used in industry.
- When asked what they would like to add to the higher education IT curriculum to better prepare graduates for the workplace, one participant cited more practical work with real work practices and less theory, another participant mentioned that the inclusion of general business practice would help prepare graduates for the workplace as well the need for the different tools and apps used in debugging and performance measures to be taught. One participant indicated that a master's degree programme would assist graduates in the workplace.

The next section presents a summary of the questionnaire findings emanating from the responses from the recruitment personnel who place IT graduates in industry.

4.2.6 Summary of questionnaire – recruitment personnel

Table 4.5 presents the opinions of the recruitment personnel who place graduates in entry level IT positions. The various views on the requirements for placing IT graduates as well as their recommendations for curriculum enhancements are discussed below. The responses seen in the table shows verbatim responses from the participants.

Table 4.5: Recruitment personnel questionnaire response output

1. Which IT position do you feel is the easiest to source IT graduates for?				
Participant 1 response:	End User Technicians.			
Participant 2 response:	End User Support Technician.			
Participant 3 response:	System Technician.			
Participant 4 response:	Any, be it hardware or software, its a learning programme.			
2. Which IT position do you feel is the most difficult to source IT graduates for?				
Participant 1 response:	Senior Developers.			
Participant 2 response:	Source Code Development.			
Participant 3 response:	Java Developers.			
Participant 4 response:	Senior Managers in the Technology space.			
3. How often is the IT graduate's attained higher education results looked at for placement purposes?				
Participant responses:				
All the time	Often	Seldom	Not at all	Not applicable
1	2	1	0	0
4. Which skills are most often looked for by industry when an IT graduate is required? (Soft skills are generally referred to as professional skills. Some examples of soft skills are communication skills, motivation skills, interpersonal skills, teamwork, work ethic and problem solving.)				
Participant responses:				
Technical skills	Soft skills	Combination of the above	Other	
0	1	3	0	
5. What are the key strength/skill sets requested by industry for a graduate level position?				
Participant 1 response:	The graduate should know the core functions of modules they had taken.			
Participant 2 response:	Ability to adapt, learn and grow within a post.			
Participant 3 response:	Technical skills			
Participant 4 response:	Good attitude toward learning, hunger to achieve and strong analytics			

6. Do companies provide feedback upon employment of an IT graduate?		
Participant responses:		
Yes		No
2		2
If Yes, please elaborate on the type of feedback gained.		
Participant 1 response:	The companies would give feedback on how the graduate managed to settle in with the skills that they came with into the company.	
Participant 2 response:	n/a	
Participant 3 response:	n/a	
Participant 4 response:	To the Seta ³ , a report is written detailing training completed, the duties performed.	
7. Are there any performance gaps mentioned by companies after an IT graduate is placed?		
Participant responses:		
Yes		No
2		2
If Yes, please indicate any performance gaps mentioned.		
Participant 1 response:	Graduates mostly go into industry with the knowledge of systems used in industry but would not know how to implement that knowledge into their work.	
Participant 2 response:	n/a	
Participant 3 response:	n/a	
Participant 4 response:	Soft skills (dress code, etiquette) and Business Acumen	
8. Is there anything done by the recruitment end when performance gaps are mentioned by industry?		
Participant responses:		
Yes	No	Not applicable
2	2	0
If Yes, please indicate what is done.		
Participant 1 response:	Recruiters would then source the graduates from institutions they know have graduates who fill these gaps.	
Participant 2 response:	The student is advised and requested to up-skill as necessary.	
Participant 3 response:	n/a	
Participant 4 response:	Only if they are successful to placed on our internship programme do we focus on the graduate.	

³ Seta - Sector Education and Training Authority

9. What are some of the difficulties / issues that you face when placing an IT graduate into industry positions?	
Participant 1 response:	The only issue would be that the students may not be exposed to the core industry needs, however if they graduated from an institution that gives more exposure to how industry works they are able to grasp the functions quickly.
Participant 2 response:	Practical experience is almost non-existent. Graduates theoretically know how to get tasks done (determined by Interview tests). IT positions are usually very specific and not all candidates meet the requirements or specialisations.
Participant 3 response:	Extensive training required.
Participant 4 response:	None, managers are always looking for assistance and are eager to pass on knowledge. After completion absorption in the business can become problematic (<i>sic</i>) if no role exists.
10. What recommendations would you like to make towards the enhancement of the IT curriculum so that it could better equip graduates for the workplace?	
Participant 1 response:	If institutions could give a deeper teaching of how the industry works, the graduates would go into a more familiar environment when they start working and that is an advantage for both the graduate and the company as it minimized further training from the company's side.
Participant 2 response:	Practical application of theory at curriculum level. Focus on generic languages giving students the ability to adapt to others.
Participant 3 response:	More experience.
Participant 4 response:	Soft skills need to be ingrained; most companies recruit for the right behaviours. Business Acumen as Technology is an enabling function, therefore a degree of knowledge about basic business principals.

4.2.7 Analysis of questionnaire summary – recruitment personnel

The following is an analysis of the questionnaire summary presented in Table 4.5 based on feedback from the various recruitment personnel and as pertaining to the research themes outlined in Table 3.1:

Employability

- When the participants were asked which was the easiest IT position for which to source IT graduates, the majority cited end user support/systems technician. One participant specified it was easy to source any software or hardware graduates.
- Half of the participants indicated that it was difficult to source for senior positions in IT while the remainder mentioned source coder/Java developers as being difficult to source.

- Half of the participants mentioned that they often took into account an IT graduate's results for placement purposes, one participant indicated that the results were always taken into account while one stated that results were seldom looked at for placement purposes.
- There was an equal split between those participants who noted that companies would either provide feedback or not provide any feedback on the IT graduates they had placed at the companies.
- The feedback received from the companies usually involved how the graduates had managed to settle into the positions in which they had been placed and, if the companies were Seta affiliated, then a detailed report on training and duties performed would be received.
- The majority of the participants indicated that graduates who lacked exposure to industry needs, especially in the practical side context, were difficult to place. When extensive training was required this would become an issue. In addition, sometimes only after a placement had been done did a company realise that the position in which the graduate had been placed was no longer required.

Skill sets

- Three participants indicated that a combination of technical and soft skills was often sought by industry when sourcing an IT graduate although one participant indicated that soft skills only were the most sought after by industry.
- Feedback on the key strengths/skill sets required by industry for a graduate level position elicited various types of feedback. A detailed understanding of the key elements of the modules completed by graduates, the ability to adapt, learn and grow within a position, and technical skills were also highlighted. A positive attitude towards learning as well as a drive to succeed and strong analytics were also noted as some of the key strengths/skill sets required.
- Half of the companies reported performance gaps pertaining to the graduates placed to the recruitment personnel while the other half did not.
- Companies that do provide feedback on the performance gap of the graduates placed mentioned that graduates often had difficulty in implementing their knowledge in their work and that soft skills, such as dress code, etiquette as well as business acumen, were lacking.

- When the participants were asked whether they took any action when performance gaps were mentioned by industry, half of them indicated that they did assist with performance gaps found whereas the remaining other half indicated that they did not.
- The recruitment personnel who were informed of skills gaps by industry would advise the graduates by suggesting upskilling. On the other hand, the other recruitment personnel opted to only recruit graduates from institutions which they knew produced graduates with no such skills gaps.

Curriculum design

- The recommendations made by the recruitment personnel participants in respect of the enhancement of the IT curriculum included the following:
 - More detailed teaching on the way in which industry operates.
 - Practical application of theory items covered.
 - Exposure to more industry related experience.
 - Soft skills ingrained as recruitment companies also look for professional behaviour.

The next section presents the interviews which were conducted with the selected participants.

4.3 Interviews

4.3.1 Interview participation

Interviews were conducted with the line managers of the employed graduates as well as the employed graduates. The interviews sessions ranged from thirty minutes to an hour and a half. All the interviews took place in each line manager's office at the relevant company. Two different recording devices were used in case there were any problems with one of the devices. The two recording devices included the researcher's cell phone and laptop that had a voice recorder application. Before leaving the premises where an interview had been conducted the researcher checked whether the session had, in fact, been recorded and immediately did a backup to the researcher's secure cloud account to prevent loss of the recording.

Besides the recruitment personnel participants, the other participants included the following eight participants:

- Participant 1 from company 1
- Participant 2 from company 2
- Participant 3 from company 3
- Participant 4 from company 3
- Participant 5, employed graduate from company 3
- Participant 6, employed graduate from company 3
- Participant 7, employed graduate from company 1
- Participant 8, employed graduate from company 2

The interview scripts were based on each participant's questionnaire feedback. This assisted the semi-structured interview process. The interview scripts were used to highlight and determine probing questions in the interests of clarity as well as to shed light on some of the unclear/unanswered questions. Two examples of these interview scripts are contained in Appendices E1 and E2.

The interviews ensured that the research objectives indicated in Chapter 1 were realised. Each interview session focused on the following four themes:

1. Skills
2. Impacts
3. Measures
4. Recommendations

Appendices E1 and E2 contain an example of a line manager and a graduate's interview scripts and transcriptions respectively. The interview transcripts were shared with each participant to validate the accuracy of the information captured during the interview session. Validation of the correctly captured and transcribed interviews was received from all participants, some verbally by telephone and some in writing via email.

The purpose of analysing each interview transcript was to provide a description of each interview as well as to ascertain the depth and scope of the interview. The descriptions provided by the interview transcripts constitute a simple form of analysis and interpretation comprising the conversion from field data into research data (Mouton, 2001; Hofstee, 2006).

4.3.2 Interview with participant 1 from company 1

Participant 1 from company 1 was the line manager for (Participant 7, an employed graduate who held a junior IT network technician position. Company 1 is a global organisation that offers educational knowledge from both local and international resources. The company offers products such as the publishing of educational items to assessment services for corporates and schools. Participant 1 was at the management level of the South African IT sector for the organisation and had been employed in the IT field for more than 12 years. Over the years, Participant 1 had gained vast experience in the hardware stream and, hence, his line management position.

The interview transcript was coded in terms of the four themes indicated in subsection 4.3.1. Participant 1 summed up his experience of employing an IT graduate as pleasant and indicated that the graduate possessed a sound knowledge of the curriculum studied. He also mentioned that the employed graduate had better practical skills as compared to other employed graduates who had not completed the curriculum via the MLM mode of study. He highlighted that simulating a live production environment within a test environment for study purposes does sometimes prove to be different to the environment to which graduates are exposed once employed. However, it appeared that the graduate under his management had easily grasped the concepts of the live production environment.

When probed about problematic skills experienced with the employed graduate, the participant expressed the view that graduates are exposed to insufficient practical work, particularly technical configuration, during their studies.

The participant confirmed that the higher education results attained by the graduate had been taken into account for employment purposes. The reason for this was to ensure that a specific skill set required for the position had been included in the applicant's studies, with the results indicating how well the graduate had done in relation to those skills. This had enhanced the first-year productivity level of the graduate. The participant indicated that the graduate was highly productive with no negative impact experienced by either the company or the department.

The participant highlighted the following recommendations in respect of improving the IT curriculum to better prepare graduates for industry:

- Include more practical than theory and laboratory and real-life situations.

- Offer IT certifications in demand in industry.
- Move with the times as technology evolves at a rapid pace.

The last recommendation made by participant 1 is in line with Moyo's (2013) recommendation that the higher education curriculum in South Africa continuously aim to keep up with the fast paced rate at which the IT industry evolves. Likewise, participant 1 recommended curriculum improvement to keep abreast of the rapid pace trends in technology.

The interview with participant 1 from company 1 is summarised in Table 4.6 below.

Table 4.6: Summary of interview - Participant 1 from company 1

Interview themes	Research objectives	Participant feedback
Skills	To determine the key skills which graduates lacked upon employment.	Not sufficient practical work on technical configurations.
Impact	To identify the impact on the workplace of the employment of inadequately prepared graduates.	No negative impact experienced.
Measures	To identify measures taken to upskill graduates to enable them to meet the workplace needs.	None.
Recommendations	To ascertain recommendations that industry would like to make to improve the higher education IT curriculum.	<ul style="list-style-type: none"> • Include more practical work than theory. • Include laboratory and real-life situations. • Include IT certifications. • Move with the times as technology evolves quickly.

4.3.3 Interview with participant 2 from company 2

At the time of the study Participant 2 from company 2 was in a line management position to the employed graduate (participant 8) while the graduate was holding a software development position within the company. Company 2 is a locally based company that offers products such as web applications, software solutions, consulting services and information risk analysis to other organisations. Participant 2 performed an executive management role within the company and had been in the software stream for approximately 18 years. He had worked his way up from heading the software development department to the executive role that he was holding at the time of the study.

The participant described his experience of employing an IT graduate as not very pleasant due to the length of time taken for the on boarding process of the employed graduate and which was resulting unexpectedly in a loss of money as well as momentum within the team. The

participant referred to the employment of graduates as an expensive way of acquiring an asset. When probed further about the issue of problematic skills, the participant mentioned matters pertaining to technical and soft skills. Regarding the technical skill, the participant felt that graduates should be exposed more to peripheral tools covering code versioning as this is one skill with which graduates struggle. In respect of soft skills, the participant raised many concerns in this regard, noting communication skills as extremely problematic as graduates were not able to express the problems they faced. Time management was also noted as a skill that they lacked although the participant linked this a lack of professional skills and behaviour skills, especially in relation to maturity and accepting responsibility and accountability respect of assigned tasks.

The participant had indicated that the higher education results attained by the graduate were taken into account for employment purposes in the questionnaire. When asked what was generally considered important in such results in relation to possible employment, the participant indicated that consistency in terms of the results was important. He further explained that if a graduate maintained good results/grades and, thus, demonstrated consistency then this spoke of discipline, seriousness and perseverance.

When asked about the effect of the results attained graduates on their productivity level, the participant referred to the efficiency of the on-boarding process and the return on investment effect. The participant assumed that if the results attained were good, then the on-boarding process would be easier although this had not been the case with participant 8. When discussing the measures taken once performance gaps were found, the participant reiterated the point he had made in the questionnaire, indicating that consultations with the graduates concerned were held and explained each stage of consultation consisted of between two to three consultations within a space of two weeks. However, the participant also explained that if a graduate's performance did not then improve, an exit strategy would be mutually arrived at as it becomes expensive to retain a graduate of such poor calibre. The participant also mentioned that the main impact experienced by the company was the expense of the on-boarding process.

The participant was asked to describe the graduate's productivity level in the first year of employment. He indicated that the first half of the year comprises mainly of the on-boarding process and getting the right skill set in place resulting in the graduates not being productive during this time. However, the participant also described one graduate who had recently

completed the one-year period and was surpassing colleagues in the same environment who had been there for more than three years.

The participant summed up his advice to improve the IT curriculum as follows:

- Cultivate a passion for the IT environment.
- Include soft skills including communications skills and aspects of professionalism such as maturity levels that demonstrate both accountability and responsibility.
- Include practical skills by involving exposure to peripheral tools such as code versioning.

The recommendations made by participant 2 on the need to enhance the IT curriculum with soft and practical skills is linked to the various skills that graduates lack as indicated in the literature review in Chapter 2. Simon and Jackson (2013) highlight the need for a combination of soft and practical skills to assist graduates in analyst positions to meet the requirements of both the users and consumers while Soffel's (2016) 21st-century skills required for the workplace include communication skills as a core competency. Amiruddin et al. (2016) and Taylor (2016b) concur that soft skills plays a pivotal role in developing graduates for the workplace, while Waldrop (2017) validates the importance of these skills as required by graduates for employment purposes and further states that higher education should ensure that the latest skills required are incorporated into the curriculum.

The interview conducted with participant 2 from company 2 is summarised in Table 4.7.

Table 4.7: Summary of interview - Participant 2 from company 2

Interview themes	Research objectives	Participant feedback
Skills	To determine the key skills which graduates lacked upon employment.	Practical skills involving the use of peripheral tools.
Impact	To identify the impact on the workplace of the employment of inadequately prepared graduates.	Extra cost to the company for the length of time the boarding process takes to ensure the graduates become productive.
Measures	To identify measures taken to upskill graduates to enable them to meet the workplace needs.	Consultations every two (2) weeks to check on progress.
Recommendations	To ascertain recommendations that industry would like to make to improve the higher education IT curriculum.	<ul style="list-style-type: none"> • Instilling passion. • Soft skills – communication skills, and professionalism. • Practical skills – exposure to code version tool.

4.3.4 Interview with participant 3 from company 3

Note that there were two willing participants from company 3 who, at the time of the study, were holding line management positions in relation to the graduates employed. In addition, there were also two graduate participants from company 3 who, at the time of the study, were both holding software developer positions. Company 3 is a Johannesburg Stock Exchange (JSE) listed organisation specialising in investments, asset portfolios and financial solutions enabling corporates and individuals to realise their financial objectives. Participant 3 was in the software development division of the organisation and was holding a senior management role. He had over 15 years of experience in the IT field. His strengths lay in the software stream, mainly in the application development arena. This participant was the line manager to participant 6 (employed graduate) who was a software developer.

The participant described his experience of employing an IT graduate as not a terrible experience but stated that matters could be improved. He described the lengthy on-boarding process of a graduate to the level required by the company. He cited a misalignment between what graduates studied and what actually happens in industry and indicated the importance of such an alignment.

When questioned about the problematic skills encountered on the part of the employed graduate, the participant indicated that problems with soft skills and problem-solving skills were prevalent. He also mentioned that technical skills were sometimes an issue in respect of seeing a problem through from beginning to end but not to the same extent as the soft and

problem-solving skills. When asked whether there were any positive skills that graduates may possess, the participant stated that the graduates often think more out of the box which then introduces that type of thinking into the team.

In the questionnaire the participant indicated that it would often take six months before the employed graduates became productive. When probed as to why this took so long, the participant indicated that graduates need to learn better communication skills to enable them to communicate effectively with higher levels of management when guidance is provided. He described how a graduate would come back after having received guidance and properly communicate solutions to the problem experienced. The participant indicated that in the event of a graduate performing well, very little direction was needed but that in some instances, there was considerable back and forth liaisons that would take place either daily or every second day. However, overall, the participant described the graduate's (participant 6) first year of employment as fairly productive.

The next question to the participant focused on the impacts experienced by the department in which the graduate was employed. The participant responded that there was often a monetary impact as it would take longer for items to reach the production stages but that the department had a budget in place for skilling the employed graduates. When asked as to what are done when performance gaps were found, the response was that graduates would be sent on a Java certification course as well as internal training and coaching sessions.

When queried about recommendation for improvements in the IT curriculum, the participant reiterated that soft skills should be included. This recommendation is in line with the recommendation in literature that more soft skills should be included in the curriculum (Pradhan, 2015) at each level of study (Taylor, 2016a).

Table 4.8 outlines the interview summary conducted with participant 3 from company 3.

Table 4.8: Summary of interview – participant 3 from company 3

Interview themes	Research objectives	Participant feedback
Skills	To determine the key skills which graduates lacked upon employment.	<ul style="list-style-type: none"> • Soft skills. • Problem solving skills. • Technical skills.
Impact	To identify the impact on the workplace of the employment of inadequately prepared graduates.	A cost to the company to upskill the graduates upskilled.
Measures	To identify measures taken to upskill graduates to enable them to meet the workplace needs.	<ul style="list-style-type: none"> • Graduates sent on Java certification courses. • Internal training and coaching sessions.
Recommendations	To ascertain recommendations that industry would like to make to improve the higher education IT curriculum.	<ul style="list-style-type: none"> • Include soft skills.

4.3.5 Interview with participant 4 from company 3

Participant 4 was a member of the line management team for the employed graduate (participant 5) who was a software developer. At the time of the study, participant 4 had been in the IT environment for over 20 years. His specialisation was in the software stream and he was assigned to graduates to help to build the required skill sets within the field.

The participant described some of his experiences as good and some as not as good, with this being dependent on the institution from which the graduates came. In relation to the graduates from the institution on which this case study was based, the participant described a more positive experience, stating that he preferred the methodology of student progress, tracking and the requirement of 60% to pass a module.

In response to the questionnaire, the participant mentioned that employed graduates would take as long as six to 12 months to become productive. When probed about this lengthy period, the participant explained that due to the complex nature of the company, it generally took this long to understand the nature of the business as well as the legacy systems in place that required rebuilds. When asked to describe his views about the productivity of participant 5 after a year of employment, the participant indicated that he had been quite impressed as the graduate was quickly productive.

The impact of unprepared graduates on the participant's department was the next question asked. The participant responded that delays were often experienced in terms of getting their products to market in time. He described the delays as relating to the poor quality of work

produced and the refinements that were required. When asked as to what the curriculum lacked in preparing a graduate for employment, the participant responded that the technology aspect was satisfactory but that how an individual kept oneself updated was important in the sense that if development is required, a check must be carried out on whether there is something that may be reused first and to enhance ways of thinking. He later added that frameworks covering the Java Spring framework would be a good addition to the curriculum.

When questioned about the skills that graduates lacked, the participant mentioned communication skills as well as the way in which the graduates should conduct themselves in meetings. The participant had indicated in the questionnaire that the graduates lacked subject knowledge and, when probed further, described that if a graduate came from a Java-learnt background, the graduate was expected to be well versed in the programming language and to possess a detailed knowledge of it. He also highlighted that it is essential for graduates to have a sound concept of design.

To address the graduates' performance gaps, the participant indicated that in addition to courses and coaching, Java courses were arranged for them. The participant listed the following recommendations for improvements to the IT curriculum:

- Including an understanding of broad IT concepts such as design is important.
- Subject knowledge to be covered on the difference between application running and enterprise solution.
- Exposure to the current technologies used.

These recommendations made by participant 4 correlate with the literature. Waldrop (2017) indicates that graduates lack the crucial IT abilities and skill sets, including technical/hard skills, which employers look for, while Shivoro et al. (2018) advise that higher education aligns the curriculum offered with industry feedback and collaboration in order to produce proficient graduates for the workplace.

Table 4.9 outlines the interview summary conducted for participant 4 from company 3.

Table 4.9: Summary of interview – participant 4 from company 3

Interview themes	Research objectives	Participant feedback
Skills	To determine the key skills which graduates lacked upon employment.	<ul style="list-style-type: none"> • Communications skills. • Subject knowledge.
Impact	To identify the impact on the workplace of the employment of inadequately prepared graduates.	Delays in delivering products to market.
Measures	To identify measures taken to upskill graduates to enable them to meet the workplace needs.	<ul style="list-style-type: none"> • Internal training and coaching sessions. • Java courses.
Recommendations	To ascertain recommendations that industry would like to make to improve the higher education IT curriculum.	<ul style="list-style-type: none"> • Exposure to the latest technology. • Broad IT concepts of design.

4.3.6 Interview with participant 5 - employed graduate from company 3

At the time of the study Participant 5 was employed as a junior software in company 3 and has been employed for approximately one year eight months at company 3. The participant’s line manager was participant 4.

The participant described his experience during the first year of employment as good, even though the environment had been completely different to his years of study. The problems he had encountered during this time were linked to soft skills, in particular communication skills and practical skills. Regarding communication skills, he mentioned that he had felt somewhat “reluctant” to approach his employer about items in relation to what his role entailed and what his duties were. The reason for his feeling this way was due to him feeling “like a kid” while everyone else was active and busy. The participant went on to mention that “within the first 3 months basically nothing happened” as he had been more familiar with the theory aspect of learning but had lacked the practical skills that he required to perform the practical tasks assigned to him. However, this had led to the employer arranging courses for him to attend that covered practical skills involving certification as well as soft skills.

The participant cited an unproductive period of five months. During this time, when his employer had found performance gaps, the participant had been exposed to an upskilling process provided by the company that included both practical courses and the communication skills required in the position he held. During the upskilling process, the participant’s performance was reported to the line manager, with their performance being discussed on a monthly basis.

The participant felt that the curriculum he had followed had not prepared him for the workplace, as the curriculum had been too theoretical in nature and, therefore, had not prepared him at all for the workplace. When probed regarding additions to the curriculum to better prepare graduates for the workplace, the participant responded, “it’s too much theory” and stating that he would recommend the inclusion of more practically inclined items than those that had been offered when he had been studying. This should cover focus areas, for example if students aspired to becoming programmers then, for at least a year of study, such students should be given programming assignments that were practically inclined with less theory. He also mentioned that examples of workplace similarities and simulations would assist graduates in the workplace.

Before the conclusion of the interview, the participant returned to the issue of soft skills and touched on the importance of the maturity levels graduates required for the work environment. He cited a brief example of his naivety “being young” and “irresponsible” when first joining the work space and how his manager had to speak to him about being responsible and about his work attendance. The participant felt that if the soft skills aspect could include items related to being responsible and maintaining professionalism, this would certainly assist graduates’ preparedness for the workplace. Table 4.10 presents a summary of the interview conducted with participant 5.

Table 4.10: Summary of interview – participant 5 (employed graduate) from company 3

Interview themes	Research objectives	Participant feedback
Skills	To determine the key skills which graduates lacked upon employment.	<ul style="list-style-type: none"> • Communications skills. • Practical skills.
Impact	To identify the impact on the workplace of the employment of inadequately prepared graduates.	Lack of a productive environment for almost half a year.
Measures	To identify measures taken to upskill graduates to enable them to meet the workplace needs.	<ul style="list-style-type: none"> • Internal training on soft skills for communication purposes. • Practical programming courses.
Recommendations	To ascertain recommendations that industry would like to make to improve the higher education IT curriculum.	<ul style="list-style-type: none"> • More practical curriculum with less theory. • Include soft skill items, such as communication skills which are vital in the workspace, as well as guidance on professional behaviour.

4.3.7 Interview with participant 6 - employed graduate from company 3

Participant 6 was also employed by company 3. The participant discussed his first-year encounters as an employed graduate appointed as a junior software developer. However, at the time of the study he was holding a more senior role in the development environment and had been employed for approximately three years and six months. His line manager was participant 3 during his first year of employment.

The participant described his experience during the first year of employment as very different to what he had previously been exposed while studying and performing volunteer work. He had learnt much during the first year of employment and had faced challenges at work. He further explained that 10% only of what he had learnt during his studies had assisted him to carry out the tasks assigned to him in the workplace. He highlighted that most of the items included in the Java programming module was not needed for industry purposes as industry was no longer using these concepts. However, he was aware of the fast-paced trends in IT trends and realised that including such aspects in the curriculum on time would be problematic. However, he encouraged those who were experiencing similar task issues in the workplace to conducting researching on the Google platform for items with which they were having problems. He also advised that it was sometimes not necessary to create items from scratch “by reinventing the wheel” as the Google Java platform highlighted several items that could be used and customised to meet the developer’s needs.

When probed about his questionnaire feedback on his productivity levels during his first year of employment, the participant pointed to his nature “I write down all the things that I want to do” and mentioned that despite the fact that he had experienced two unproductive weeks, he had taken measures to close the performance gaps that had been picked up. He had used self-study in respect of the items he had not been able to resolve by questioning his line management, peers and the Google platform in order to acquire the skills he lacked. He described himself as always wanting to know how and why things work in the way in which they do so that he could better understand what he was asked to do and to ensure that things worked as they were meant to. The participant equated his enquiring nature to his passion for his professional field and to being a fast learner. He explained “2 months to know Java in depth and the other stuff web services and all that, that was quite quick cos it’s a protocol driven development you have to do it like this and this is the way, the only way it should actually will work. So 2 weeks was enough for me”.

Despite the fact the participant mentioned that the curriculum he had completed had prepared him to some extent for the workplace, he iterated the importance of also being informed about aspects of IT other than programming. He described how a knowledge of technical IT aspects related to programming was vital as it helps when communicating with technical IT professionals.

When asked for further recommendations/advice to enhance the curriculum so that it may better prepare graduates for the workplace, he mentioned the following:

- It is essential to have at least “80 – 100%” coverage of the programming aspect with the remainder focusing on other aspects pertaining to other services to which programmers would be exposed in industry.
- Passion/zeal for the profession is vital and, thus, it is important to ascertain at the beginning of the graduate’s career if the IT/development profession is the profession to which the graduate aspires.

Table 4.11 presents a summary of the interview conducted for participant 6.

Table 4.11: Summary of interview – participant 6 (employed graduate) from company 3

Interview themes	Research objectives	Participant feedback
Skills	To determine the key skills which graduates lacked upon employment.	<ul style="list-style-type: none"> • Practical skills.
Impact	To identify the impact on the workplace of the employment of inadequately prepared graduates.	No negative impact indicated.
Measures	To identify measures taken to upskill graduates to enable them to meet the workplace needs.	<ul style="list-style-type: none"> • Self-study on programming practices. • Line management guidance.
Recommendations	To ascertain recommendations that industry would like to make to improve the higher education IT curriculum.	<ul style="list-style-type: none"> • More practical approaches to programming aspects. • Include other related programming aspects such as web services and technical server knowledge.

4.3.8 Interview with participant 7 – employed graduate from company 1

Participant 7 had been employed at company 1 previously, although he is no longer with the company. The participant discussed his first-year experiences as an employed graduate in the hardware stream. He has been employed in the IT field for approximately two years and four months. His line manager had been participant 1.

The participant described his first year of employment as “overwhelming and a bit nerve wrecking” as it was his first job in a big organisation, and he had wanted to be as successful as possible. He mentioned that what he had learnt during his studies had played a role in his being able to carry out the technical tasks he had been assigned. In addition, he mentioned soft skills as the only aspect for which his studies had not prepared him. The participant explained that he had had to learn to deal with people at various levels and that learning “general business manner” and how businesses function within a corporate environment were crucial knowledge for graduates.

When probed on his questionnaire feedback on his productivity level during his first year of employment, the participant highlighted that it had taken him two months and “it was a case of actually doing little by little, job shadowing to an extent until I was comfortable doing it (KPI’s⁴) on my own”. He mentioned that the academic results he had attained had played a role in the length of time it had taken him to become productive as the items he had learnt in the hardware stream had assisted him to carry out the tasks he had been assigned. Despite the fact that the curriculum had prepared the participant for the workplace, the participant mentioned that when he had identified some performance gaps, he would search the internet, look at YouTube videos and google similar challenges faced by others in forums to further upskill himself.

The participant summarised the following recommendations to enhance the IT curriculum to better prepare graduates for the workplace:

- Include a section on soft skills for communication purposes in a professional environment.
- Help students to understand the business environment.
- Include some items of what students may expect in industry as a beginner.

Table 4.12 presents a summary of the interview conducted for participant 7.

⁴ KPI – Key Performance Indicators

Table 4.12: Summary of interview – participant 7 (employed graduate) from company 1

Interview themes	Research objectives	Participant feedback
Skills	To determine the key skills which graduates lacked upon employment.	<ul style="list-style-type: none"> • Soft skills.
Impact	To identify the impact on the workplace of the employment of inadequately prepared graduates.	No negative impact indicated.
Measures	To identify measures taken to upskill graduates to enable them to meet the workplace needs.	<ul style="list-style-type: none"> • Self-guidance from internet searchers. • YouTube videos.
Recommendations	To ascertain recommendations that industry would like to make to improve the higher education IT curriculum.	<ul style="list-style-type: none"> • Soft skills to be added to the curriculum. • Include business concepts and industry expectations.

4.3.9 Interview with participant 8 – employed graduate from company 2

Participant 8 discussed her first-year experiences as an employed graduate in the software stream. She has been employed in the IT field for approximately one year and ten months. Her line manager was participant 2.

The participant described her first year of employment as a graduate as different to other graduates due to the volunteer work she had done while studying which, she claimed, had given her the advantage in her first year of employment of being acquainted with much of what happens in the work environment. The one aspect that the participant had found problematic upon employment was her lack of exposure to the latest technologies. She also added that debugging and “problem solving on existing applications was a bit of a learning curve” and difficult as, during her studies, she had had to deal only with her own work. However, she iterated that all the practical work she had done during her studies had assisted her.

Communication skills was another item she listed as a problematic skill she had encountered as she had been required to communicate with other employees on various levels as well as clients and had had to learn “how to communicate effectively and efficiently”. When performance gaps had been found the participant mentioned that a mentor had been assigned to guide her. She would also continuously practise items and read up on technical items to further skill herself. She also mentioned that she had completed additional certification to supplement her existing knowledge.

The participant made the following recommendations to improve the IT curriculum to better prepare graduates for the workplace:

- More work-related examples in the practical work done.
- Use of latest technology.
- Inclusion of teamwork and then working on someone else’s code to troubleshoot and improve.
- Communication skills to be added to the curriculum.

Table 4.13 presents a summary of the interview conducted with participant 8.

Table 4.13: Summary of interview – participant 8 (employed graduate) from company 2

Interview themes	Research objectives	Participant feedback
Skills	To determine the key skills which graduates lacked upon employment.	<ul style="list-style-type: none"> • Exposure to latest technologies. • Communication skills.
Impact	To identify the impact on the workplace of the employment of inadequately prepared graduates.	No negative impact noted.
Measures	To identify measures taken to upskill graduates to enable them to meet the workplace needs.	<ul style="list-style-type: none"> • Mentoring. • Reading up on practical items • Completing certifications.
Recommendations	To ascertain recommendations that industry would like to make to improve the higher education IT curriculum.	<ul style="list-style-type: none"> • Include more work-related practical examples. • Exposure to the latest technologies. • Teamwork, troubleshooting and enhancing existing work. • Include communication skills.

The next section presents an analysis of the interview conducted with the line managers and the general impressions in respect of the line manager interview themes, as well as the employed graduates’ interview themes.

4.4 Analysis of interviews

This section presents an analysis of all the interviews that were conducted.

The subsection below contains the analysis of the line managers' interviews.

4.4.1 Line manager interview analysis

This section highlights the general impressions that emerged in relation to the interview themes per interview participant. Table 4.14 presents a summary of the interviews conducted with the line manager participants.

Table 4.14: Summary of interview analysis – line managers

Interview themes	Company 1 Participant 1	Company 2 Participant 2	Company 3 Participant 3	Company 3 Participant 4
Skills lacked by graduates	Not enough practical work on technical configurations.	Practical skills involving peripheral tool use.	Soft skills. Problem solving skills. Technical skills.	Communications skills. Subject knowledge.
Impact	No impact felt.	Extra cost to the company for the length of boarding time required for the graduate to become productive.	A cost to the company to upskill the graduates.	Delays to deliver products to market.
Measures	None.	Consultations every two (2) weeks to check on progress.	Graduates sent on Java certification courses. Internal training and coaching sessions.	Internal training and coaching sessions. Java courses.
Recommendations	Ensure more practical than theory. Include laboratory and real-life situations. Include IT certifications. To move with the times as technology evolves at a rapid pace.	Instilling passion for IT. Soft skills – communications, and professionalism. Practical skills – exposure to code version tool.	Include soft skills.	Exposure to latest technology. Broad IT concepts of design.

In Table 4.14 the interview themes are mapped to the research objectives. The table links the summary of each line manager feedback to the interview themes.

Regarding the first interview theme concerning *Skills lacked by graduates*, which is related to the research objective of determining the key skills lacked by graduates upon employment, the common feedback which was given related to practical skills. This was mentioned by all the participants and was followed by soft skills, problem solving skills and subject knowledge.

The second interview theme concerning *Impact* related to the research objective of identifying the impacts on the workplace upon employment of unprepared graduates. Here two participants across different companies indicated a cost impact on their department/company, while one participant cited a delay in delivering the company's product to market which, in hindsight, had also caused a financial ripple effect to the company. One participant only indicated that no impact had been experienced.

Measures to be taken are the third interview theme that linked to the research objective of identifying the measures to be taken to upskill graduates to enable them to meet the workplace needs. Three of the four participants cited various methods taken to upskill their employed graduate, for example, general training, certifications, consultations and coaching.

The *Recommendations* interview theme linked to the research objective of ascertaining the recommendations that industry would like to make to improve the higher education IT curriculum. All four participants across the companies cited the need to include soft skills as well as more practical/technical work-related exposure to the latest technology tools and concepts. The next subsection presents an analysis of the interviews conducted with the employed graduates.

4.4.2 Employed graduate interview analysis

This section highlights the general impressions in respect of the themes that emerged from the interviews which were conducted with the employed graduates.

Table 4.15: Summary of interview analysis – employed graduates

Interview themes	Participant 5	Participant 6	Participant 7	Participant 8
Skills lacked by graduates	<ul style="list-style-type: none"> • Communications skills. • Practical skills. 	<ul style="list-style-type: none"> • Practical skills. 	<ul style="list-style-type: none"> • Soft skills. 	<ul style="list-style-type: none"> • Exposure to latest technologies. • Communication skills.
Impact	The graduate was unproductive for almost half a year but no negative impact indicated.	No negative impact indicated.	No negative impact indicated.	No negative impact noted.
Measures	<ul style="list-style-type: none"> • Internal training on soft skills for communication purposes. • Practical programming courses. 	<ul style="list-style-type: none"> • Self-study on programming practices. • Line management guidance. 	<ul style="list-style-type: none"> • Self-guidance from internet searches. • YouTube videos. 	<ul style="list-style-type: none"> • Mentoring. • Reading up on practical items. • Completing certifications.
Recommendations	<ul style="list-style-type: none"> • More practical inclined curriculum with less theory. • Include soft skill items such as the communication skills vital to the workspace. 	<ul style="list-style-type: none"> • More practical approach to programming courses. • Include other related programming elements such as web services and technical server knowledge. 	<ul style="list-style-type: none"> • Soft skills to be included in the curriculum. • Business concepts and industry expectations. 	<ul style="list-style-type: none"> • Include more work-related practical examples. • Exposure to the latest technologies. • Teamwork, troubleshooting and enhancing existing work. • Include communication skills.

Table 4.15 summarises the interviews conducted with each participant per interview theme. In relation to the first interview theme of *Skills lacked by graduates*, two participants indicated the lack of practical skills and the remaining participants also noted a lack of communication skills.

Regarding the *Impact* theme, here we see a difference as three participants indicated that no impact had been felt by the department/company while one participant cited an unproductive period of as long as six months.

In respect of the third theme of *Measures*, all the participants indicated some form of upskilling with one participant having attended courses while the others had relied fully self-study and guidance from the line manager. Three of the graduates mentioned measures they had taken for self-development as mentioned by Carbery and Garavan (2005) in the literature.

For the last interview theme on *Recommendations*, similar feedback related to the recommendation to include more practical aspects for programming, exposure to the latest

technologies and problem solving on existing software. Other IT facets noted included the technical aspect of programming needs, more work-related examples, business concepts relevant to a professional working environment as well as the need to incorporate soft skills into the curriculum.

It is clear from Table 4.15 that the participants highlighted a lack of practical skills upon employment. Despite the fact that there was a distinct difference between the apparent impact of these participants on the company/department concerned, there was similar feedback in relation to measures taken to address performance gaps. This included the underlying aspect of learning the practicalities of programming, which is essential to note for enhancing the IT curriculum.

The next subsection presents an analysis of the interview summary relating to the links between the various participant levels. The summary provides each employed graduate linked to his/her line manager.

4.4.3 Linking participants – employed graduate and line manager

This section provides the general impressions from the interviews linking the employed graduates to their line managers.

Table 4.16 presents the interview summary linking the participants per interview theme and linking the first employed graduate (participant 5) to his line manager (participant 4).

Table 4.16: Linked participant interview themes – participants 5 and 4

Interview themes	Participant 5 (employed graduate)	Participant 4 (line manager)
Skills lacked by graduates	<ul style="list-style-type: none"> • Communications skills. • Practical skills. 	<ul style="list-style-type: none"> • Communications skills. • Subject knowledge.
Impact	Lack of a productive environment for almost half a year.	Delays in delivering products to market.
Measures	<ul style="list-style-type: none"> • Internal training on soft skills for communication purposes. • Practical programming courses. 	<ul style="list-style-type: none"> • Internal training and coaching sessions. • Java courses.
Recommendations	<ul style="list-style-type: none"> • More practical curriculum with less theory. • Include soft skill items such as the communication skills vital to the workspace. 	<ul style="list-style-type: none"> • Exposure to latest technology. • Broad IT concepts of design.

It is clear from Table 4.16 that that the participants from different employment levels indicated matching feedback across each theme. Participant 4 was the line manager for participant 5.

Both participants agreed that the main skill lacked by the graduate was communication skills. However, the other skills lacked corresponded in that the participant 4 indicated a lack of subject knowledge while participant 5 indicated a lack of practical skills.

In relation to the impact theme, participant 5 indicated the amount of unproductive time as almost half the year that tied into the feedback from participant 4 who had indicated the impact of delays up to six months to deliver products to the market.

Both participants cited training, coaching and courses as measures that had been taken when performance gaps had been found in relation to participant 5.

Both participants recommended that soft skills, including communication skills, exposure to the latest technology and more practical work be included in the curriculum to better prepare graduates for the workplace and improve the curriculum.

Table 4.17 presents the interview summary linking the participants per interview theme and linking the second employed graduate (participant 6) to his line manager (participant 3).

Table 4.17: Linked participant interview themes – participants 6 and 3

Interview themes	Participant 6 (employed graduate)	Participant 3 (line manager)
Skills	<ul style="list-style-type: none"> Practical skills. 	<ul style="list-style-type: none"> Soft skills. Problem solving skills. Technical skills
Impact	No impact indicated.	A cost to the company to upskill the graduates.
Measures	<ul style="list-style-type: none"> Self-study on programming practices. Line management guidance. 	<ul style="list-style-type: none"> Graduates sent on Java certification courses. Internal training and coaching sessions.
Recommendations	<ul style="list-style-type: none"> More practical approach to programming aspects. Include other related programming aspects such as web services and technical server knowledge. 	<ul style="list-style-type: none"> Include soft skills.

Table 4.17 highlights that for the first interview theme of skills lacked, the employed graduate (participant 6) cited one skill only relating to practical skill that corresponded with the line manager’s (participant 3) mention of technical skills. However, the line manager also noted more items on the skills lacked, including soft skills and problem-solving skills.

The graduate (participant 6) does not acknowledge any negative impacts on the department/company resulting from his unproductivity level although the line manager indicated the cost impact of upskilling participant 6.

The graduate (participant 6) mentioned self-study and line manager guidance as measures taken to address performance gaps whereas the line manager indicated the coaching, training and a course that had been identified to assist participant 6 when performance gaps had been found.

The participants provide different views on items to include in the curriculum to assist graduates in the workplace with the graduate recommending that soft skills be added to the curriculum and the line manager recommending that the curriculum should include more practical approaches to programming modules with an emphasis on the way in which programming relates to operations.

Table 4.18 presents the interview summary linking the interview participants per interview theme and linking the third employed graduate (participant 7) to his line manager (participant 1).

Table 4.18: Linked participant interview themes – participants 7 and 1

Interview themes	Participant 7 (employed graduate)	Participant 1 (line manager)
Skills	<ul style="list-style-type: none"> • Soft skills. 	<ul style="list-style-type: none"> • Not enough practical work on technical configurations.
Impact	No negative impact indicated.	No negative impact felt.
Measures	<ul style="list-style-type: none"> • Self-guidance from internet searchers. • YouTube videos. 	<ul style="list-style-type: none"> • None.
Recommendations	<ul style="list-style-type: none"> • Soft skills to be included in in the curriculum. • Business concepts and industry expectations. 	<ul style="list-style-type: none"> • Include more practical than theory. • Include laboratory and real-life situations. • Include IT certifications. • Move with times as technology evolves so quickly.

Table 4.18 illustrates that for the first interview theme of skills lacked, the employed graduate (participant 7) indicated soft skills as the only skill he had lacked while the line manager (participant 1) mentioned an issue with the practical work on technical configurations.

Both the employed graduate and line manager acknowledged there had been no negative impact on the department/company.

The line manager (participant 1) indicated no measures had been taken for upskilling the employed graduate although the graduate mentioned that he had used YouTube videos and conducted internet searches to further skill himself.

The employed graduate noted a few recommendations for the improvement of the IT curriculum that involved the addition of soft skills, business concepts and industry

expectations. His line manager (participant 1) recommended that more practical work be included with ‘real-life’ examples/situations, as well as the inclusion of IT certifications and keeping up with/providing exposure to the rapid evolving technology would also be advantageous.

Table 4.19 presents the interview summary linking the interview summary per interview theme and linking the fourth employed graduate (participant 8) to her line manager (participant 2).

Table 4.19: Linked participant interview themes – participants 8 and 2

Interview themes	Participant 8 (employed graduate)	Participant 2 (line manager)
Skills	<ul style="list-style-type: none"> • Exposure to latest technologies. • Communication skills. 	<ul style="list-style-type: none"> • Practical skills involving peripheral tool usages.
Impact	<ul style="list-style-type: none"> • No negative impact noted. 	<ul style="list-style-type: none"> • Extra cost to the company for the lengthy on-boarding time it takes for the graduate to become productive.
Measures	<ul style="list-style-type: none"> • Mentoring. • Reading up on practical items. • Completing certifications. 	<ul style="list-style-type: none"> • Consultations every two weeks to check on progress.
Recommendations	<ul style="list-style-type: none"> • Including more work-related practical examples. • Exposure to the latest technologies. • Teamwork, troubleshooting and enhancing of existing work. • Include communication skills. 	<ul style="list-style-type: none"> • Instilling passion. • Soft skills – communications, and professionalism. • Practical skills – code version tool exposure.

Table 4.19 revealed that for the first interview theme of skills lacked, the employed graduate (participant 8) mentioned that the skills she had lacked included exposure to the latest technologies and communication skills. The line manager (participant 2) noted practical experience with peripheral tools as a skill the graduate had lacked.

Regarding the impact theme, the employed graduate expressed the view that there had been no negative impact on the department/company, while her line manager (participant 2) mentioned that the company had borne a financial impact for the length of time it had taken the graduate to become productive.

Both participants’ feedback correlated in relation to the theme of the measures taken with the employed graduate mentioning mentoring as one of the measures which had been taken upskill her while her line manager mentioned consultations every two weeks during the mentoring process. The graduate added that in addition to being mentored, she had also completed certifications and read up on practical items.

Regarding the recommendations theme, the employed graduate suggested that more work-related practical examples should be used together with exposure of the latest trending technologies. She further mentioned that working in teams and enhancing existing work would be beneficial as well as the addition of communication skills. The line manager (participant 2) advised that soft skills covering communication and professional skills be included in the curriculum enhancements as well as practical skills relating to versioning tools usage. He also added that instilling a passion for IT in the students would also be good as that passion could be then over carried over to their employment.

The next section concludes the analysis and findings presented in this chapter.

4.5 Results

This section discusses the link between the research questions, research objectives and how the findings from the various questionnaires and interviews constituted a result to the research study.

Table 4.20 presents the collective result sets. These results collectively answer the main research question relating to the recommendations for the improvement to the IT curriculum that could be extracted from an understanding of new graduates' first year of employment and using the methodological approach indicated in Chapter 3.

The sub-research questions indicated in Chapter 1 assisted in breaking down the main research question into smaller, workable packages to tie in closely with answering the main research.

The first research sub-question referred to the key skills lacked by IT graduates upon employment. There was general feedback on this from the participants across the various questionnaires and interviews with the overall results showing that soft skills were common across all result sets followed by the practical/technical skills, including problem-solving skills, that the graduates lacked.

The second research sub-question involved understanding the impacts felt within the workplace of unproductive graduates. The predominant outcome was the financial impact felt by the company although, on the other hand, the graduate level participants maintained that there had been no impacts on the workplace.

Performance gaps and the measures taken to reduce these gaps in skills of the employed graduates were the subject of the next research sub-question. All the participants, no matter the information gathering tool used, mentioned the upskilling of the graduates. All the graduates also took initiative towards their own upskilling. This could be due to the MLM mode of study that encourages self-study. In addition, consultations, training sessions and courses were provided to upskill the employed graduates.

Finally, the last research sub-question related to recommendations for curriculum enhancements from all the participants with the aim of creating better prepared graduates for the workplace. The feedback indicated that more practical items than theory items should be included in the curriculum as well as soft skills training and exposure to more industry aligned trends and tools.

Table 4.20: Collective results – interviews and questionnaires

Research sub-question 1	What keys skills do South African IT graduates lack upon employment?				
Link to research objectives	Link to literature theme	Overall interview results	Overall questionnaire results – line managers	Overall questionnaire results – employed graduates	Overall questionnaire results – recruitment personnel
Determining key skills which graduates lacked upon employment.	Skill sets.	Practical skills. Soft skills. Problem solving skills. Subject knowledge issues.	Problem-solving skills. Soft and technical skills.	Discipline. IT hardware skills. Soft skills.	Soft skills.
Research sub-question 2	What is the impact of graduates not being fully prepared to enter the workplace productively?				
Link to research objectives	Link to literature theme	Overall interview results	Overall questionnaire results – line managers	Overall questionnaire results – employed graduates	Overall questionnaire results – recruitment personnel
Identifying the impacts on the workplace of the employment of inadequately prepared graduates.	Employability.	Cost/ financial impacts.	Majority indicated financial impact to an extent.	No impacts identified.	No direct impact at the recruitment end.

Research sub-question 3	What measures does industry take when performance gaps are identified among employed IT graduates?				
Link to research objectives	Link to literature theme	Overall interview results	Overall questionnaire results – line managers	Overall questionnaire results – employed graduates	Overall questionnaire results – recruitment personnel
Determining measures taken to upskill employed graduates to enable them to meet the workplace needs.	Employability.	Certifications and training in specialised IT fields.	Coaching, training, courses and consultations implemented.	Software development courses done. Discussions on key performance areas were conducted. Graduates took measures by upskilling themselves.	Advises to place graduates on upskilling on items that are needed.
Research sub-question 4	What would industry recommend to improve the higher education IT curriculum so that graduates are fully prepared to enter the workplace productively?				
Link to research objectives	Link to literature theme	Overall interview results	Overall questionnaire results – line managers	Overall questionnaire results – employed graduates	Overall questionnaire results – recruitment personnel
Ascertaining recommendations that industry would like to make to improve the higher education IT curriculum.	Curriculum design.	Include soft skills, more practical/technical work, exposure to the latest technology tools and concepts.	More practical work related to examples from the workplace environments. More alignment to industry trends and tools used.	More practical work with real work practices, less theory and more exposure to industry experiences.	More detailed teaching on of how industry works including more exposure to industry related experience. More practical application of theory aspects covered. Soft skills, including professional behaviour.

The results in Table 4.20 clearly indicate the general impression regarding new graduate employment, including skills lack, impacts felt, and further measures taken to improve knowledge. These items feed directly into the following recommendations in respect of curriculum improvement so that better prepared graduates for the workplace are produced:

1. To include skill sets such as soft skills, for example, professionalism, communication skills and problem-solving skills, and more industry aligned, real-world practices.
2. More practical/technical work related to industry environment and less theory.

3. Inclusion of certifications and more training in specialised IT fields.
4. Exposure to the latest technology tools and concepts.
5. More exposure to industry experience.

These findings from the questionnaires and interviews relate directly to the globally aligned views from the international bodies of the ACM and the IEEE. Their objective is to ensure the development of skills and to nurture specific obligations in relation to ongoing educational trends from a global and general public standpoint (IEEE, 2018).

As indicated in Chapter 2 these bodies (ACM and IEEE) have summarised points to assist in curriculum design to better address graduate employability. When comparing the findings of this study to those of the CC2020 project from ACM and IEEE, it may be clearly seen that the study's findings relate directly to the three types of competencies noted in the CC2020 project, namely, knowledge, skills and dispositions. The skills competency refers to a need to incorporate more 'hands-on' practice that ties into the findings of more practical/technical work-related activities needed. The knowledge competency relates to the need to ensure core concepts of the discipline are covered with exposure to the latest industry aligned tools and concepts. Finally, the disposition competency from the CC2020 project entails attitudes and behaviour that are directly connected to this study's findings of the soft skills needs for graduates.

The recommendations of this study, together with the global aspects outlined in Chapter 2, would assist in the MLM curriculum enhancements and also assist in producing industry prepared graduates from both a local and global standpoint.

4.6 Conclusion

This chapter contained an in-depth data analysis and the results from all the information from the questionnaires and interviews. It presented a summary per questionnaire type and the analysis thereof as well as a summary of all the interviews held with the employed graduates and their respective line managers. The next chapter discusses contributions of the study and concludes the research study.

CHAPTER 5

Conclusions and contributions

5.1 Introduction

The purpose of this research study was to investigate, determine and confirm recommendations from industry in relation to improving the higher education IT curriculum. This involved investigating first time graduate employment experiences and the impacts thereof on industry. A case study was used to achieve the desired outcomes.

This chapter provides a brief synopsis of key conclusions and answers to the research questions posed in the study that should assist the higher education IT curriculum design component in South Africa in general and, in particular, the private higher education institution which was the focus of this study. It provides industry recommendations that could be incorporated into the curriculum to assist new graduates to be better prepared for the workplace. The chapter also includes the contributions made by the study as well as recommendations for future studies.

Section 5.2 contains a summary of the research process, followed by the findings to the research questions in Section 5.3. Section 5.4 discusses the study's key contributions while Section 5.5 highlights the recommendations of the study. Section 5.6 discusses the limitations of the study, Section 5.7 outlines future research possibilities, Section 5.8 presents a conclusion to the study and, finally, Section 5.9 reveals the researcher's reflections/lessons learnt.

The next section presents a summary of the dissertation.

5.2 Summary of the research process

As outlined in Chapter 1, Figure 1.1 this study investigated the IT curriculum completed by undergraduates at a specific private higher education institution and how those new graduates fared in their first year of employment. The starting point for the study entailed a review of relevant literature. The literature review focused on similar issues and elements with the emphasis on the three themes identified as outlined in Chapter 2. These themes included curriculum design, employability and skill set issues that linked to the study.

The research strategy involved a descriptive case study with a qualitative approach as this study was underpinned by the interpretivism paradigm. The data collection method involved both questionnaires and interviews.

Three different questionnaires were designed for the three categories of participants, namely, the employed graduates, the graduates' line manager and recruitment personnel. In order to ensure that the intended data to be collected would be appropriate to the aim of the study, pre-testing in the form of a pilot study was conducted.

The participants were fairly enthusiastic about taking part in the study as they understood the impacts and benefits of the study. The questionnaire feedback per participant was used to generate the semi-structured interview questions. The semi-structured, face-to-face interviews were conducted to further probe the feedback obtained from the completed questionnaires and to explore the experiences relating to the employment of new graduates.

A summary of the results of each questionnaire per participant type was presented in Chapter 4 in Tables 4.2, 4.4 and 4.5 while sections 4.2.3, 4.2.5 and 4.2.7 contained the analyses per questionnaire. The interview themes, as related to the research objective and interview feedback, were presented in Tables 4.6 to 4.13. While the analysis of the combined feedback from the interviews with the line manager participants is depicted in Table 4.14 and the analysis of the combined feedback from the interviews with the employed graduates is in Table 4.15. The collective results of the study per research sub-question and linked to each research objective and the themes which emerged from the literature review shown in Table 4.20 that also presents the outcomes per data collection tool.

The overall outcomes of the results from the questionnaires administered to and the interviews conducted with the selected participants are outlined in Section 4.5. The next section discusses the findings to the research questions.

5.3 Findings to research questions

The main research question aimed to obtain recommendations for the improvement of the IT curriculum in South Africa and centred on new graduates' employment. Research sub-questions were formulated to facilitate a better understanding of aspects relating to graduate employment.

The following answers are presented for each of the research questions listed in subsection 1.2.2.

Main research question:

What recommendations for improvements to the IT curriculum in South Africa could be extracted from an understanding of new graduates' first year of employment?

The findings show:

- Strengthening certain skill sets within the curriculum is required to better assist new graduates in the workplace. These skill sets encompass soft skills entailing communication and professional skills, as well as practical/technical skills.
- Include more exposure to industry related practices so that graduates would be more proficient upon employment.
- More exposure required of the latest tools used in industry.
- Including specialised training certificates in specific software/hardware areas would increase the employability of new graduates.

Sub-questions:

1. What keys skills do South African IT graduates lack upon employment?

Key skills lacked by graduates upon employment include the following:

- The soft skills they lacked included communication and professional skills. It is difficult for employed graduates to express themselves when faced with problems. In addition, communicating with different levels of management has proved to be difficult for new graduates while the ability to maintaining professionalism within the work environment also appeared to be lacking.
- A lack of practical/technical skills in IT areas of software and hardware.
- The ability to problem solve is another key skill lacking.
- Graduates demonstrated a lack of core subject knowledge.

2. What is the impact of graduates not being fully prepared to enter the workplace productively?
 - The impact was found to be financial/cost impact on the department/company.
3. What measures does industry take when performance gaps are identified among employed IT graduates?

The measures taken may be summarised as:

- Providing mentorship/coaching by the line managers.
 - Training in specialised IT areas with certifications.
 - Performance management of the employed graduate on a weekly basis.
4. What would industry recommend to improve the higher education IT curriculum so that graduates are fully prepared to enter the workplace productively?

The recommendations included:

- More focus on soft skills.
- Extensive work-related practicals/technical aspects.
- Exposure to the latest tools and concepts used in industry.
- Greater alignment to more industry trends.

The next section describes the key contributions of the study.

5.4 Key contributions

This section highlights the key contributions made by the study. The results of the study may inform the undergraduate higher certificate level of the information systems curriculum based on the case study using a specific private higher education institution in South Africa. The results may also assist in informing any IT education sector within the higher education space in South Africa. With reference to Table 1.4 on the research contributions and themes in terms of wanting to produce better prepared graduates for employment, this study uncovered key skills lacked by graduates for employment purposes. It also uncovered the impacts on industry when employing unprepared graduates, the time taken for graduates to become productive as well as measures put into place to further assist the graduates to become more productive. Industry recommendations were collected on possible curriculum enhancements to better assist graduates for the workplace.

For each expected contribution listed in Table 1.4, the following suggestions may be made as the results were cross referenced against the various participants and the two data collection tools used as illustrated in Table 5.1.

Table 5.1: Key contributions

Research questions	Theme	Expected contribution	Findings
What keys skills do South African IT graduates lack upon employment?	Skill set	A better understanding of the key skills lacked by IT graduates who have not been fully prepared for employment.	Contributing factors to be addressed in the IT curriculum include: <ul style="list-style-type: none"> • practical skills • soft skills: <ul style="list-style-type: none"> ○ professional skills ○ communication skills
What is the impact of graduates not being fully prepared to enter the workplace productively?	Skill set	An understanding of the impacts experienced by IT companies when underprepared graduates are employed.	A financial impact on the workplace.
What measures does industry take when performance gaps are identified among employed IT graduates?	Skill set	A greater understanding of the actions taken by IT companies to ensure employed graduates attain productive levels.	Measures taken: <ul style="list-style-type: none"> • training • certifications • courses • coaching
What is the impact of graduates not being fully prepared to enter the workplace productively?	Employability	A perception of the time taken for the employed graduates to become productive.	Time taken to become productive: <ul style="list-style-type: none"> • 1 week • 16 weeks • 26 weeks • 36 weeks
	Employability	An understanding of whether or not a graduate's pass level contributes to a faster pace to productive levels.	Findings showed: <ul style="list-style-type: none"> • One participant indicated that the results attained by the graduates shortened the time required to become productive. • Remaining participants indicated the results attained by the graduates did not impact on productively levels.
What keys skills do South African IT graduates lack upon employment?	Curriculum design	A richer knowledge of qualities that IT recruitment personnel seek when trying to source a possible graduate for employment.	Findings showed <ul style="list-style-type: none"> • communication skills • technical skills
What would industry recommend to improve the higher education IT curriculum so that graduates are fully prepared to enter the workplace productively?	Curriculum design	A clearer view of the recommendations made to improve the higher education IT curriculum in South African institutions so that more product graduates may be produced.	Contributory aspects entailed in strengthening the skills set involved: <ul style="list-style-type: none"> • soft skills • industry aligned practical/technical skills • more exposure to industry related practices • the latest trending tools used

Table 5.1 explains the key contributions of the study as follows:

1. A better understanding of the key skills lacked by IT graduates who have not been fully prepared for employment:
 - The majority of the participants indicated that the factors that should be addressed in the IT curriculum included both practical and soft skills. It was also highlighted that the soft skills of professional and communication skills require further refinement to assist employed graduates to communicate more effectively.
2. An understanding of the impacts on companies when underprepared graduates are employed:
 - A financial impact was the common trend seen which emerged from the study's results. The participants mentioned that if the curriculum were mapped to industry requirements, then industry would not experience the apparent financial implications of underprepared graduates in the workplace experienced at the time of the study.
3. A greater understanding of the actions taken by companies to enable employed graduates to attain productive levels:
 - It is recommended that specialised training, certifications, courses and coaching are used to upskill graduates are included the graduates' study life cycle as this would enable graduates to be productive upon employment. Graduates took the initiative to upskill themselves when they found gaps with their performance. This could be due to the nature of the MLM study mode which enforces self-study of topics prior to lecturer engagements. As such, this mode of study can also be recommended as a way to develop some of the soft skills graduates need.
4. A perception of the time taken for the employed graduate to become productive:
 - There was a significant variance in the length of time in weeks required for graduate to become productive upon employment. This ranged from one week, 16 weeks, 26 weeks to 36 weeks.
5. An understanding of whether the graduate's pass level contributes to a faster pace to productive levels or not:
 - Only one of the participants indicated that the results attained by graduates did affect the time required to become productive while the rest of the participants

maintained that the results attained by graduates did not impact on productivity levels.

6. A richer knowledge of the qualities on which recruitment personnel focus when trying to source a possible graduate for employment:
 - The participants indicated that communication and technical skills are required for graduate employment.
7. A clearer view of the recommendations made for South African higher education IT curriculum enhancement so that better geared graduates may be produced:
 - Recommendations included strengthening the skills set involving soft skills and industry aligned practical/technical skills. This included greater exposure to industry related practices and the latest trending tools used.

As a final contribution the next section outlines recommendations for improving the IT curriculum in South Africa, as based on the results from the study combined with the recommendations which emerged from literature review.

5.5 Recommendations

This section presents recommendations based on the study's findings to the higher education IT sector within South Africa, particularly to the private higher education institution that was the focus of this study. The recommendations from industry are combined with the recommendations that emerged from the literature review. Based on feedback from South African industry and recommendations in literature, the following aspects should to be included in the IT curriculum to produce better prepared graduates for the workplace:

1. Strengthen the skill set of graduates by including more:
 - Soft skills
 - Communication skills for the professional environment.
 - Understanding of business practices.
 - To consider changes to the Personal Skills Development module to incorporate the soft skills highlighted.

- Hard skills
 - Entailing industry-related practical work through collaboration with industry.
- Critical thinking skills to develop problem solving skills linked to industry matters.
- Trending technology exposure. This may be achieved through liaison links between industry and academia to ensure industry aligned technology use.
- Include the CC2020 project objectives for IT competencies that include:
 - Social skills relating to attitude, behaviour and emotional capabilities to enable graduates to be more successful in the workplace.
 - To consider changes to the Main Programming Language modules to ensure industry-related practical examples are used for projects and exercises.
 - Create industry liaison to strengthen the technologies and tools offered in the Main Programming Language modules.

2. Amend curriculum design by:

- Covering more industry-related trends, with the assistance of industry liaison.
- Including more industry-relevant practical work.
- Affording greater exposure to industry-linked environments.
- Focusing on CC2020 project outcomes for ‘hands-on’ activities and practices.
 - Add in a WIL component or module to the qualification to facilitate with better work-related experiences.

3. Cover employability aspects such as:

- IT related certifications in specialised areas. This includes alignment with/additions of international certifications.
- Strengthen core discipline concepts, as highlighted in the CC2020 global project.
 - Ensure module content alignment to the Main Programming Language module (Java) and CompTIA related modules (A+ preparation and N+ preparation) for certification preparation and ensure the certifications are done once these modules have been completed.

The next section explains the limitations of the study.

5.6 Limitations

The study was limited to one case study that was conducted at a specific private higher education institution. The study included only South African graduates from the MLM mode of study in the IT department with the undergraduate studies being restricted to a higher certificate level.

The next section presents future research possibilities.

5.7 Future research possibilities

Due to the limited scope of this study, as addressed in the previous section, the following may be explored in future studies:

1. A case study on the first year employment performance of IT undergraduates from a public higher education institution.
2. Investigating the performance gaps of degree level IT graduates during their first year of employment.
3. Comparing the performance gaps between employed IT graduates from public education institutions with those of IT graduates from private institutions.

The conclusion to this study is presented in the next section.

5.8 Conclusion

In conclusion, this case study investigated industry's recommendations to improve the undergraduate IT curriculum of a private higher education institution in South Africa to ensure that new graduates are better prepared for their first year of employment than appeared to be the case at the time of the study. The data collected reflected noteworthy trends that offer valuable preliminary points for more informative studies on the topic of curriculum enhancements in higher education in relation to the IT sector. The findings showed the financial impact on industry of unprepared graduates and that with better preparation, new graduates could be more productive within their first year of employment. Vital skills that the graduates lacked entail various components of both soft and industry-related practical skills. As discussed in the study recommendations discussed in Section 5.5 enhancing the IT curriculum would

equip new graduates with industry required aspects that would assist in creating better prepared graduates for industry.

The next section contains the researcher's reflections on the study.

5.9 Reflections – lessons learnt

As a novice in the world of research some important lessons were learnt, ranging from the simple aspect of underestimating response time to participant availability.

Underestimating participants' response time may derail most of a researcher's plans as it has a knock-on effect to the remaining planned items. An important lesson learnt by the researcher was to allocate more time to a pilot study when more than one participant is used, especially if participants across management levels are used. This would allow sufficient time for feedback, interpretations and suggestions. The estimated time frame allocated to the pilot study proved to be insufficient although the extra time required was used due to the essential role that the pilot study played in developing the questionnaires which was pivotal to the entire study.

Another lesson learnt is relation to the academic writing required for research related to the different tenses required in different chapters.

The availability aspect of participants for document completion or for a face-to-face sit down proved to be more difficult than had been anticipated. The primary work and travel schedules of participants often change and, hence, delays were experienced in gathering some of the data required.

Finally, a rewarding factor: It was gratifying to hear positive feedback from industry on the success of the MLM mode of study delivery style. This delivery style allows graduates to acquire skills that are not taught, for example, time management, project management and the need to further build on new ideas/concepts. The Personal Skills Development module also encourages self-development on the part of graduates. Overall, these were banked as good lessons learnt by the researcher, thus making her one step wiser in the world of research.

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Appendices

Appendix A – Module descriptions

Module: Computer Literacy

Module description

Knowing how to use a computer has become a necessity for many people. In order for the student to know how to use a computer, students need to understand some fundamental concepts for example; what contributes to making the computer run and operate correctly. This module introduces the computer and how it functions to students. Students will gain a thorough understanding of information and communication. Students will understand the fundamental principles of the internet and email concepts. Word processing involves creating and editing text documents. The student will be introduced to the concepts of word processing and will understand and use a spreadsheet to organise data and present information. Students will understand the concepts of databases and students will discover many ways in which they can, for example, sort data and represent it in a report. Students will be introduced to the concepts of presentations and understand and learn how to create a new presentation, and how to add images, charts and objects to a presentation. Students will also learn how to apply animation and transition effects to make a presentation come to life.

Module: Personal Skills Development

Module description

Personal skills development implies the professional and personal growth in knowledge and skills. Personal skills development embraces a whole range of practical and transferable skills that can be applied within higher education and the workplace. The aim of this module is to allow students to discover their own personal skills and to develop them so that they can be used throughout various tasks or phases in their lives. Students will identify inherent transferable skills and will be able to apply these in different scenarios. Students will be able to improve their own learning, be involved with team work and be more capable of solving problems through the use of case studies, role-play and real-life activities. This module can be taught traditionally or integrated in other modules on the programme. The rationale behind this module is to enable students to have exposure to softer skills that are critical in the workplace and higher education. This module attempts to encapsulate a range of key and common skills and deliver this information in a dynamic learning environment. The concept of group work, or teamwork, will be discussed. Students will become familiar with group dynamics and formal, as well as informal, roles that the individual plays within a group. Problem solving is another topic that will be explored in this module. The steps involved in solving a problem and the resultant decision-making processes will be evaluated and implemented in an assignment. Lastly, students will review their own learning experience and monitor their growth over a period of time. Students are encouraged to research relevant topics to gain a better understanding of this field. Students will have to incorporate their knowledge into a theory-based examination. The theory will be written at the end of the module. This will test the student on the content of the module. Students may be asked to draw diagrams according to a given scenario.

Module: Processing and Logic Concepts

Module description

This module lays the foundation for an understanding of the logic concepts on which computer programming is based. The module concentrates on six key areas in particular, namely, number systems, logic concepts, decision Tables, system flowcharts, program flowcharts and pseudocode. The first section will introduce students to different number systems; they will apply their knowledge to convert from one number system to another and perform basic addition and subtraction using numbers from different number systems. They will gain an overview of how the computer performs arithmetic operations, and when to use the one's and two's complements. Logic concepts will give students an understanding of logic symbols and ways that these logic symbols can be incorporated into electronic circuits in the form of logic gates, which can be further represented in the form of truth Tables. The module also includes Boolean equations and the ability to draw logic diagrams from these equations. De Morgan's theorem and Karnaugh maps are used for proving and simplifying Boolean expressions. Using these logic concepts students will learn how to construct decision tables, and will be introduced to the concept and functions of system flowcharts. The final section of the module focuses on the ability to write and understand the logic of pseudocode as a means of outlining and converting a programming problem into an easily readable solution that can be applied to any high-level programming language.

Module: Program Design

Module description

The aim of this module is to provide students with an understanding of the concepts of a computer program and how to write and analyse the structure of simple sequential programs in pseudocode. Program control statements are identified, explained and implemented in constructing simple programs with the help of one-, two-, and three-dimensional arrays. Simple sort algorithms using arrays are also taught and depicted in pseudocode. The concepts of file handling, or the opening and closing of files and how they are coded in pseudocode specifically,

are also explained. The student is given practice in writing pseudocode with the help of exercises before undertaking similar questions in a test environment.

Module: Hardware Essentials

Module description

The aim of this module is to provide the student with a basic knowledge of the different hardware and software components that make up a computer system and the procedures that are followed to maintain and upgrade those components. The student will gain an in-depth understanding of the functions and characteristics of the different computer components. Common computer hardware problems and how to go about solving those problems will also be explained. This module will also briefly cover the basics of networking. Students who have completed this module will be able to describe and identify the internal components of a computer system, disassemble and reassemble a computer system, install and use an operating system, troubleshoot a system using common system tools and diagnostic software, and perform common maintenance procedures to prolong the lifespan of a computer system. Hands-on practical exercises will test the student's ability to operate, maintain and upgrade a computer system and will also help him or her to develop computer-related problem-solving skills.

Module: Software Engineering

Module description

The aim of this module is firstly to introduce students to business process modelling, the role of the systems analyst, and the different stages in the systems development life-cycle. This includes a discussion of the different charts, diagrams (Gantt charts, context diagrams), and tools described in the Unified Modelling Language (UML) that can be used in the analysis and design of a system. UML makes use of the following tools to design the system: classes, objects and class diagrams; sequence and communication diagrams, which show the interactions between objects; state diagrams, which show the operations or behaviours of a single object; activity diagrams, which model the activities of all objects in the system for a specific purpose; component diagram, which models various software-designs. The students are then given a practical introduction to UML for use as a tool in the systems development process. More specifically, students will familiarise themselves with use cases and scenarios, identify different actors that play a role in a system, and learn to draw and use case diagrams. The module also explores the use of state, sequence, collaboration, activity and deployment diagrams. At the end of the module students will have to incorporate all taught concepts into the given projects. This project will also require user documentation. The user documentation will consist of an explanation for the use case diagram, activity diagram, class diagram, communication diagram, and state diagram. Students will also have to incorporate their knowledge into a written theory-based exam.

Module: Database Design Concepts

Module description

Database systems are at the core of any business organisation. The demand for more complex data structures is ever increasing as applications become ever more sophisticated. The use of databases is therefore fundamental to the development of any significant information system. The aim of this module is to provide students with an essential basic knowledge of database systems which will enable them to design and implement effective relational database solutions. These skills will allow students to become efficient database developers or administrators using good practices and techniques. This module focuses on systems analysis, entity relationship diagrams, data normalisation and mapping a database's design to Tables.

Module: Database Management

Module description

The aim of this module is to introduce students to the concepts of databases as well as a practical approach to developing databases. The module starts off with the fundamentals of database design by explaining the RDM (relational database model). From there on, the concepts of creating a database are covered as well as populating and implementing functions of a database. The concepts of creating a database are: creating a database, altering a database, and creating Tables. These tables are created with certain constraints such as primary keys and foreign keys. The module then looks at how to insert data into the Tables that were created. Detailed explanations and exercises are given to demonstrate how to query information (i.e. retrieve information) from a database. Certain data is selected from a Table as well as inserting selected data in another Table. The module also explains how to update and delete information in a table. There are a few extras including indices, joins, views, stored procedures, triggers, and database security, which are all used to either retrieve or update data in a database. These are all explained to give the database and functions an edge. At the end of the module, students will have to incorporate the concepts taught into a project. This project will also require user documentation. The user documentation will consist of author details, installation details, design details and any extra information which may be relevant to the project. Students will also have to incorporate their knowledge into a theoretical and practical exam. The theory will be written at the end of the module and the practical will be done after the theory exam. The practical exam tests the student's ability to create a database and apply functions to the database.

Module: First Programming Language

(Elective) Java Programming

The basic module introduces students to the basic concepts of Java. This covers basic data structures that Java uses and the fundamental concepts of object-oriented programming. Moving onto the Graphical User Interface in Java, the module looks at how Swing components in Swing containers using custom layout managers can be used to create Graphical User Interfaces. The ability to attach events to components enables functionality to be added using the Event Delegation Model and AWT Components as well as writing an application in a threaded environment. This section also looks at how to write a basic applet/application that makes use of images and animation, and the HTML code necessary to run an applet in a browser. Building on the basics features such as exceptions and how to handle them, the Collections framework and Collections hierarchy, how to use Sets, Maps, and Lists, regular expressions and what they are used for as well as how to use the various Pattern and Matcher classes. Students will also look at Java packages and classes including how access modifiers work, how they influence programs, and how to use packages to organise programs. The final part of the section looks at Java Beans and what they are used for, and which development tools are used to create Java Beans. The advanced module builds on the basic module. Students are introduced to Java Enterprise Edition technologies for web development. Students also learn how to create applications for use on Android mobile devices. Students will combine a wide variety of web-related technologies to develop dynamic web-based applications. Students will learn all the basic techniques and elements used in JavaServer Pages (JSP) and will also learn how to write their own JSP custom tags, and how to retrieve records from databases and display them in JSPs. Taking students through how to create Web Services. XML parsing and JSON are compared leading to Java API options for SOAP web service delivery and the implementation of RESTful architecture. The final element of the module will focus on building applications for use on Android devices, using the Android Studio.

(Elective) C# Programming

The basic module starts off gradually by explaining the easier C# programming concepts first. This lays a base for students to work from. From there on, the more intermediate, and difficult concepts are explained. Examples of all the concepts are provided and these incorporate the concepts discussed in a particular section. These concepts covered in the easier sections are: C# compiler, object-oriented programming, data types, expressions, and program control statements. Later on, classes, modifiers, constructors, destructors, encapsulation, and exceptions are also discussed in detail. The most advanced concepts entail: delegates, events, Windows forms, controls, and the Collections framework. These are dealt with under the Graphical User Interface section. Students will have to incorporate all taught concepts into the given projects. This project will also require user documentation. The user documentation will consist of author details, installation details, design details, and any extra information which may be relevant to the project. The advanced module introduces the use of ASP.NET to create web pages, explains distributed computing, and how to create Windows and Web Services. Advanced Windows applications include user controls, deploying applications, maintaining and supporting applications, attributes, reflection, file input and output, and ADO.NET. ASP.NET includes basic HTML, Web Form programming, validation controls, data binding, and accessing database information. Distributed computing consists of XML Data and .NET remoting.

Module: Second Programming Language

(Elective) Mobile Development

The aim of this module is to provide students with an understanding of the concepts of mobile development. Students will be introduced to Java Micro Edition platform designed for embedded systems on mobile devices. Students will gain an understanding of Graphical MIDlets and Animation. Students will also learn how to develop Android applications covering the use of Android SDK which provides an extensive set of application programming interface (APIs).

(Elective) C# Programming (Basic)

The basic module starts off gradually by explaining the easier C# programming concepts first. This lays a base for students to work from. From there on, the more intermediate, and difficult concepts are explained. Examples of all the concepts are provided and incorporate the concepts discussed in a particular section. These concepts covered in the easier sections are: The C# compiler, object-oriented programming, data types, expressions, and program control statements. Later on, classes, modifiers, constructors, destructors, encapsulation, and exceptions are also discussed in detail. The most advanced concepts entail: delegates, events, Windows forms, controls, and the Collections framework. These are dealt with under the Graphical User Interface section. Students will have to incorporate all taught concepts into the given projects. This project will also require user documentation. The user documentation will consist of author details, installation details, design details, and any extra information which may be relevant to the project.

(Elective) Java Programming (Basic)

The basic module introduces students to the basic concepts of Java. This covers basic data structures that Java uses and the fundamental concepts of object-oriented programming. Moving onto the Graphical User Interface in Java, the module looks at how Swing components in Swing containers using custom layout managers can be

used to create Graphical User Interfaces. The ability to attach events to components enables functionality to be added using the Event Delegation Model and AWT Components as well as writing an application in a threaded environment. This section also looks at how to write a basic applet/application that makes use of images and animation, and the HTML code necessary to run an applet in a browser.

Module: Network+ Preparation

Module description

This module is a comprehensive introduction to the basics of computer networking and telecommunication principles. It covers networking sector skills and knowledge that a network technician would need to successfully complete their work. This module focuses on network terminology, protocols, standards, services, types, models, media, testing tools and programs, infrastructure and network communication devices. In particular, students will be taught how to attach a computer to a network system, connect network cabling, devise an addressing scheme, set up, manage and secure a simple physical network, understand today's network requirements and plan and recommend improvements to a network infrastructure. Basic troubleshooting techniques and the ability to troubleshoot simple networking hardware communication problems will prepare the student for current and future network-related problem-solving scenarios.

Students will understand and apply commonly used networking technologies in a variety of contexts and appreciate what takes place in the daily operation and management of today's networks. This module provides enough knowledge for students to make appropriate judgements when planning and designing a new network. It involves hands-on, lab-oriented activities that stress laboratory safety and working effectively in a lecturer-led environment. The Network+ Preparation module is intended for anyone who is looking for a technical career in the Information Technology (IT) industry.

Module: Security+ Preparation

Module description

This module explores the diverse subject of security, looking at general security principles and terms, common security issues and the procedures for correcting them, as well as how attacks against systems and networks are carried out, their symptoms and their impact on individuals and organisations, as well as the counter-measures that can be implemented to mitigate them. Wired, wireless and virtualised communication and network infrastructure security, cloud computing security, organisational and operational security, cryptography techniques and physical and environmental controls along with how an organisation would manage and improve their security will also be explored. Successful completion of this module will ensure that students understand what is needed to secure today's computers and networks and will be able to use their knowledge and skills gained to configure tools and apply security measures to ensure the security of the systems they will be using and networks they will be managing.

Module: A+ Preparation

Module description

The aim of this module is to teach students the fundamental principles of supporting operating systems, troubleshooting common computer and printer hardware and software problems and basic networks. This module builds on the first A+ 901 module, with special focus on installing, configuring and managing operating systems, applications and client virtualisation software, diagnosing and resolving software, computer hardware, printer and network problems, securing computers and networks, and supporting mobile devices. This module is intended for students wishing to pursue a technical career in the Information Technology (IT) field as an entry-level computer technician or in another related Information Technology support role.

Module: Windows Server

Module description

The aim of this module is to prepare the student for the server administrator role. The administrator is responsible for the operations and day-to-day management of an infrastructure of Windows servers for an enterprise organisation and the network itself. Fast changes in network and server technology and its importance have led to a high demand for skilled server administrators who can manage and maintain network environments of different size and complexity. In bigger organisations this may be the role of the Information Technology (IT) services department but in smaller and medium-sized organisations, this role may be taken by a single server administrator with a wider set of responsibilities. These responsibilities would include the planning for installation, deployment, monitoring and maintaining the server environment to ensure continuity and high availability for the network. Server administrators conduct management tasks both remotely and locally by using administration tools. A server administrator's primary tasks include: managing the Windows Server operating system, file, application, print and directory services; distributing software and updates; profiling and monitoring assigned servers and securing and troubleshooting infrastructure and services. This hands-on module is designed for individuals with computer hardware and networking experience who wish to further their skills in the installation, configuration and administration of computer networks and the Windows Server operating system. It is particularly beneficial to those students who wish to pursue a career in IT positions such as Systems Administrator and Network Administrator.

Module: Domain Servers

Module description

This module prepares the student for the server administrator role in a Domain environment. The administrator is responsible for the operations and day-to-day management of the domain infrastructure for an enterprise organisation. The server administrator uses scripts and batch files written by others, or those that they occasionally write themselves, to accomplish tasks on a regular basis. The server administrator's primary tasks in a domain environment include: managing the network, distributing software and updates, profiling and monitoring the domain servers and communications, and troubleshooting common domain environment-related problems that may arise. This module specifically focuses on configuring domain environment and preparing server roles, maintaining objects in the domain. On completion of this module, the student will have an understanding of the necessary theoretical and practical skills needed to manage Domain Servers. This module is important and relevant, as it teaches the students to work in complex computing environments implemented in medium to large-sized organisations.

Module: Application Services

Module description

This module prepares the student for the server administrator role. The administrator is a member of the domain's Administrator group responsible for the operations and day-to-day management of an infrastructure of application servers for an organisation. Server administrators manage the infrastructure, Web and application servers. They conduct most server management tasks remotely by using Terminal Server or administration tools installed on their local server. A server administrator's primary tasks include: managing the server operating system; distributing software and updates; profiling and monitoring assigned servers and network computers; and troubleshooting application-related problems. On completion of this module, the student will know how to configure various application server roles and will be able to manage the application and Web infrastructure. This module is important and relevant, as it teaches the students to work in complex computing environments implemented in medium to large-sized organisations.

Module: Exchange Server

Module description

The aim of this module is to provide students with the knowledge and skills that are needed to manage and support a reliable, secure messaging infrastructure. Fast changes in messaging technology and its importance in running a successful business have led to a high demand for skilled messaging administrators who can maintain mail systems of different sizes and complexity. In bigger organisations this may be the role of a messaging services department but in smaller and medium-sized organisations, this role may be taken by a single messaging administrator with a wider set of responsibilities. Students will examine how email systems work to deliver email across networks and the Internet as well as how Exchange Server, a messaging program, works with Windows Active Directory, a directory service and to provide for email delivery within an organisation. Students will discover throughout this module that the most important area of a messaging environment is the management of recipients, mailboxes and databases. They will learn how to install, configure, maintain and troubleshoot Exchange Server in a variety of different environments and scenarios. More specifically, students will learn how to configure email clients, user settings, mailboxes, public folders, email protocols, address lists and the Active Directory service. In addition to this, how to backup, restore, monitor, secure and cluster messaging servers will be explored. This module offers a significant number of hands-on practical exercises that assist students in becoming proficient in the skills that are needed to update and support Exchange Server and the messaging environment.

Module: Introduction to IT Virtualisation

Module description

As technology has evolved, the need to create virtual systems to simulate a server for example has become common practice. The abilities of virtualisation allow many commercial environments to use virtualisation to run seemingly live arrays of servers to ensure redundancy, reliability, security and a lower cost of hardware ownership. It has become possible with the development of server virtualisation environments to have one hardware platform to behave as a series of servers or remote workstations. Creating a virtualisation environment will require an understanding of the host system and its limitations as well as the requirements of the guest operating system. This module will encourage the student to explore how this may be accomplished and implement a viable system for commercial or personal use.

Module: Wireless Networks and Security

Module description

The application of wireless technologies in IT (Information Technology) networks is increasing and incorporates wireless devices, wireless LAN (Local Area Network) technologies and wireless security. The aim of this module is to provide students with the knowledge and skills that are needed to manage and support a reliable, secure wireless network infrastructure. Fast changes in wireless technology and its importance in running a successful organisation have led to a high demand for skilled wireless administrators who can maintain wireless networks of different size and complexity. In bigger organisations this may be the role of an Information Technology (IT) department but in smaller and medium-sized organisations, this role may be taken by a single wireless network

administrator with a wider set of responsibilities. This module will develop the student's understanding of the basics of the wireless architecture. Students will learn the technologies, devices, standards, security and advancements to wireless technologies. Students will be able to identify wireless specifications and standards and will be able to perform simple calculations and site surveys. The operation, configuration and installation of wireless equipment will help students gain a better understanding of today's wireless network requirements. Basic troubleshooting techniques will prepare the student for current and future wireless-related problem solving scenarios. This module provides enough knowledge in order for students to make appropriate judgements when planning and designing a new wireless network. This module will also clarify the security issues and obstacles associated with the use of wireless infrastructure and communications. Students will be provided with the necessary knowledge, skills and practical experience in a hands-on, lab oriented environment that will help them manage and maintain a wireless network. It is particularly beneficial to those who wish to pursue a career as a Wireless Network Administrator, Wireless LAN Administrator and Wireless Specialist and for those who wish to obtain a certification.

Module: Server Network Infrastructure

Module description

The aim of this module is to prepare the student for the server administrator role. The administrator is responsible for the operations and day-to-day management of an infrastructure of Windows servers for an enterprise organisation. Fast changes in network and server technology and its importance have led to a high demand for skilled network administrators who can manage and maintain network environments of different sizes and levels of complexity. In bigger organisations, this may be the role of the Information Technology (IT) services department but in smaller and medium-sized organisations, this role may be taken by a single network administrator with a wider set of responsibilities. These responsibilities will include the planning for installation, deployment, monitoring and maintenance of the network environment to ensure continuity and high availability for the network. This module specifically focuses on configuring a server for networking and covers networking aspects such as network addressing, name resolution, network access and authentication, providing network services, and monitoring and maintaining the network infrastructure. This hands-on module is designed for individuals with computer hardware and networking experience who wish to further their skills in the installation, configuration and administration of computer networks and the Windows Server operating system. It is particularly beneficial to those students who wish to pursue a career in IT positions such as Network Administrator and Network Specialist.

Appendix B – Questionnaire sample for industry

The purpose of this research is to determine the participant's experience upon employing of an IT graduate as well as to gain any recommendations towards having better prepared graduates for employment purposes. The participation of this research is of a voluntary nature and the participant may choose to withdraw from participating at any point in time without any consequences. The feedback gained shall be treated at all times in a confidential manner and anonymity shall be ensured during the feedback report by using coded names of the participant.

1. What education level does your company generally consider when hiring an IT graduate for entry level positions?
 - Professional Certifications
 - Higher Certificates
 - Diplomas
 - Degree
 - Other: _____

2. Is the attained higher education results of the graduate considered for placement?
 - Yes
 - No

3. How long (in weeks) did it take for the employed graduate to become productive upon employment?

4. Do you feel that the employed graduate's attained higher education results affected the time taken to become productive?
 - Yes
 - No
 - Not considered

5. Do you feel the qualification completed by the graduate fully equipped the person for employment at your company?

- Yes
- No

If No, please indicate what do you feel the curriculum lacked in preparing the graduate?

6. What key strength(s) / skill(s) did the graduate lack upon their first year of employment?

7. How would you classify the key strength(s) / skill(s) lacked?

- Soft skills
- Practical skills
- Lack of subject knowledge
- A combination of the above
- Other: _____

8. Was your company / department impacted by the unproductivity level of the employed graduate?

- Yes
- No

If Yes, please describe the impact.

9. Were any measures put into place in when performance gaps were found with the employed graduate?

- Yes
- No

If Yes, please describe what was done to further upskill the graduate.

10. What recommendations would you make from industry's viewpoint to add to the higher education IT curriculum to better prepare graduates for the work place?

→ Thank you for your time and contribution to the questionnaire.

[exit questionnaire]

Appendix C – Questionnaire sample for employed graduates

The purpose of this research is to determine the participants experience upon being employed as an IT graduate as well as to gain any recommendations towards having better prepared graduates for employment purposes. The participation of this research is of a voluntary nature and the participant may choose to withdraw from participating at any point in time without any consequences. The feedback gained shall be treated at all times in a confidential manner and anonymity shall be ensured during the feedback report by using coded names of the participant.

1. Which field within IT did you complete your studies in?
 - Software
 - Hardware
 - A combination of the above

2. Were your attained higher education results considered for your graduate employment?
 - Yes
 - No

3. How long (in weeks) did you take to become productive upon employment as a graduate?

4. Did your attained higher education results assist / aid in the length of time you took to become productive upon employment?
 - Yes
 - No

5. Indicate your emotions / feelings during the first year of your employment as a graduate?
 - Confident
 - Slightly confident
 - Comfortable

- Slightly comfortable
- Slightly overwhelmed
- Extremely overwhelmed
- Other:

Please indicate why you felt the way you indicated above.

6. Did you feel the qualification you studied for fully prepared you to be productive within your first year of employment as a graduate?
- Yes
 - No

If No, please indicate what the curriculum lacked in preparing you for the work place?

7. What key strength(s) / skill(s) you lacked as a graduate upon your first year of employment?

8. How would you classify the key strength(s) / skill(s) lacked?

- Soft skills
- Practical skills
- Lack of subject knowledge
- A combination of the above
- Other: _____

9. Was your company / department impacted by your lack of productivity as a graduate within your first year of employment?

- Yes
- No

If Yes, please describe any impact(s) felt.

10. Were any measures put into place by the company upon finding performance gaps within your first year of employment as a graduate?

- Yes
- No

If Yes, please describe what was done to further assist you?

11. Were any measures put into place by yourself upon finding performance gaps within your first year of employment as a graduate?

- Yes
- No

If Yes, please describe what you have done to further skill yourself?

12. In your view, what would you add to the higher education IT curriculum to better prepare graduates for the work place?

→ Thank you for your time and contribution to the questionnaire.

[exit questionnaire]

Appendix D – Questionnaire sample for recruitment personnel

The purpose of this research is to determine the participant's experience upon the placement of an IT graduate as well as to gain any recommendations towards having better prepared graduates for employment purposes. The participation of this research is of a voluntary nature and the participant may choose to withdraw from participating at any point in time without any consequences. The feedback gained shall be treated at all times in a confidential manner and anonymity shall be ensured during the feedback report by using coded names of the participant.

1. Which IT position do you feel is the easiest to source IT graduates for?

2. Which IT position do you feel is the most difficult to source IT graduates for?

3. How often is the IT graduate's attained higher education results looked at for placement purposes?

- All the time
- Often
- Seldom
- Not at all
- Not applicable

4. Which skills are most often looked for by industry when an IT graduate is required?

- Technical skills
- Soft skills
- Combination of the above
- Other: _____

5. What are the key strength/skill sets requested by industry for a graduate level position?

6. Do companies provide feedback upon employment of an IT graduate?

- Yes
- No

If Yes, please elaborate on the type of feedback gained.

7. Are there any performance gaps mentioned by companies after an IT graduate is placed?

- Yes
- No

If Yes, please indicate any performance gaps mentioned.

8. Is there anything done by the recruitment end when performance gaps are mentioned by industry?

- Yes
- No
- Not applicable

If Yes, please indicate what is done.

9. What are some of the difficulties / issues that you face when placing an IT graduate into industry positions?

10. What recommendations would you like to make towards the enhancement of the IT curriculum so that it could better equip graduates for the work place?

→ Thank you for your time and contribution to the questionnaire.

[exit questionnaire]

Appendix E – Examples of interviews

Appendix E1 – Interview script and transcription – Company 2 (line manager)

The interview script was developed based on participant 2’s (company 2) responses to the questionnaire.

Interview Company No.2(Participant 2 – Industry)
Interviewed by: Annelee Panday

Date: 26 September 2018
Time: 8.30am

Research Topic

Recommendations for improvement to the South African IT curriculum to enhance new graduates’ first year of employment.

Interview Script outline

1. Greetings, thank you for sharing your time with me this morning.
2. As mentioned, all participation for reporting purposes shall be deemed under anonymity. Are you still comfortable with this? (...) Thank you.
3. Just to note that this interview shall be recorded for transcribing purposes only. Are you comfortable with this?
4. Thank you very much. So as you are aware the purpose of our engagement to gain your experiences from industry on IT graduate employment, so tell me...

Interview question guidelines

1. How would you describe your experience employing an IT graduate?

2. Any skill that you could indicate that were problematic?

3. Any skill that you would say was a positive factor?

4. I would just like to circle back to a question on employment...
You indicated within the questionnaire that a graduate’s attained education results are looked at for employment purposes could you perhaps elaborate on what do you look for in their results for employed?

5. Also, you mentioned that the employed graduates attained results affected the time taken to become productive, could you please explain why did you feel this way?

6. You mentioned that the curriculum the graduate completed lacked in preparing the graduate, and stated an item such as common tools could you please elaborate further on it?

7. Now looking at the what the graduate lacked within their first year of employment, you mentioned communication, lets unpack that for a bit, could you please further explain the communication skills lacked?

8. You also mention soft skills lacked, what type of soft skills do you look for in a graduate?

9. And that of the practical skills, what type of practical skills do you often look for?

10. Now let's uncover more on the measure put into place when performance gaps were found, apart from the consultations to inform the graduate of their expectations, where there any else done to further aid the graduate?

11. What attributes do you look for in a graduate for employment purposes?

12. What was your experience of the graduates productively level within the first year of their employment?

13. In your expert opinion, please share any advice or recommendations could improve the IT curriculum to better prepare graduates for the work place.

14. Is there anything that you would like to further share that we perhaps have not covered but is important to you?

Thank you!

Interview transcription – Participant 2, company 2.

Industry Interview Company No.2 Participant 2
Interviewed by: Annelee Panday

Date: 26 September 2018
Time: 8.30am

Industry Interview – Company no. 2 Participant 2

I = Interviewer, P2 = Participant 2

I: Thank you so much for sharing your time with me this morning. As previously mentioned, all participation for reporting purposes shall be deemed under anonymity also to note that the interview is recorded for transcribing purposes. Are you still comfortable with that?

P2: yep.

I: okay, thank you so much. So you basically our engagement for today is with regards to your experiences from industry regarding IT graduate employment, can you describe to me your experience on employing IT graduates?

P2: I think for the last 5 years especially, our experience has been to make a lot of provision for on boarding graduates into the work space, a lot of effort and the success of keeping them on board was really dependent on how much time we spend on making them take that transition. It was not something we anticipated to be honest, I sometimes think (...) I didn't have to do that myself, it was something of adapt or die but at a certain scale, you'd have too. We can make mistakes during the, the placement process, we lose a lot of money, a lot of momentum as well. So, it's a expensive asset to have, so we focusing a lot on the on boarding process.

I: alright, thank you for that. Any skills that you can indicate that was problematic apart from the on boarding process?

P2: Well, I think maybe to go into detail about the on boarding, from a technical perspective. No let's talk about soft skills, we had a chat earlier about project management. I would say, may going down to time management perhaps, mhm, I have seen other where in one institution I've noted a pattern, where they spend some time or some energy on whatsoever on working on an estimate, for how long it was going to take to do a certain thing. Not project planning from a structural point of view, it's just estimating workload and then feedback based on, on your actual progress. That is absolutely a potential for trying to determine that skill as a profit in the end of the day. If we, if we sell 10 hours in the day, it takes us 20 hours, (...) mhm... you lose more than the 10 additional hours. I think time management is something that, we almost, at this stage work from the offset that, there is no time management, we have to start from scratch. Eer, I think, eer even from as accurate feedback as dismal as it may be and "this is going to take me a year" and another person says "it's going to take me a month" it's really

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(...) its accurate what you do and what it should be. Eer (...) software development IT guys are, a lot of people hammer on communication and I'm saying yeah, is this guy doing marketing do we really expect him to, to do some kind of a presentation, I don't think so. I, in terms of communication, it's really making sure of does your support structure offer / understand what your challenges are. Some people struggle to communicate that and if you can't say with everything in place, you can't communicate that this is what I'm working with then I is able to help you even though they willing and you will fall through the cracks and probably, your path will probably sit at this stage and say we don't know what more that we could do and it's avoidable. And it's a expensive, and again it's a expensive thing to do. Mhm, I from a technical prospective, I think that there is a lot of skills all of the peripheral tools, I think I mentioned this a couple of times, all the peripheral tools from a software development environment, things like code versioning to start with. These this article (...) yoh what is the (...) it's just referred to as Joel, Joel's top 10 of development tools. There's sort of assessment that, there, you rate the maturity of your development team, based on whether you have certain things in place or not. And that was something like a joke to start off with and then we realised there's a lot of truth. It goes with, like things about a proper system or even its excel, it doesn't matter, just a system to record, features, bugs and improvements and things that need to happen. Project schedule is broken down into actual tasks, some kind of a system. Issue a management system is not what they normally refer too but there's 100's of them out there, free as well. So, you have to know what you doing actually. Code versioning is another, it's nice if you one person working on a project and it's something you start and finish in 6 months, maybe you don't need to go through all that hassle but if it's something you going to support maybe for another 6 months versioning source code, is *absolutely* essential. We've actually written off a product because we didn't have proper source version control on this and we lost the product, literally we lost almost a year and half worth of work, due to just that not being in place. Eer, so especially if you in a team and you working on the same kind of files, project, its critical. There's a lot of tools out there that, subversion, mhm, get hub has its own type of stuff, there's all sorts of things out there. Mhm, then there's another thing, I feel that really where that is confined to software development, IT or business as a whole, is when it comes to automation, so in our sense, it refers to build automation, there's a lot of tasks, think about getting source code to the point where you can now test it, you know there's a database component, there's source code that needs to be compiled, packaged, mhm, typically if it's a web application, you deploy it on some kind of build, and that takes away a whole lot of time and someone prepares

to do that, you know, “I can finish this”, “I can solve this problem within 20 minutes” and then it’s probably going to take me half a day testing, then it’s expensive, especially when you want to go agile or iterative or more prototyping approach, it’s like “I’ll do something, show it to you and make any corrections and realign” and the customers love that but if it takes you half a day to prepare 20 minutes worth of work then it’s not very efficient. So, there’s a lot of build automation tools out there, Jenkins is a very popular one, there’s go cd, eer there’s couple of stuff. What a lot of development teams and products out there are, how would you say, measures maturity, how often can you make a release of your product. Cos it says a lot about the entire system, the whole lifecycle and if you get new graduates on board and it can be very counterproductive for that process, extremely counterproductive and it’s simply because they not familiar with the tools, the, the purpose of having those tools. So, so all of these things work together very nicely in a integrated way. What happens is eventually when it goes into a support mode, now you logging a bug in the system, you need to be able to trace this thing back to the source code version number and when you supporting something that’s being released a year, you need to be able to fix that version like what is was back then, what build did it go to, there’s so many different variables, were a problem could arise and you come onto haphazardly, just think this and some kind of quick and dirty fix and throw it back into a version, you gonna, it’s gonna be a expensive to run it an efficiently then those tools are essential. We actually spent, we spent (...) a quarter of our on boarding time, which is almost under 3 months, which is ridiculous because that’s sort of our probation period, you can’t really determine anything at that stage but, I would say a quarter of that time is spent on familiarising them on the tools cos that’s going to be essential to determining whether they can succeed successfully and efficiently and perform in a larger team.

I: Right, thank you for that. I just want to circle to the employment side, on the questionnaire you indicated that the graduates attained education results are looked at. What do you generally look at when it comes to a graduate’s results for employment purposes? Is there any specifics?

P2: Well I, I look at consistency in terms of the marks, to be honest I think there’s (...), you get sort of a natural (...), people are more sort of talented or just with natural skills with regards to certain topics but if you can manage a consistent, good result and grade, it says a lot a bit the discipline and perseverance and seriousness with which the course is actually aimed. Well, that’s something we definitely look at. I know that courses that allow, eer mhm (...) the self-study courses, it allows for a certain time period, you are possible to go over that time period, it’s not like a class structure where it’s were when you fail you out, like that. It’s, I like to see

how much time was spent on certain modules. Some of the courses I'm more familiar with in terms of the actual modules and I liked what's familiar with the specific modules, I do place a bit more value on some of them. The processing and logical concepts modules in the past has been a very good indicator of whether an individual would really be able to apply a object oriented programming. If they could pass a language, that module earlier on is a very good indicator to me. I like from a database prospective whether the person would work with databases, I think that relational database design is an awesome module to determine if someone is able to understand the structuring of databases cos when you start working with code, whether you building that database or not, you are modelling that object, you modelling data at the end of the day. Anything you doing with modelling of data, so getting a good understanding of what the data relationships look like is in my opinion has been a good indicator whether they would really be able to apply that in the workplace.

I: okay, thank you, that was quite interesting. So moving on to the productively level of the graduates, you in your questionnaire mentioned that the attained results affected the time taken for their productivity so, can you explain how, why did you feel this way?

P2: Just repeat that?

I: so, you've mentioned in the questionnaire that the employed graduates attained results affected the time taken to be productive,

P2: yes

I: can you explain why did you feel this way?

P2: Well (...) I think we have to do a bit of rework. I think that there is a, there's back to the previous question, mhm, we want to make sure we have an efficient on boarding process. We want a new graduate to be working on 1 of our a new release prints as soon as possible, that would literally be, that would be a start on getting a return on our investment. So, the longer the on boarding takes, the the, you know, the school fees that we're still paying at that stage so depending on what, we wouldn't take a generic approach necessary to that on boarding, if we do employ 3 or 4 of those individuals, coincidentally at the same time, we would try and obviously accommodate them together but if we see a candidate that we willing to employ but they are lacking in certain modules in terms of their scores and how they did, we would spend some more time or at least try and assess whether if that's something we need to spend more time on. But we would have to create some scenario's to test and be sure, like I said, if that

individual gets to work onto a release and only then it becomes apparent that they, there's some fundamental problems, it's going to cost us, a whole lot more. So, its really about, we overcompensate on it for the on boarding process, which means that it gets a little bit more expensive.

I: okay, alright, so looking at the communication that you mentioned let's unpack that a bit. What are some of the communication skills lacked that you've experienced in industry?

P2: yeah, I think the common problem mhm has been failure to accurately verbalise (...) I want to say the blockage that the graduate is experiencing and I want to say 50% of the time I attributed to them feeling, that they don't want to feel that they silly or stupid or almost like they think they going to give away that they don't really belong here, if they ask something fundamental. But we have an appetite for that and dealing with that and if an individual for whatever reason doesn't not in a timely fashion communicate they have a certain blockage and what it is, then, then it really becomes a serious, serious problem for us because there is no way of guiding or recovering those scenario's, you'd have to really guess what was the root cause of us not completing this specific task in time. And you know in the absence of that, if it's truly about that they don't understand at all, they would typically revert to things like it wasn't explained properly or it wasn't, but in you have these things that become counterproductive in a larger team setup. So, we put a lot of effort on tell me or if you ask me 100 questions, we going to be 100 times more confident, even if it's silly questions, we want to know about it now, cos we got time to recover it now but don't at a later stage say you fine and then you not really fine. You know sometime when you give someone feedback and you can see that they don't really understand what you saying what was wrong or what they needed to change but even in a discussion you can't get anything out of them to say "I understand what I did wrong" and sometimes people need to just echo what you were saying and just to understand just what you took you were saying now and that's it's, people joke about IT people aren't the best communicators in any case but this is a serious problem in a team setup.

I: So, apart from the communication side, what other soft skills do you look for in a graduate?

P2: We talked a little about time management, I think that is a important one. Mhm, there's a couple of interesting one's, I want to say interesting but not to say a more important one's but interesting one's that I have seen. In a more diverse work place, putting an effort to, to join a diverse team and not, again people joke about and say "it's a developer what you expect" but, you know if you have someone that is engaged in a team is *way* more productive than someone

a little bit more withdrawn and not willing to join the team for whatever reason maybe they personalities don't, or not exactly the same or share the same interest but mhm you see people not feeling 100% okay do not necessary engage with the team, "I'll do my own thing and you'll do your own thing" and that's not very productive, we've seen in time it's not a productive attitude and we don't see it as a positive if "I rather to my own thing and I'm a solo agent here and let me do my thing" there's a time a place for it but we don't operate like that. The (...) we have seen a little bit of immaturity when it comes to conflict management as well, I don't know who's responsibility it is but parents probably [laughs] but I don't know but it's a problem that needs to be solved, how HR department, even on our on boarding process, we trying in those scenarios then people try and finger pointing earlier on in the process, you can realise that's not productive behaviour at all, taking responsibility for whatever you've done good or bad, we put way more, mhm, we'll praise that actually. Taking responsibility for a mess you've made we'll praise that, we can work with that but you know sort of putting the blame on other places trying to save yourself in the scenario sometimes at the cost of others, is something that we absolutely don't want to work with and it destroys a teams, a team's culture as well. Yeah, no I think apart from the time management, that's some of the interesting stuff I've seen as well.

I: okay, excellent, thank you for that. So on the practical skills side, I know we touched on the tools that you've mentioned, is there any other practical skills that you often look for in an IT graduate?

P2: (...) Mhm apart from the things we've already mentioned, one maybe also an interesting thing to be honest we've been looking for an individual, we've got this vacancy we probably have and at it for more than 3 years to be honest and it entails a cv of a software developer, definitely someone with, with good time management skills but the essences that I wanted to get back to was, that is someone that is very presentable and professional. Now, it's difficult, that and a graduate doesn't go that well, I think nowadays there's opportunities, there's opportunities for a graduate if he's presentable, comes across well, someone that's a lot to start with but less oversight having working on a client's site and that's a something that our customers like someone sitting close to them in their own teams but with a graduate sometimes it's difficult, you don't know if they going to represent themselves or the company in the same way. So, we willing to, if we find this "unicorn" we'll definitely have a job for him or her [laughs] but we found one or two individuals that we taught that had that but was lacking on some of the other soft skills so much so that we couldn't let them work there on their own.

Anything will allow us to have minimal oversight. But you know, like I said, they, they're a professional, presentable individual, that's something unfortunately we don't see a lot of, then you see someone you have a chat about dress code then you have to have a chat about dress code again. Its silly things like people just not being considerate like, you'd be at a client and they would be eating some kind of a fish sandwich in the middle of a work space, it's again, I don't know who's supposed to teach them that but it's at the end of the day that's our client and in an embarrassing way they would have to tell us, that "this isn't acceptable, talk to this child please." [laughs]

I: Alright, in your questionnaire you mentioned that when performance gaps were found, that consultation with the graduates took place, was there anything else done to further aid them, apart from the consultation? Anything to add to that or was it just consultation?

P2: Well it's a, not to put a negative spin on it but (...) if we realise that a certain candidate is not making the mark, it becomes expensive to avoid the inevitable of finding an exit strategy for the individual, so so we've learnt that we would have to do that way sooner than later, I feel that it's absolutely the responsible thing to do for the employer, the team as well as for the individual, the graduate to know, are they making the mark or not and more importantly it's to give them an opportunity as early as possible to improve on that. So, if there really was a missed managed agreement in terms of what was expected of them, maybe there were assumptions that we would then declare in writing, we would say, this is what we were expecting, so maybe for the 1st consultation we didn't ask you when there is a meeting, don't talk while other people are talking, its rude. Maybe we specifically didn't say don't do that but this is something that doesn't work well in the team and we'll list every single one of them, no matter how silly it is or how important it is and what we'll do is have at least 2 or 3 follow up consultants in terms of that. And we'll rate that individual items and say has there been any improvement. So typically in the 1st session, I would say a third of the items we mentioned is a prize to be in the individual. Mhm, from soft skills stuff to the more, I would say one more than the other but across the board, but then the good thing is that on the 2nd session, we typically give it about 2 weeks at most we have a follow up session and and we would ask them to give us feedback in terms of what "you were doing" at that stage it would be a bit of a reality check, to say "no I realise I actually haven't been doing well" and since "you mentioned it", so if we see a consistent poor performance in terms of that, we find that even the graduate understanding that okay no maybe this isn't the way "I wasn't doing well, and I understand that our paths will have to split" or you can save in term of what you spent in terms of placement and training and

whatever, at a very early stage you can prevent frustration and conflict by saying, this is what we expect of you and “I didn’t realise it was part of the expectation” and they quickly adapt to that, to the benefit to everyone involved. So, so we see that more often luckily than not.

I: okay, so like we’ve spoken about the productivity level, so for the graduates first year of employment, how would you describe their productivity level in your environment?

P2: (...) Mhm, I would have to compare the 2 colleagues on, I don’t think it’s fair to compare it with someone who’s more than 3 years but with someone that just passed that 1-year mark. (...) it’s well, we work of the assumption that they still need a little but more oversight so as part of our development process, example, doing code reviews that’s another important part of the previous question with tool sets, code review. Certain individuals that have proven themselves you find that their code reviews, you looking at the quality, consistency, best practices being followed, is easier but in that first year, we would from the management side would spend a lot more time and we would even tell them and got to nit-pick so that they know to get you to that next level. So, I think that 1st year there’s a lot of rework, but it’s you know, sort of initiated by us to be honest. We see 1 in 5 maybe 2 in 5 graduates don’t need that and you see quite quickly that they catch on, and you don’t need to do that and we can get them on board working with the team say within 5 months even we can get them on board. We actually have a guy that recently been here now for maybe about a year now I think he’s already surpassed his colleagues that has been here for 3 years. So, I want to say on a productivity level only because we initiate, we create a scenario whereby if the productivity is down or the ability to perform at the same level as their colleague’s do that we have an appetite and scenario to sort of pick that up and to realign with that and we spend some time with that, we budget some extra time. So maybe it’s not fair to say every single graduate needs more but we budget for a graduates development day is going to be, we can say account for 4 hours and with someone else, we do 8 because we going to spend a lot of time on other activities as well.

I: okay thank you for that. So in your expert opinion, what advice that you could share or any recommendations that you could share with us, to improve the IT curriculum to better these graduates?

P2: Mhm (...) okay obviously everything that we’ve discussed is something to take away.

I: Sure sure, perhaps anything else to add?

P2: There's nothing else, but it's that responsibility but (...) I think there's a lack, there's a deficiency for cultivating passion for, for certain positions. Mhm, there's just no substitute for someone that is passionate about what they do. That's the reason, the previous candidate I was talking about the graduate, he is just so passionate, he's makes a whole of mistakes, takes a whole lot of chances and if he's unsure, the next day he's probably got like red eye's cos he was up all night because he wanted to he wanted to understand, and you can bet that he's going to teach you something the next day and I think at a stage, we've see a lot of people in an interviews where I get a little bit of frustrated and have a very candid conversation and I ask them "what was your expectation in terms of the work place, when you started to go down this route" and something that you hear quite often is "well, there's a need for it in the market and it pays well." And things like that and "it's something you can do internationally, not just a local skill, you can do it anywhere, work aboard.." yada yada yada and but not a lot of emphasis, and then I ask them "you like?, you actually like it" and they say "well, thy do well, they manage it and they also like other things." Then when you start talking to them about other things, like "what do you like to do, let's forget about the work side, what would you like to do?" then you would have people talking about stuff like "I like to coordinate events for my friends" and that like there's another passion here [laughs], there's an underlining passion here and I know why but you'll find that these individuals they will fight their instinct to what they were meant to do, what they were created to do, I think there's a talent being wasted then it's a pity, I don't actually even want to, (...) that person's actually going to beat themselves up because they don't make the mark or they going to have to work 3 times as hard as someone else that just naturally has the passion for it. Now I don't want to say a talent, it just do it but the passion that will drive them to overcome every single obstacle. Personally, I thought at I stage that I want to do accounting, because I was good at it in school and I like the order of numbers and everything balancing [laughs], just makes sense but actually doing that on a day to day bases would, would kill me, I would dread going to work and the amount of time you spend in that work, the impact that has on your psyche, your family's psyche, children, everything that you do, your colleagues, I think it's no one tries to put a number to that to what your happiness level would be at some stage [laughs]. And I think, I, one day, if I in the future be a way when you do these types of assessments, where does this individual play, what's his skill set, but a lot of emphasis on what is it that they passionate about and I have seen scenarios were, he's an individual and not passionate about development but passionate about problem solving and that's actually the only thing you need to do is to try and convince this individual

this is a problem that, this is an unsolved problem and then he takes care of the rest. That passion takes care of the rest, if you saying you need to write 50 lines of code, he's not excited about that he's looking for the next problem to solve. In a workplace, you can, if you know your employees well [laughs] and you know what drives them, what motivates them but that takes a lot of time, takes a lot of effort. I think that if you have someone that applies for a job that is passionate about doing things, there's no doubt he would get to a point of realising his own potentials and obviously to the benefit to any employer that they come in contact with, maybe at some stage we would have some kind of a rating as part of his transcript there, would be passion score [laughs] whatever that would be. But that's something we try and gauge in a conversation but some of these guys they would say "part-time, I also code, write my own games and I try and do this and someone is stuck with something and I try and write a little application to help them", then you know, I'm not saying that's all they got to do 24/7 [laughs] but you can, it's easy to pick up on that passion and it's contagious in the work place, other people feel like "yoh," they looking bad, they need to now play around.

I: okay, excellent. So, with that said, is there any further that you would like to share that we perhaps not covered but is important to you?

P2: Mhm (...) I think briefly we had a discussion before the interview about maybe preparation for the interview process, mhm very boring topic so much has been said about it but still unfortunately, I get to the conclusion that individuals are not representing themselves well and I don't think expect, a dinner and a show for someone at that but, I often get to ask, "tell me about who you are?, Just your story, where did you go to school, your family?" and it's almost like they can't even tell you that either they so nervous or they simply weren't prepared to be asked something like that, they ready to ask Java questions and technical this and maybe if you give them acronyms and what does it stand for, whatever but, but I tell them in a very short time period we need to get to know one another and like decide if we're going to marry or not, so you know it's a critical life changing hour, half an hour and it's important. You know being presentable, being friendly, some people are so nervous they can't even crack a smile at all but there's a lot of people involved in the interview process, including the team leaders and if team moral has a very big influence [laughs] and they sharp on picking on stuff like that, you don't want someone negative bringing down the momentum of the team. So I think there's a whole, there's nothing new to it, I don't think there's a lot of emphasis placed on it. I have heard individuals say "I'll try that it's a scarce skill" so, this is sort of "take it or leave it, I'll find someone else that will", maybe [laughs] but not with that attitude, maybe the skill but not with

that attitude [laughs]. So, I think that they can be more prepared for interviews just to represent themselves well, they don't have prepare so that you have all the correct answers, just prepare for a conversation.

I: okay perfect. Thank you so much for your time today, I really do appreciate it.

P2: Pleasure.

I: Thank you.

Appendix E2 – Interview script and transcription – Participant 6 (graduate)

The interview script was developed based on participant 6’s responses to the questionnaire.

Interview Participant 6 – employed graduate)
Interviewed by: Annelee Panday

Date: 1 October 2018
Time: 10am

Research Topic

Recommendations for improvement to the South African IT curriculum to enhance new graduates’ first year of employment.

Interview Script outline

1. Greetings, thank you for sharing your time with me this morning.
2. As mentioned, all participation for reporting purposes shall be deemed under anonymity. Also to note that this interview shall be recorded for transcribing purposes only. Are you comfortable with this?
3. Thank you very much. So as you are aware the purpose of our engagement to gain your experiences when you started as an employed IT graduate, so tell me...

Interview question guidelines

1. How would you describe your 1st year of employment as a graduate?

2. Any skill that you noticed that were problematic for you?

3. Any skill that you would say was a positive factor for you?

4. In the questionnaire, you indicated it took as long as 2 weeks to become productive, could you describe the issues experienced during this time?

5. You indicated that the curriculum prepared you for employment, how do you feel that the curriculum prepared you?

6. You indicated a combination of skills lacked during your 1st year of employment, what were some of the soft skills do you feel you lacked?

7. What were some of the practical skills you feel you lacked?

8. When gaps were found with your performance, can you describe some measures taken for you to further upskill?

9. How long did it take you to further skill yourself?

10. In your opinion, please share any advice or recommendations you would like to make to improve the IT curriculum so that we can better prepare graduates for the work place.

11. Is there anything that you would like to further share that we perhaps have not covered but is important to you?

Thank you!

Interview transcription – Participant 6, Company 3.

Industry Participant 6(graduate)
Interviewed by: Annelee Panday

Date: 01 October 2018
Time: 10am

Industry Interview – (Participant 6)

(I = Interviewer, P6 = Participant 6)

I: Good morning and thank you so much for your time. As mentioned for reporting purposes all participation shall be deemed under anonymity and the interview for transcribing purposes shall be recorded. Are you still comfortable with that?

P6: I am comfortable with that.

I: Perfect, thank you very much. So, the purpose of our engagement is to gauge your experiences when you started as a graduate as an employed graduate rather in IT, so tell how would you describe your first year of employment?

P6: Okay, my first year of official employment cos I first volunteered then I was an official employment, which one do you want?

I: Official employment

P6: Official employment mhm, things were a little bit different from the volunteering part of it, cos volunteering I was chilled, relaxed and all of that so then the official part of it, I, I learnt a lot, there were a lot of challenges, challenges being the work itself, it was quite different from what I experienced with, with the volunteering part of, of my previous job, there were some learnings that I have to do, in fact, what I have done at varsity was 10% of what I actually needed to do at, at work [laughs]. So, I had to for instance in Java, at varsity they teach you the normal Java – concurrency, sockets and all of that but here you don't do all that, you know, you, you can't have a multithreaded on a 2 threaded application server. If you know, what I mean neh?

I: Yes, yes.

P6: So, all of that part now if all out [laughs], it's not that it's not useful, it's useful, just that when we got to, when I got to the work force, neh, it was web services, it was create a web services, now what is a web service, they never taught me something like that at varsity and I don't want to lie to you but back then I didn't even know what a web services is, neh, and then we had to learn about web service types. Woah! So then web services were the thing, neh, and started and oh looks pretty and makes wholes to that. It was challenging in its own way but I had fun, I had a lot of fun and I remember when every time I got to work I would write down all the things that, that I would want to do for that particular task, write down. I know what I

needed to do but I would write them down and then when I'm done I would tick all the boxes and then relook at the solutions on my personal side. Okay so say "create a web service, start records, retrieve and updates for all information or client information" so I would say okay, this is the work I need to do, then mark it there, then once I'm done, then can I go and on my personal side, go and do the same thing to see if I could and with that, that's where the trouble was, cos you work on an existing project that, "Paul" the engineer designed so what you basically doing is, "we did this, now we need to do this". You know if I could put this blankly it was basically copying and pasting but still, but sometimes you do understand what they are doing. But the biggest challenge is that you starting this from scratch without seeing what somebody else has done. So, so that, that was my learning curve, and that I used to tell my manager, "you what, you know this thing called a service request component, I've actually got my own component called service request called "lawrance" neh, and in this component, you guys are using IBM web services, I'm using access web services, similar different technology right." So he says "oh, how did you do that?" so I say "I researched, I Googled this, this, this and that, all the research and I come up with it" and he's like "oh so now you know web services" and those were the challenges but end of the day after you know, after telling him that I'm doing this, this and that, that's what I do on the side and think that's where I am today cos of that kind of attitude towards to my challenges, there were days went I was like I don't know what this thing is, I don't know what to do here. I remember one day, I used to get my internship and the company was losing money, cents, cents neh, some programmes cos it was an integration project we come from main frame, from main frame "a" and "b" and when the value got to our client application, it would have lost the precision, the value, that point 0, which is really nothing, if you can think about it but, but, but as they did pay out neh, as they did pay outs, they then calculated from main frame and all pay outs from there and they didn't give the client the full amount and within a 3 year period the company reserved almost a million rand cos somebody didn't do something right neh, then that app was given to me, what am I supposed to do, you know what I mean, you supposed to covert the cents to what? I'm like, but this amount comes to me without cents and then you have you now investigate and you send out emails go upstairs to the 9th floor and then back down cos I'm on the 1st floor then you get support again, there was a lot of frustration but for me all of that was learning curves. A very nice pure learning curve and the 90% of the stuff meh, was stuff that I had to go out and learn. And I worked with people who was very busy, not that they didn't want to help but they wanted to help, in fact I would say "hey, can you help?" they would help but they were very busy.

They would only say it once “this you do I like this and then do you get it? And ca you repeat it?” you do it like this and they say “okay cool”. You know I would write it down, with that then I would Google, you know you have to Google, you know sometimes you can’t have all the answers and someone at Google who might have experienced your problem and actually you know what Google did with the library. There’s a library called Google Java. Google Java is this collections library that you could use on your app. You can have lists of lists of lists which is a very nice thing to have in your app, if you want your app to have it. As soon as I heard of it, I was like “OH, now we use this thing in Java!”, I was like okay plug it in and my frustrations were gone because Google developed something that we can also use in Java and then you don’t have to go redevelop it and reinvent the wheel, I didn’t have to do that. So basically but it went back to knowing the fundamentals, you have to know what that thing is doing, cos you don’t want to take something from the internet and have it approved on production services and you know, it’s a parasite and it’s learning about somethings so that the 90% of the stuff that I, that I [laughs] did I answer all 4 of the questions [laughs].

I: That is fine [laughs]. That is perfectly fine, don’t worry.

P6: Alright.

I: That’s excellent cos you’ve actually helped me in understanding your point of view, your experiences and where you come from as a graduate which is absolutely essential to what we are looking for.

P6: 100% [laughs].

I: So, like you’ve mentioned you’ve taken 2 weeks to become productive in your questionnaire.

P6: Yes,

I: Would you attain that to your passion or self-studying?

P6: Yes, I would definitely agree to that, why do I say that cos I’m a different person. It differs from person to person and I won’t lie, we have interns on the floor, give them a single task and I’m like “where is your passion, where is your drive, do you really want to become a software developer?” When I first started, and understand this we, a group of us went to India to learn Java and other domains and the pressure there is quite different from South Africa and you get Indian intelligence, and I’m telling you, I’m being honest, they study day in day out, when they get home they talk sleep Java all the time [laughs]. And they explore all these things and that

were I learnt that, you know what this thing is actually a career it's not a job, you know, it's something that one has to actually wake up and say "Whoa! Let me go work." You know, not "eer, let me go work...and make some money... and see if..." you know that kind of thing it is a career right, and I must say for me, that time was, was enough. It was, I remember the systems analyst nominated me for one of the best junior developers. At that time, I was on the board with very senior guys, who had been in the company for 20 years neh, and on the remarks she said that "Give [redacted] [participant 6] something and he would do it, if though he doesn't know how to do it, he will still do it." [laughs]. Which is excellent right, I was like you know what, I'm there is definitely something here, let me explore it and that's why I am here today.

I: Excellent, excellent stuff! So you also indicated that you the curriculum prepared you for employment, how did you feel that the curriculum prepared you?

P6: So these, these more things. I'm a developer, there's more things than development in the work space, you have to learn how to work with people, you know. You have to learn how to control your emotions, you have to learn about IT itself, there's Java, there's networks, there's role groups, there's other things you know, Java doesn't run the world right there's also other things that run the world so you have to know all of these but it's not like you have to know it but at least you have, you need to have an idea so that is actually what I was referring to. There are other domains in IT that helps one to, cos sometimes let's say your Java app is not working, it's not responding to the HTTP request, how do you explain that to a network guy cos a network guy say "what, what, what, how's that possible?, it that on the network, it's not my problem." Because his network is working and there are other app's so you'd need to understand okay, how from a network engineer point of view, how do you guys wire these servers up and then if you get a request from an external server, how do you handle that. And they they'll tell you "oh, we've got an engine X server that handles all of this", so now we not talking Java, we out of this. So that's the knowledge that I'm referring too. So, that helped me a lot, in fact what I did in school was more infrastructure driven just that I am me, I added a lot of, I did C#, I did VB, I did Java and then I volunteered here [redacted] [company no.3] I was doing C# and I was doing support so in my time of studying, I was so busy, I would say "Ah, I'm so busy, I'm not going to class", let me come here and today I'm doing some project management or tomorrow I'm writing code. You know it was that exciting but you know it didn't feel like it's stopping me from studying. I kept on doing both of them and this is the end result. Cool.

I: Okay, excellent. Then I think we've covered most of our questions which is absolutely excellent.

P6: Alright.

I: Your upskilling you mentioned, how long did that take you?

P6: It really depends right, for my domain like I said, 2 months to know Java in depth and the other stuff web services and all that, that was quite quick cos it's a protocol driven development you have to do it like this and this is the way, the only way it should actually will work. So 2 weeks was enough for me to know what a web service is, to develop it, test it, to wire it up to a database, you know of all that from a user clicking this, calling a web service, going into a database, find a user, the user exists, and the use just clicked once and from there come back this and that, what do we display, we display the errors, user not found, so all of that I've actually learnt to do system design and tools.

I: including validation?

P6: Validation, everything yes.

I: Excellent. So, in your opinion is there any advice or recommendations that you'd like to make to improve the IT curriculum so we can better prepare graduates for the work place?

P6: Yeah, I felt like the curriculum itself was broad, even though doing C# if I want to become a programmer give me things that I pretty much related to programming right, not that I'm saying leave all that server stuff but it would give you all the information regarding active directory and you would have to write a test on that and for me, I have, I can know about it but give me at least 20% of it and give me 100% or 80% on development cos that's what I want to do. So I don't know how to put it in simpler terms but maybe like a domain driven education system, I don't know how to actually put it but if I want to do web development, give me modules that strictly that at the end of the day, I would come out and say I'm a qualified a web developer from a university cos now all the developers have done servers which is okay for the industry itself cos somethings there's no jobs for web and they can actually do IT infrastructure instead. But what about passion, you know, what about these things that makes your world go round. Are you going to settle for something you don't necessarily like, you know that's were misalignment / the gap is at. I know of a friend that did web, and at varsity I was doing support with all these programming and he was the cool one and saying "I'm doing web page and click there, reload and look at that" he was the cool one and we couldn't do that, we were writing

black screens of enter number, the boring stuff. But today, I'm doing all the stuff that he was doing at varsity but now I'm doing it in a very different approach and he's unemployed. You know what I mean, and now it's difficult for me to say "dude, just go and learn Java" and because at school he used to say "I don't like Java" you see what I mean but Java now has proved that it has advanced to an extent of. If the company comes back and says it wants to create a product, I can quickly create a new Java product and call it product enablement and then sommer get the requirements and ha, we have a product, anyone can call it, anyone can, you know that kind of thing. It has advanced to that stage, so for me the misalignment or the gap, no not the misalignment the gap, is that we do a lot of things and at the end of the day you might get a job that doesn't exactly excite you, so if I wanted to be a Java developer, have a Java developer domain driven what is it, a domain driven course, whatever I don't know what it is so I know its first computer literacy, the basic programming then Java then advanced Java then Java and Java and Java [laughs]. The server, then you get the basic knowledge, some cloud computing. I deploy my personal app's to the cloud which is, if I talk to someone like line manager he's going to say "Ag, arg, argh, physical servers" they don't understand the cloud thing so well but they do, but we are not there yet in terms of the organisation, you know what I mean. So yes, I talk a lot [laughs].

I: Okay, that's excellent, that's perfectly fine. Is there anything else that you would like to further share perhaps we didn't get a chance to cover but is important to you?

P6: Mhm for specifically for undergraduates / interns, I feel we should, there is no zeal and passion anymore and why do I say this because I've lead 5 - 6 / 7 graduates previously and teaching them Java and how to use Java and had some production ready app's but were already on the client portal and one thing they all lacked was the passion and drive. It's that, how can we reemphasis that, in our courses, how do we, how can we, at varsity I know that they do only 1 project or 2, how can we get them to do more projects that can / will ignite their passion cos with that you can tell that this person doesn't actually like this presentation part of it or they don't like programming itself and with, and rate the passion. You get the guys that get there and they draw and draw, they show you all of that and then you get someone that "So you login and then after you log in, you get the email address" but then you already logged in? "and then the passion is gone and most of the interns nowadays think that after work, there is no work. I took my work home, I, I remember went I was doing my internship, I asked my manager to give me VPN access and he was like "What, what! You still an intern what you doing with that?" so I said I want to code, I want to write code and for me to be the best developer in the

team cos that what they were emphasising “always, always, always try to be the best in the team”, try to be the go to guy and I got there and I, it was to be honest, the time that I had in the office was not enough for learning, it was never enough for learning. But the time I had after work was enough for learning. I would do something and don’t understand it and I would ask my team leader I understand I am adding 2 integers but then what am I really doing, what does it mean for business? What does it mean for? Does it bring in money for the company? [laughs] you know, yeah and the guy would tell me, you know “can we look at that tomorrow” and I would say “okay cool but can you give me VPN access for tonight?” then he knows that tomorrow I won’t ask him cos the following day I’m there “oh, that fund exit manager, oh, ag no those are the amounts you used to display on the policy and, and” so it’s that and you don’t at home for me, I open my laptop, sit on my couch, “like eer, check, check, check what’s happening” I write it down, “fin exist manager does this, this and this, calculates premium and that, print, code, oh cool” and then the stuff that I did “okay, calculate premium, then add this 2 and then this 2 are the numbers I’m adding, oh,oh!” now I know so cool “hey, ok I found this, this and that, it actually does all of this” and then its marked correct and then comes the KPA’s and then I take all the marked cos I voting buttons on the email and asked so say just yes or no and sometimes I did get no’s cos of insufficient information I provided cos some stages it gets cumbersome and “oh, I got this and that” but then I said no you can’t get all great and I think that’s what got me to where I am and if the other graduates they can ignite that passion, you know, question the code, why does Google do it like this? Go to forums, why did you do it like this? O remember there was this guy that once shouted at me on stack overflow for asking why, why, why, yes I’m not lying and I was so cross but I’m just asking why, and he said “why don’t you just go through the code” but I was “asking you why, I know the code, what the code is doing, I’m asking why is the code doing that, I know what the code is doing” and he says “just go read the documentation” and I know what the documentation is saying, but “why does it” I know it can be done in that why but why can’t it be done another way, you know what I mean that kind of thing and he was like shouting and I was like you know what its fine. And that’s the attitude the other team leader gave me, you need to ask the why question, the why question is very important, cos if you understand the why question, you can almost do anything, do any, any, anything. Cool.

I: Excellent, thank you so much, I really do appreciate your time.

P6: Sweet.

Appendix F – Ethical clearance certificates



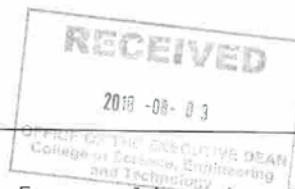
UNISA COLLEGE OF SCIENCE, ENGINEERING AND TECHNOLOGY'S (CSET) RESEARCH AND ETHICS COMMITTEE

26 July 2018

Ref #: 022/AP/2018/CSET_SOC
Name: Mrs Annelee Panday
Student #: 58562702

Dear Mrs Annelee Panday

**Decision: Ethics Approval for 3 years
(Humans involved)**



Researchers: Mrs Annelee Panday,
29 Villa Donato, Campbell Road, Craigavon, Fourways, Johannesburg, South
Africa, 2191, 58562702@mylife.unisa.ac.za, +27 84 602 9894

Project Leader(s): Dr Marthie Schoeman, schoema@unisa.ac.za, +27 11 670 9178

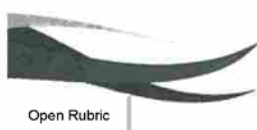
Working Title of Research:

Recommendations for Limitations Experienced by Higher Education IT Graduates Upon
Employment within South Africa: A Case Study at a Private Higher Education Institution

Qualification: Research

Thank you for the application for research ethics clearance by the Unisa College of Science, Engineering and Technology's (CSET) Research and Ethics Committee for the above mentioned research. Ethics approval is granted for a period of three years, from 26 July 2018 to 26 July 2021.

1. The researcher will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.
2. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study, as well as changes in the methodology, should be communicated in writing to the Unisa College of Science, Engineering and Technology's (CSET) Research and Ethics Committee. An amended application could be requested if there are substantial changes from the existing proposal, especially



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if those changes affect any of the study-related risks for the research participants. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.

3. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the confidentiality of the data, should be reported to the Committee in writing, accompanied by a progress report.
4. The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study. Adherence to the following South African legislation is important, if applicable: Protection of Personal Information Act, no 4 of 2013; Children's act no 38 of 2005 and the National Health Act, no 61 of 2003.
5. Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data requires additional ethics clearance.
6. No field work activities may continue after the expiry date (26 July 2021). Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.
7. Field work activities may only commence from the date on this ethics certificate.

Note:

The reference number 022/AP/2018/CSET_SOC should be clearly indicated on all forms of communication with the intended research participants, as well as with the Unisa College of Science, Engineering and Technology's (CSET) Research and Ethics Committee.

Yours sincerely



Dr. B Chimbo

Chair: Ethics Sub-Committee SoC, College of Science, Engineering and Technology (CSET)



Prof I. Osunmakinde

Director: School of Computing, CSET



Prof B. Mamba

Executive Dean: CSET

Approved - decision template – updated Aug 2016

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2 February 2018

To Whom It May Concern:
Pearson Institute of Higher Education (PI)
UNISA

Research Ethical Clearance No:
PIHE/2018/0202/01

Research Topic: Recommendations for Limitations Experienced by Higher Education IT Graduates upon Employment within South Africa: A Case Study at a Private Higher Education.

This is to confirm that the Research Ethics Committee of the Pearson Institute of Higher Education, acting on behalf of the Research Committee and Management of PI, has granted Mrs Annelee Panday approval to undertake a research project using documents (secondary data) from the institution.

It is to be noted that approval for the research project is granted on the following conditions:

1. That the specific documentation for secondary data be identified and the purpose thereof for the study be clarified.
2. That if the secondary data contains identifying information that could be linked to identify participants, show how participants' privacy and the confidentiality of the data will be protected.
3. That the findings and recommendations made available to the institution for the improvement of the MLM programme.

Formerly Midrand Graduate Institute

Pearson Institute of Higher Education (Pty) Ltd. (formerly Midrand Graduate Institute) is registered with the Department of Higher Education and Training as a private higher education institution under the Higher Education Act, 101, of 1997. Registration Certificate number: 2001/HE07/008. www.mgi.ac.za

It is understood that appropriate protocols, with particular reference to consent by, and confidentiality will be observed.

The Research Committee and Management of PI wish Mrs Annelee Panday success with her research project.

Sincerely, and on behalf of the PI Research Ethics Committee,

Dr Shaheda Mahomed



Dean of Academics

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Appendix G – Participant information sheet



Ethical clearance # 022/AP/2018/CSET_SOC

Research permission # 022/AP/2018/CSET_SOC

COVER LETTER TO AN ONLINE ANONYMOUS WEB-BASED SURVEY

Dear Prospective participant,

You are invited to participate in a survey conducted by Annelee Panday (Annie) under the supervision of Dr. MA Schoeman, a senior lecturer in the School of Computing, College of Science, Engineering and Technology towards a Master's of Science in at the University of South Africa.

The survey you have received has been designed to study the how the South African higher education IT curriculum can be adapted to improve the efficiency of an IT graduate upon employment. You were selected to participate in this survey because of you have been employed as an IT graduate. By completing this survey, you agree that the information you provide may be used for research purposes, including dissemination through peer-reviewed publications and conference proceedings.

It is anticipated that the information we gain from this survey will help us to improve graduates' preparation for employment. You are, however, under no obligation to complete the survey and you can withdraw from the study prior to submitting the survey. The survey is developed to be anonymous, meaning that we will have no way of connecting the information that you provide to you personally. Consequently, you will not be able to withdraw from the study once you have clicked the send button based on the anonymous nature of the survey. Any identifying information that is obtained in connection with this survey will remain confidential and will be disclosed only with your permission or as required by law. If you choose to participate in this survey it will take up no more than twenty minutes of your time. You will not benefit from your participation as an individual, however, it is envisioned that the findings of this study will improve the calibre of graduates for employment thus making the working



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environment more effective and productive upon their employment. We do not foresee that you will experience any negative consequences by completing the survey. The researcher undertakes to keep any information provided herein confidential, not to let it out of our possession and to report on the findings from the perspective of the participating group and not from the perspective of an individual.

The records will be kept for five years for audit purposes where after it will be permanently destroyed together with all electronic versions which will be permanently deleted from the all storage devices. Note that you will not be reimbursed or receive any incentives for your participation in the survey.

The research was reviewed and approved by the Ethics Review Committee. The primary researcher, Annelee Panday, can be contacted during office hours via email: 58562702@mylife.unisa.ac.za or anniep@cti.ac.za. Should you have any questions regarding the ethical aspects of the study, you can contact the chairperson of the Ethics Research Committee via SocEthics@unisa.ac.za. Alternatively, you can report any serious unethical behaviour at the University's Toll Free Hotline 0800 86 96 93.

You are making a decision whether or not to participate by continuing to the next page. You are free to withdraw from the study at any time prior to clicking the send button.



Appendix H – Similarity check

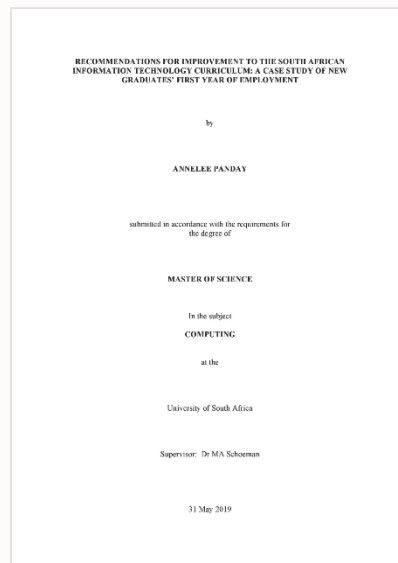


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30 May 2019

Re: Mrs Annelee Panday, student number 58562702

This is to confirm that a copy of the final dissertation,

“RECOMMENDATIONS FOR IMPROVEMENT TO THE SOUTH AFRICAN
INFORMATION TECHNOLOGY CURRICULUM: A CASE STUDY OF NEW GRADUATES’
FIRST YEAR OF EMPLOYMENT”

has been submitted to an appropriate plagiarism detection system and the results are within
acceptable limits of similarity.

Sincerely



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