Competency Maturing

A substantive theory of how senior Information Systems undergraduates develop their existing competencies and acquire additional competencies within an organic learning environment

A thesis presented for the Degree of Doctor of Philosophy in the Department of Information Systems

By

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Abstract

There is a high demand for competent Information Systems (IS) / Information Technology (IT) graduates in a globalised knowledge-driven economy with rapidly evolving Information and Communication Technology (ICT). However, becoming a competent IS/IT graduate is not a once-off event because rapid technological changes require that IS/IT graduates continually strive to be up-to-date and relevant. Continuous updating of knowledge, keeping up-to-date, acquiring a diverse set of IS/IT/ICT competencies, and being competent is a problematic task globally, and requires building competencies comprising knowledge, skills, abilities and values.

This thesis employs Classic Grounded Theory Methodology (CGTM) with a single case to identify the main concern of senior IS undergraduates during their learning process, and how they resolve the concern. Data were obtained from two diverse groups of senior IS undergraduate classes using multiple data collection methods, embedded in constant comparative analyses. Understanding what was going on in the substantive research area and explaining how the senior IS undergraduates' main concern was resolved was the focus of the data collection and conceptualisation.

Through the single case exploratory CGTM study, the senior IS undergraduates' main concern emerged as a *perceived lack of IS Competency*, and the main concern was explored. A substantive theory of *Competency Maturing* conceptualises and explains how these students attempt to resolve their *perceived lack of IS Competency*. A substantive theory of *Competency Maturing* is a Basic Social Process (BSP) which involves engaging in *learning by doing*, and *spontaneous learning* within an *organic learning environment*. Three phases of the BSP of *Competency Maturing* are *student engagement*, *self-awareness of competency*, and *self-development*.

This thesis recommends a Framework for a South African senior IS undergraduates' programme and offers a set of conceptual propositions developed from empirical data. The thesis makes theoretical and practical contributions to the IS education body of knowledge of student engagement, learning environment, senior IS undergraduates' curriculum development and competency development. A substantive theory of *Competency Maturing* is relevant to IS educators who wish to break away from traditional, teacher-centred approaches in higher

education, and are willing to create learning environments where senior IS undergraduates are motivated to learn in rich, relevant and real-world contexts. The thesis contributes to IS educators who seek to understand how the learning environment and IS educational content influence and support *student engagement* and *Competency Maturing*. This thesis also offers IS educational practitioners an understanding of the educational content and a delivery style that can provide senior IS undergraduates with strong theoretical and practical foundations. The thesis's findings suggest that creating an *organic learning environment* can be a useful approach to developing more competent IS graduates.

Keywords: *Competent Information Systems graduates, Competency Maturing, Organic learning environment, Learning-by-doing, Spontaneous learning, Student engagement, Self-awareness of competency, Self-development*.

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Dedication

This thesis is dedicated to the Almighty God, the lover of my soul, the only potentate (1 Timothy 6:15).

Acknowledgement

My sincere gratitude goes to the Almighty God, who has always been there for me; He sustained and kept me throughout this long journey. Indeed, I can do all things through Christ who strengthens me (Philippians 4:13), and with God, all things are possible (Matthew 19:26).

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List of acronyms and abbreviations

ACM	Association for Computing Machinery
AIS	Association for Information Systems
AITP	Association of Information Technology Professionals
AMCIS	Americas Conference on Information Systems
BCS	British Computer Society
BI	Business Intelligence
BPM	Business Process Management
BSP	Basic Social Process
CE	Course Evaluation
CGT	Classic Grounded Theory
CGTM	Classic Grounded Theory methodology
CITANDA	Centre for Information Technology and National Development
CITP	Chartered IT Professional
CV	Curriculum Vitae
e-CF	e-Competence Framework
ECIS	European Conference on Information Systems
ER	Empirical Research
ERP	Enterprise Resource Planning
DHET	Department of Higher Education and Training
DPMA	Data Processing Management Association
GC	Global Citizenship
GDP	Gross Domestic Product
GIS	Geographic Information Systems
GTM	Grounded Theory Methodology
HEI	Higher Education institution

HEQF	Higher Education Qualification Framework
HEQSF	Higher Education Qualification SubFramework
HKAIS	Hong Kong Association for Information Systems
HTML	Hypertext Markup Language
ICIS	International Conference on Information Systems
ICT	Information and Communication Technology
IDA	Infocomm Development Authority
IFIP	International Federation for Information Processing
IM	Information Management
IoT	Internet of Things
IS	Information Systems
IT	Information Technology
JSTORE	Journal Storage
KSAOs	Knowledge, Skills, And Other Characteristics
LMS	Learning Management Systems
MIS Quarterly	Management Information Systems Quarterly
NVQ	National Vocational Qualification
NWU	North-West University
PACIS	Pacific Asia Conference on Information Systems
PC	Personal Computer
POE	Portfolio of Evidence
SACLA	Southern African Computer Lecturers' Association
SADC	Southern African Development Community
SAICSIT	South African Institute for Computer Scientists and Information Technologists
S/4 HANA	SAP High-Performance Analytic Appliance fourth version

SD	Systems Development
SFIA	Skills Framework for the Information Age
SOAR	Self, Opportunity, Aspiration, Results
STEM	Science, Technology, Engineering, and Mathematics
SU	Stellenbosch University
UCT	University of Cape Town
UJ	University of Johannesburg
UKZN	University of Kwazulu Natal
UP	University of Pretoria
V1, V2, V3	Version 1, Version 2, Version 3
VET	Vocational Education and Training
Wits	University of the Witwatersrand

Plagiarism Declaration

1. I know that plagiarism is wrong. Plagiarism is to use another's work and pretend that it is one's own.

2. I have used the required convention for citation and referencing. Each contribution to and quotation in this PhD thesis *"Competency Maturing: A substantive theory of how senior Information Systems undergraduates develop their existing competencies and acquire additional competencies within an organic learning environment*" from the work(s) of other people has been attributed and has been cited and referenced.

3. This PhD thesis *"Competency Maturing: A substantive theory of how senior Information Systems undergraduates develop their existing competencies and acquire additional competencies within an organic learning environment*" is my own work.

4. I have not allowed, and will not allow, anyone, to copy my work with the intention of passing it off as his or her own work.

5. I acknowledge that copying someone else's assignment or essay, or part of it, is wrong, and declare that this is my own work.

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Tejumade V. Ogundipe **May 2021**

1. Introduction

Information and Communication Technology (ICT) competencies are essential for driving business growth and innovation in a globalised knowledge driving economy (Gjermundrod, Dionysiou, Baumberger & Pattinson, 2016). One of the aims of establishing tertiary institutions – universities and colleges – or academic programmes is to graduate students who are competent, prepared and well able to take up employment immediately after graduating and fulfil a role in the society (Miller & Dettori, 2008; Mulder, Gulikers, Biemans & Wesselink, 2009). The earlier views which focus on producing graduates with generic skills have given way to approaches that emphasise understanding, metacognition, personal attributes and practical skills (Griesel & Parker, 2009). The core functions of the Higher Education institutions (HEIs) of teaching, researching to produce scientific knowledge and service have played a central role as knowledge and skills providers. These also translate to why Computing educators – such as Information Systems, Information Technology, Computer Engineering, Computer Science, and Software Engineering lecturers – focus on graduating competent students to prepare for future careers in industry or to advance their studies (Miller & Dettori, 2008; Radermacher & Walia, 2013).

Information Systems (IS) programmes have a long tradition of enabling graduates to develop the appropriate skills needed for their future careers upon graduation (Mitchell & Benyon, 2018; Tan, Nakata & Paul, 2018). Previous studies, however, suggest that IS curricula are not always well aligned with industry/business needs, and that organisations have difficulties in finding "*IS graduates who possess both the knowledge and skills that are best suited to their specific needs*" (Tan et al., 2018, p. 169). IS curricula are thus required to be regularly updated to meet the need of rapid technological changes (Woodside, Augustine, Chambers & Mendoza, 2020). To produce competent IS graduates, able to meet the developmental requirements of a country, requires a collaborative engagement of business, government, and HEIs (Mateus, Iwu & Allen-Ile, 2014; Schlebusch, 2018; Scott, Yeld & Hendry, 2007).

This thesis focuses on senior IS undergraduates and derives a substantive theory of Competency Maturing that explains how senior IS undergraduates attempt to mature Competency during their learning process.

The rest of this introductory chapter is organised as follows: Section 1.1 covers the definition of the key terms in the thesis title. Section 1.2 presents the purpose of the study, which covers the aim and objectives of the thesis. Section 1.3 provides a brief overview of the research methodology, followed by section 1.4, which presents the scope of the study. Section 1.5 covers the ethical approvals, and an overview of the research journey is presented in section 1.6. Section 1.7 covers how I addressed the potential bias, and section 1.8 concludes with an outline of the thesis.

1.1. Definition of key terms

Appendix A: Glossary of terms. The key terms as used in the thesis are defined and presented in alphabetical order as follows:

Competency emerged as a graduate's ability to know the core concepts of the IS discipline, how and why to apply the core concepts to complete today's and tomorrow's Information System tasks successfully and effectively (Arifin, Rasdi & Mohd, 2017; Leidig, Salmela, Anderson, Babb, de Villiers, Gardner, et al., 2020; Ulrich & Dulebohn, 2015; Yang, Fang & Huang, 2017).

A substantive theory of ***Competency Maturing*** emerged as a continuous process by which senior IS undergraduates develop their existing competencies and acquire additional competencies that have personal or life relevance, through engaging with peers, academics, and industry practitioners, and with a wide variety of relevant Information Systems educational content shared within an organic learning environment.

An **organic learning environment** emerged as a natural learning space that respects and responds to senior IS undergraduates' individual and collective needs (goals, values and interests), where IS educational resources are sufficiently abundant and well organised, allowing senior IS undergraduates to learn by doing and spontaneously develop and improve their competencies (skills, knowledge and acquire experiences).

Senior Information Systems undergraduates are students who enrol in an optional fourth-year IS undergraduate programme, i.e. three years IS undergraduate programme with an additional one-year qualification, which prepares them for a research-based postgraduate

programme. The fourth-year programme, otherwise referred to as an Honours programme in countries such as South Africa and the United Kingdom, typically follows a Bachelor's programme.

A **substantive theory** is a theory developed from a specific research area (Glaser, 1978; Glaser & Holton, 2005a; Woods, Gapp & King, 2016).

1.2. Study aim and objectives

I began this thesis broadly to identify and explore senior IS undergraduates' main concern during their learning process. The study was exploratory, and the focus of the data collection and conceptualisation was to generate a grounded theory that explains the resolution of the senior IS undergraduates' main concern during their learning process. Following an inductive approach, the emergent grounded theory, in the end, provides an explanation to the following question:

How do senior IS undergraduates mature competency during their learning process?

However, I started the thesis by asking the question: "what is the main concern of senior IS undergraduates during their learning process, and how do they attempt to resolve the concern?" The thesis objectives were to:

- identify the main concern of the senior IS undergraduates during their learning process,
- explore how they attempted to resolve their main concern, and
- generate a substantive theory that conceptualises and explains how the senior IS undergraduates attempted to resolve their main concern.

1.3. An overview of research methodology

As Braun and Clarke (2006, p. 97) indicate, "*[w]hat is important is choosing a method that is appropriate to your research question, rather than falling victim to 'methodolatry', where you are committed to method rather than topic/content or research questions*". For this thesis, I needed to investigate real-life empirical situations in the substantive research area; thus, I chose the approach that enabled me to answer the research question and meet the thesis objectives. I

embraced an inductive research approach to explore the main concern of senior IS undergraduates, which was revealed as being resolved through Competency Maturing during their learning process.

The research process determines a theory's authenticity; how the theory was developed or generated (Glaser & Strauss, 1967). A theory that emerges from an inductively developed social research captures what is happening in the substantive area, unlike a theory logically deduced from a priori assumption (Glaser & Strauss, 1967; Patton, 2015). We are in a fast-changing world, and our understanding of the opportunities and challenges ICT presents is constantly evolving (Terras & Ramsay, 2012; Urquhart, 2013). Previous theories not grounded in data may not be useful for theoretical advancement (Glaser & Strauss, 1967). As a result, the Classic Grounded Theory methodology (CGTM) was considered appropriate for this study and was used to interrogate the main concern and achieve the research objectives.

The CGTM is an inductive research approach with elements of both abductive and deductive analysis (Holton, 2017; Holton & Walsh, 2017). Several scholars have indicated that grounded methodology is probably the most influential qualitative research approach in social science (Birks & Mills, 2011; Denzin, 1997; Lacey & Luff, 2009; Morse, 2009; Patton, 2015). CGTM is suitable for studying processes (Holton & Walsh, 2017), building theory in the area where no previous theory exists or producing a fresh viewpoint on existing knowledge (Goulding, 2002; Urquhart, 2013). CGTM can be used in a research area where little is known (Goulding, 2002; Urquhart, 2013). CGTM provides a set of interrelated grounded concepts that describe both the research process and a new theory empirically grounded in data (Holton & Walsh, 2017).

1.4. Scope of thesis

This thesis is a CGTM study with a single case, where I used multiple data collection methods to obtain data from academics, and from senior IS undergraduates who enrolled in an Honours programme in a South African HEI. Using a case study or cases within a GTM study is quite feasible, as has been demonstrated in several IS studies such as Fernandez (2003), van Niekerk (2009) and Adolph (2013). The thesis used a case study because:

> "*(1) researchers can study information systems in a natural setting, learn about the state of the art, and generate theories from practice, (2) it allows the researcher to answer "how" and "why" questions, thus, to understand the nature and complexity of the processes taking place, and (3) it is an appropriate way to research an area in which few previous studies have been carried out*" (Mueller & Urbach, 2013, p. 9).

A case study can be either a single case or multiple cases with several levels of analysis and can be used to describe, test theory or generate theory (Eisenhardt, 1989; Yin, 2009). A single case was considered appropriate for this thesis because single cases can "*enable the creation of more complicated theories than multiple cases, because single-case researchers can fit their theory exactly to the many details of a particular case*" (Eisenhardt & Graebner, 2007, p. 30). "*Case studies typically combine data collection methods such as archives, interviews, questionnaires, and observations*" (Eisenhardt, 1989, p. 534).

For the thesis, I used multiple data collection methods to generate a substantive theory of *Competency Maturing*. The multiple data collection methods included direct observation, informal discussions, formal interviews (face-to-face and telephonic interviews), field notes, lecture videos, documentation (course evaluations, Honours Programme outlines, and seminar reflections), online surveys, and when the theory was sufficiently grounded, I used scholarly literature. In line with Eisenhardt's (1989) view, the multiple data collection methods assisted in triangulating the evidence and strengthening the emerged theory of *Competency Maturing*.

1.5. Ethical approvals

Before I could interview or interact with any participants, I had to obtain all the relevant or necessary ethical approvals. Approvals were obtained from the Faculty Ethics in Research Committee, Executive Director of Human Resources, and Executive Director of Student Affairs. Ethic approval number 34-2015 from the XXX Faculty.

1.6. An overview of my research journey

I conducted this CGTM thesis to explain how senior IS undergraduates resolve their main concern during their learning process. Conducting and completing this CGTM thesis was not an easy task since CGTM was new to me. The initial phase of the thesis was characterised by

uncertainty and fear, and thus, it took longer than anticipated. This thesis that was initially intended to examine unintended consequences of mobile technology usage in undergraduate teaching and learning processes resulted in developing a substantive theory of *Competency Maturing*. It was possible because of the research approach, CGTM, that I adopted.

1.7. Dealing with bias

It was relatively easy for me to set up interviews with the senior IS undergraduates because the students had a computer laboratory dedicated to them, where each student is provided with a workspace (a Personal Computer (PC), a table and a chair). To minimise power imbalances between the senior IS undergraduates and myself as a researcher, I conducted all the face-to-face interviews within the Department of Information Systems. A flexible and semi-structured approach was used to obtain data from the senior IS undergraduates. This approach allowed them to take the lead, and have their voices heard. Although I was more comfortable interviewing the black students, being a black person myself, I did not allow any personal bias to influence the process of inviting whom to participate in the study. I theoretically sampled and did not try to over-represent or under-represent a group and made the follow-up surveys available to all the senior IS undergraduates who enrolled in the 2015 and 2016 Honours programmes. There was no conflict of interest, as I have never registered or attended the IS Honours programme at any point; thus, there was no impairment in my ability to present an unbiased analysis of data.

1.8. The outline of the thesis

The left side of Table 1 presents how the thesis was conducted, while the right side is the outline of the thesis.

Table 1: How the thesis was conducted versus the outline of the thesis.

How thesis was conducted		**Outline of the thesis**	
Phases	**Description**	**Chapters**	**Description**
Starting out Noting down prior interests, exploring pre-conceptions, obtaining approvals, asking the right question.	Identification of the research field	1	**Introduction** Introduces the thesis and presents the definition of key terms, the study aim and objectives, an overview of the research methodology, the thesis's scope, ethical approvals, an overview of the research journey, dealing with biases, and outline of the thesis.
Open coding **Constant comparison** Purposive sampling, Initial data collection, coding line by line and in vivo coding, theoretical sampling, additional data collection, etc.	Identification of the main concern		
	Theoretical sensitivity	2	**A contextual literature review** Based on a hermeneutic framework proposed by Boell and Cecez-Kecmanovic (2014), this chapter identifies and presents concepts relevant to senior IS undergraduates. The chapter covers the nature of IS discipline, issues pertinent to senior IS undergraduates, and recommended a framework for a South African senior IS undergraduate programme.
Selective coding **Constant comparison** Theoretical sampling, additional data collection, theoretical coding, saturation, a little bit of reading and integrating the literature.	The emergence of the core category	3	**Research Methodology** Presents philosophical assumptions, an overview of the adopted research approach and criteria for evaluating Classic Grounded Theory.
		4	**Case description** An overview of the senior IS undergraduate programme, research population, primary and secondary data sources, and the case's employment outcome**.**

How thesis was conducted		Outline of the thesis	
	Literature Review	5	**Conceptual grounding process** Presents the preconceived idea and personal struggles (entering the field), systematic data collection, coding, and analysis, and reflection on the conceptual development process.
	Theoretical saturation	6	**Theory of Competency Maturing** Presents the conceptual overview of a substantive theory of Competency Maturing, an organic learning environment, Competency Maturing process and phases, learning by doing and spontaneous learning, and the resultant effect of the senior IS undergraduates going through a Competency Maturing process, and the evaluation of a substantive theory of Competency Maturing.
Theoretical coding Relating the emerged substantive codes to each other, examining the nature of the relationships between codes.	Integrating the theory and delimiting the theory. Articulating the research question.	7	**Theoretical integration** Relates Competency Maturing theory with the Iceberg Model of Competency and Boyatzis' intentional change theory, and other related theories in the extant literature that explain certain concepts in the Competency Maturing theory.
Writing Sorting, writing, reading and integrating the literature, and a little bit of theoretical sampling, theoretical coding, and saturation.	Integration and elaboration of the grounded theory	8	**Conclusion** Presents contributions of the thesis to knowledge, implications of the findings for students and teaching, and limitations of the thesis and recommendations for further research.

2. A contextual literature review

This chapter presents a contextual literature review relevant to South African senior IS undergraduates and their learning process. The aim is to synthesise and critically assess what is pertinent to the senior IS undergraduates' main concern and then suggest a framework for their South African programme. The chapter's layout is as follows: section 2.1 presents an overview of the contextual literature review process. Section 2.2 covers the nature of the IS discipline, and this is immediately followed by section 2.3, which looks at the senior IS undergraduates' issues. Subsequently, section 2.4 critically assesses the state of the literature relevant to the senior IS undergraduates' main concern and suggests a good practice framework for their South African programme. Section 2.5 summarises the chapter.

2.1. An overview of the contextual literature review process

Following Holton's (2017) suggestion on the presentation of a CGTM study, the contextual literature review was done ex-post but presented ex-ante to help the reader understand the thesis. This chapter presents what the extant literature says about the subject of the thesis: **how senior IS undergraduates mature competency during their learning process**. A hermeneutic process was used to identify and interpret relevant concepts to the phenomenon which involved finding relevant texts, and then interpreting them to develop a broader understanding of the relevant literature (Boell & Cecez-Kecmanovic, 2014). The literature review was developed iteratively through two major mutually intertwined hermeneutic circles - the search and acquisition circle, and the wider analysis and interpretation circle (Boell & Cecez-Kecmanovic, 2014).

Based on the initial knowledge about senior IS undergraduates' main concern and review papers, a set of keywords was developed to form a search string. The search string was used to search the following databases, top IS journals and conferences, developing countries' journals, and African journals and conferences:

- Databases: Google Scholar, ScienceDirect, Scopus, Web of Science, EBSCO host, JSTORE, AIS eLibrary.
- IS journals: MIS Quarterly, Information Systems Research, Journal of Management Information Systems, Journal of the AIS, Information Systems Journal, European

Journal of Information Systems, Journal of Information Technology, Communications of the ACM, Communications of the AIS, Information & Organisation, Electronic Journal of IS in Developing Countries, African Journal of Information Systems, Journal of Information Systems Education, South African Computer Journal.

- IS conferences: ICIS, ECIS, PACIS, AMCIS, SAICSIT, SACLA.

Based on the emerged concepts, the initial search string was then updated and modified to:

> **("Information Systems" OR IS) AND (Honour* OR Honor* OR "senior undergrad*" OR Graduate* OR "4th year" OR undergraduate*) AND (curriculum OR curricula OR Model OR Framework).**

All the relevant, peer reviewed, full-text accessible journal and conference papers published in the English Language from 2015 – 2020 were acquired. The orientational reading of the identified publications was then done, followed by deeper reading and further searching. Additional relevant publications were obtained through citational tracking of authors, journals, and conferences. The hermeneutic process continued until a saturation point was reached – when new publications only introduced familiar concepts. Based on the concept-centric classification of the literature (Webster & Watson, 2002), the resulting literature is organised as follows.

2.2. The nature of the Information Systems discipline

Information Systems (IS) is one of the most diverse and dynamic interdisciplinary disciplines in the social science field (Lee, Park & Suh, 2018; Nambisan, 2003) that evolves with a continuous stream of technological developments, deployment opportunities, and trends (Leidig et al., 2020). IS combines technology, data, people, and processes, directed toward the collection, manipulation, storage, organisation, retrieval, and communication of information (Belanger & Van Slyke, 2011). Tarafdar and Davison (2018, p. 525) define the IS discipline "*as that which studies the human, social, and technological phenomena associated with the design, construction, implementation, and use of computer-based information systems by individuals, organizations, and societies*". An early definition of IS articulates five components; hardware, software, data, users, and process (or procedures), and the sixth component which accounts for media/communication has recently been added (Belanger, Van

Slyke & Crossler, 2019). The IS discipline, which was commonly referred to as "management information systems" and formed from the nexus of computer science, management and organisation theory, operations research, and accounting, has been around and evolving since the 1960s (Hirschheim & Klein, 2012). The emergence of the discipline can be traced to the limitation experienced in primary disciplines to focus specifically on the application of computers in organisations, for example,

> "*Computer Science was a theoretical study of implementing structures and processes to a computer, while Software Engineering focused on the design and construction of computer hardware and software. IS was introduced to examine the usage of computers within organizations to serve as a bridge to organizational and societal contexts*" (Leidig et al., 2020, p. 21).

The IS research and practice talk of three uses of information: intended information, potential information, and information in use, which are simultaneously related to social, cognitive, technological, and material aspects and resonate with IS's sociotechnical perspective (Boell & Cecez-Kecmanovic, 2015). The sociotechnical perspective of IS, which considers the technical artifacts and the individuals or collectives that develop and use the artifacts in social contexts, captures the essence of the discipline (Sarker, Chatterjee, Xiao & Elbanna, 2019). IS scholars have noted that neither the technical nor the social contexts should be apportioned a privileged position, but ascribe comparable importance to both, as the outcomes of the interaction emerges from the interplay of the technological artifacts and their appropriation in human contexts (Beath, Berente, Gallivan & Lyytinen, 2013; Fischer & Baskerville, 2020; Sarker, Chatterjee, Xiao & Elbanna, 2019). Lee (2004) indicated that studies that do not account for this interplay are not considered IS research. However, Sarker, Chatterjee, Xiao and Elbanna (2019) proposed that scholars be aware of their work on a sociotechnical continuum where on one end are predominantly sociocentric studies and on the other end are predominantly technocentric studies. Technology artifacts, information artifacts, and social artifacts form the IS artifacts (Lee, Thomas & Baskerville, 2015).

2.2.1. Developmental stages of IS across regions and countries

Due to different environmental and situational factors, IS as an academic discipline is in different developmental stages across regions and countries (Lee & Yoo, 2007). For example, the series of papers published in a special issue of Communications of the AIS (Chau & Kuan, 2007; Gable, 2007a; Lee & Liang, 2007; Lee & Yoo, 2007; Tan & Chan, 2007) that reported the state of the IS academic discipline in Pacific Asia (Australia, Singapore, Korea, Hong Kong, Taiwan, New Zealand), clearly demonstrate that IS as an academic discipline has evolved differentially around the globe. Therefore, a similar type of case study would be useful in determining the state of IS as an academic discipline in South Africa. These papers from Communications of the AIS will now be outlined country by country.

The developmental stages of the IS discipline in Australian universities can be categorised into three main phases, the emergence phase, establishment phase, and consolidation phase (Gable, 2007b). During the emergence phase (up to 1965), the curriculum emphasised systems and development, producing hundreds of influential senior managers in public and private sectors (Gable, 2007b). From 1965-1973 (the establishment phase), departments were created to assist business and government with the application of computers, which gave rise to topics about how to apply technology in universities' IS undergraduate curricula to sub-majors, majors and later postgraduate teaching and research (Gable, 2007b). The next phase is the consolidation phase, from 1974-1990, when the first university IS department was formed, and the first IS professor was appointed in an Australian university, and in 1990, IS was first recognised within the Australian Computer Society Accreditation Guidelines (Gable, 2007b). Australian universities had more IS departments located in the business faculty than in a technology faculty (Gable, 2007a, 2007b). The study revealed little evidence of a distinctive Australian flavour of IS, the decentralised nature of Australia as a country, and concluded that IS in Australian universities has a low degree of professionalism relative to longer-standing disciplines (Gable, 2007a, 2007b).

The Infocomm Development Authority (IDA), which is the regulatory board of Singapore, has as its strategic goal "*to cultivate a vibrant and competitive infocomm industry in Singapore - one that attracts foreign investment and sustains long-term GDP [Gross Domestic Product]*

growth through innovative infocomm technology development, deployment, and usage in Singapore - in order to enhance the global economic competitiveness of Singapore" (Tan & Chan, 2007, p. 108). Singapore universities particularly have distinctive features of the IS curriculum; the universities have the freedom of formulating their own curricula and are not pressured by any local contingencies, thus have a high degree of professionalism (Gable, 2007a; Tan & Chan, 2007). Apart from taking initiatives from the AIS and the annual surveys of IDA, some universities in Singapore include distinctive subjects developed based on the advice of an industry board (such as the National University of Singapore), others (such as the Nanyang Technological University) focus more on IS/IT applications in a specific business context (such as finance and banking, the service sector, and accounting). The IS curriculum in Singapore Management University combines IT and business core units with liberal arts core units (Tan & Chan, 2007). The aims of these universities vary from producing technically-strong students that could effectively deploy IT for business; to producing business students who understand and can identify and deploy IT in enhancing/supporting business functions; to producing students who understand business processes/architecture and how IT could be deployed in the context of these processes (Tan & Chan, 2007). Therefore, the IS programmes in Singapore universities are well placed to recognise the country's changing needs and respond quickly to produce IS graduates that match the country's needs, thereby meeting industry demand (Tan & Chan, 2007).

In the mid-1980s, the IS discipline began to emerge as a separate academic field in Korea, generally located as either an academic major (mainly adopted by top-tier schools) or as a department (as a key programme in second-tier universities) within the College of Business Administration (Gable, 2007a; Lee & Yoo, 2007). Korean universities faced both market and economic crises, and depended mainly on student tuition fees in their financial management. The Korean private universities required tuition fees for about 90 percent of their finances, and the universities and colleges needed to achieve their respective student quotas in their undergraduate and graduate programmes (Lee & Yoo, 2007). Due to these crises, "*with the support of the Korean Government, public and private universities are encouraged to cut on their student quota, to optimize their academic structure, to set up university-industry collaboration, and to conduct mergers and acquisitions between universities*" (Lee & Yoo, 2007, p. 62). The financial and restructuring pressure on Korea's education sector can either

be an opportunity or threat to the evolution process of emerging disciplines such as the IS discipline. The IS discipline in Korea is considered immature because of the high impact of local contingencies (Gable, 2007a; Lee & Yoo, 2007).

IS, as a young academic discipline in Hong Kong, had the first IS department established in 1990, situated in the faculty of business, and the second IS department founded in 1992 within the business school (Chau & Kuan, 2007). Though IS groups in Hong Kong might be within different departments, due to reorganisation, they are now located in business schools with almost no separate IS identity within the universities (Chau & Kuan, 2007; Gable, 2007a). Previously, several IS groups had a separate identity before being merged with other groups in other disciplines. Hong Kong faced declining demand and negative growth in all its IS programmes, resulting in a university closing its IS major programme due to low enrolment due to the downturn of the economy (Chau & Kuan, 2007). The Hong Kong undergraduate IS curriculum emphasises business/management skills, equipping the students with knowledge and skills in both business and technical areas. At the master's level, the focal point is either management of IS/IT or electronic business/commerce. However, the IS groups are generally small in terms of staff numbers and weak in terms of the number of senior faculty members, especially at the chair or professorship level, and there is limited collaboration between the IS academic community and industry professionals. The establishment of the HKAIS (Hong Kong Association for Information Systems) will hopefully encourage more collaboration (Chau & Kuan, 2007; Gable, 2007a).

IS is called Information Management (IM) in Taiwan, and as an academic discipline, IS is newer in Taiwan than other business disciplines. Due to the strong high-tech manufacturing industry presence, which offers a very good job market, IS is the fastest growing business discipline and the most popular major among college students in Taiwan (Lee & Liang, 2007). The largest growth was experienced in the graduate programmes. The Taiwanese government closely controls higher-education policies, thus all programmes need official permission before recruiting students (Lee & Liang, 2007). The first stage was the initiation of undergraduate programmes, from 1981-1990, when the government only permitted a few IS programmes to recruit undergraduate students. The second IS evolution was the establishment of graduate programmes first offered in 1989, and the third evolution featured the offering of doctoral

programmes, first offered in 1998 (Lee & Liang, 2007). Graduate studies used to be free until around 1999, and doctoral programmes are highly regulated by the Taiwanese Ministry of Education. Taiwanese IS programmes require students to learn the strategic and organisational aspects of IS as well as the design science aspect of programming and system development (Lee & Liang, 2007).

Lehmann and Huff (2007) recorded three separate identifiable developmental stages since the advent of IS academic programmes and departments in the 1980s in New Zealand universities. From the early 1980s to about 1997, IS's initial seed as an academic discipline was sown in each of the seven universities in New Zealand. The growth rate in the second stage, from around 1997 to late 2002, was more rapid "*both in terms of the number of students seeking an IS education, the size of the IS faculties, and also in [the] breadth of programme offerings*" (Lehmann & Huff, 2007, p. 88). In the third stage, by late 2002 or early 2003, New Zealand universities experienced a downturn in their student demand for IS courses, majors and programmes / electronic commerce (Gable, 2007a; Lehmann & Huff, 2007). The majority of IS units in New Zealand universities are in business/commerce faculties, and all have a postgraduate programme with widely differing emphasis and a distinct variation in the teaching and research focus in their IS programmes (Lehmann & Huff, 2007). The IS discipline in New Zealand has a clear business orientation (emphasising IT's organisational/managerial business aspects) and a significant bias towards the more technical elements (Gable, 2007a; Lehmann & Huff, 2007).

Similarly, in South Africa, the late Prof Roode is known as IS academic pioneer (Anteneh, Brown, Toker & Wiredu, 2014; Kroeze, Pretorius & Roode, 2010). He was appointed in 1988 to head the new Department of Informatics at the University of Pretoria (Venter, 2009). He later became a visiting professor to other institutions in South Africa, such as the University of Cape Town (UCT) and Cape Peninsula University of Technology (Kroeze et al., 2010) and became a convener of the UCT IS PhD programme in 2003 until he passed away in 2009 (Anteneh et al., 2014).

In the 90s, IS departments were under-resourced, while they were equally under pressure to increase students' enrolment (Machanick, 1999), when students entering the universities were

unaware of IS as a field of work and study (Seymour, Hart, Haralambous, Natha & Weng, 2005). In the 2000s, South Africa experienced a high demand for workers with a tertiary qualification, an increasing demand for graduates with an education in STEM (Science, Technology, Engineering, and Mathematics), and unmet demand for ICT services (Seymour et al., 2005). Increasing the enrolment in the ICT related fields became a key focus of the Ministry of Education. In terms of their IS curriculum, South Africa had challenges implementing the IS'97 curriculum because the undergraduate programme was three years in contrast to the typical four-year programme, which IS'95 intended (de Villiers & Roode, 1995). Instead of finding room for additional external courses, an alternative teaching approach for enabling students to acquire the required skills by practising them, meeting the industry requirements and IS'95 recommendations, was proposed.

Due to high student-to-teacher ratios and a massive shortage of IT professionals and academics, initially, IS academics were largely involved with teaching (Kroeze et al., 2010), resulting in a small IS research community in South Africa (Brown & Tanner, 2008). This problem is not unique to IS academics. Prior to 1990, there was virtually no computer science research being done in South Africa (Kritzinger, 1990). According to Kroeze et al. (2010), North-West University (NWU) was the first South African institution to create a full-time research professorship in a School of IT to promote a research culture. The South African IS research output has since increased. From 2008 to 2017, Parry (2019) reported a greater rate of increase in the South African computing research output than that of South African research at large. The number of IS doctorates awarded in South Africa grew very fast since 2009, increasing the research output and the number of academic staff members in the Computing discipline (Sanders & Alexander, 2015).

2.2.2. Positioning and characteristics of IS programmes

IS programmes exist in various schools, faculties, and institutions, and each programme has its specific characteristics (Leidig et al., 2020; Sherer, 2002). The 2021 Times Higher Education and US News Best Global Universities Rankings included the 26 public universities distributed across the nine provinces of South Africa. Table 2 describes the IS departments of the top

seven South African universities, based mainly on the information available on each institution's websites.

Table 2: The IS departments of the top seven South African universities.

Institutions	**Schools**	**Faculties**	**Programmes characteristics**
University of Cape Town (UCT)	IT	Commerce	The IT school bridges the Science, Commerce and Humanities Faculties and combines knowledge and practice of IS and Computer Science disciplines. The UCT IS department offers a range of qualifications and courses accommodating students from the first year to doctoral levels. It caters for both part-time and full-time students at the postgraduate level.
University of the Witwatersrand (Wits)	Business sciences	Commerce, Law and Management	Wits offers IS programmes for undergraduate and postgraduate study, from the first-year undergraduate to doctoral degrees. The postgraduate programmes are offered either full-time or part-time.
Stellenbosch University (SU)	-	Faculty of Arts and social sciences	The Information Science Department offers Information Systems modules to students in multiple faculties, e.g. offers Information Systems Management to students in the Faculty of Economic and Management Sciences, and Socio-Informatics to students in the Faculty of Arts and Social Sciences. The Information Science department, together with the departments of Computer Science and Electronic Engineering, form the IT departments at SU. SU Information Science undergraduate programmes focus on the domain of Information Systems and offer advanced programmes in Information and Knowledge Management practice at the postgraduate level.
University of Kwazulu Natal (UKZN)	Management, IT and Governance	Law and Management Studies	The Information Systems and Technology department offers IS programmes for undergraduate and postgraduate students.

Institutions	**Schools**	**Faculties**	**Programmes characteristics**
North-West University (NWU)	Computer Science and Information Systems	Natural and Agricultural Sciences	NWU offers part-time and full-time contact and distance IT programmes for undergraduate students. The Faculty of Economic and Management administers postgraduate Information Systems programmes while the Natural and Agricultural Sciences faculty offers Information Systems programmes at undergraduate and postgraduate levels.
	Economic Sciences	Economic and Management Sciences	
University of Johannesburg (UJ)	Consumer Intelligence and Information Systems	Business and Economics	The Applied Information Systems department offers Information Systems programmes for undergraduate and postgraduate study.
University of Pretoria (UP)	IT	Engineering, Built Environment & IT	UP Informatics department offers both undergraduate and postgraduate degrees in Informatics, Information Systems and Information Systems. The Masters degree in Information Systems is administered by the Faculty of Engineering, Built Environment and Information Technology, while the Informatics Masters degree is administered by the Faculty of Economic and Management Sciences. Together with the departments of Information Science and Computer Science, the Informatics Department form the school of IT at UP (Anteneh et al., 2014; Venter, 2009).

According to Leidig et al. (2020), Table 3 highlights some of the key characteristics of IS programmes in each school.

Table 3: Key characteristics of IS programs in various schools (Leidig et al., 2020, p. 21-22).

Schools	**Characteristics**
Computing IS program is designed to co-exists with Computer Science, Information	IS program co-exists with more technical programs. Opportunities for sharing technical courses. Program orientation is often slightly more

Schools	**Characteristics**
Technology, Software Engineering, Cybersecurity, and Data Science.	technical. Degree structures provide more credit hours for major subject, thus graduates often excel in technical IS competencies.
Business IS program is designed to co-exists with accounting, finance, economics, marketing, management, organizational behaviour, supply chain management, etc.	IS program co-exists with a large number of business disciplines. Opportunities for sharing courses that examine design, delivery and use of technology in organisations. Program is often slightly more use-domain oriented where they are referred to "Business Information Systems" or "Management Information Systems". The amount of major subjects studied is often lower, limiting the possibility to reach higher skill levels in technical IS competency areas. Often place more emphasis on individual foundational competencies and business domain competencies.
Information	Focuses on foundational understanding of information and knowledge. In naming the program, some include libraries, while some typically use Information Management School, Information Science School, or iSchools. Often positioned to offer an emphasis on information access, analytics and knowledge management. Program name may refer to Information Management or Information Science, rather than IS. If combined with Data Science, Management Science, or Operations Research, the program can provide strong competencies in data analytics and knowledge management.

2.3. Issues pertinent to senior IS undergraduates

While prior systematic literature reviews basically focused on a particular aspect of IS curricula, a recent systematic literature review of IS curriculum research from 2010 to 2019 classified the articles into three broad categories: planning process, curriculum contents, and competency requirements (Feng & Salmela, 2020). The research community covering IS curricula is largely United States-based (Feng & Salmela, 2020; Kevor, Boateng, Kolog, Owusu & Afful-Dadzie, 2020), which makes Feng and Salmela (2020) raise the question: "*why*

are contributions from Europe/Africa and Asia/Pacific so limited?" Feng and Salmela (2020) further recommend a more focused approach in the future analysis of IS curriculum literature. Thus, this section focuses on the competency requirements of senior IS undergraduates both from the developing country context (South Africa, where this study is conducted), and the context of the national demand for IS professionals.

Several names such as final year, Honours, high-level, upper level (Woods, 2020), fourth year (Liu & Murphy, 2017), senior-level, or senior year (Karsten & Roth, 2015) have been used in the literature to refer to senior IS undergraduates. While some do not specify the years of study, others combine both third and senior IS undergraduates in their samples, making it more difficult to compare findings and present pertinent issues relevant to the senior IS undergraduates' concern. Research that specifically focused on the senior IS undergraduates' competencies, curriculum, and issues are rare.

The following subsection first presents the subject of competency from general literature and IS contexts, and is then followed by one on IS curriculum development. The next subsections cover the market demand for IS/IT graduates, the growing IS/IT skills gap, and strategies to bridge this skills gap.

2.3.1. Competency

Competency is viewed in this thesis from two perspectives: general literature on the topic, and in an IS education context, and presented in the following subsections.

2.3.1.1. Competency and competence: general literature

Competency (plural competencies) and competence (plural competences) are common words, used almost as synonyms in the extant literature (Nieminen, 2015) but rarely defined, and when defined, the definition is ambiguous, while few empirical studies exist (Shet et al., 2017; Wu, Lee & Tzeng, 2005; Yang et al., 2017). "*Those who spend efforts in examining competency are immediately struck by the lack of uniform definitions, compositions, and methodologies which, of course, lead to misunderstanding, wandering, and waste*" (Chouhan & Srivastava, 2014, p. 15). However, what is not defined cannot be measured and improved (McAfee, Brynjolfsson,

Davenport, Patil & Barton, 2012). According to scholars (Arifin et al., 2017; Khongmalai et al., 2016; Shet et al., 2017; Yang et al., 2017), McClelland (1973) proposed the notion of competency. This notion was aimed at challenging the traditional way of evaluating higher education systems (Shet et al., 2017). The notion has since then influenced many studies in the fields of education, human resources management, and business management (Shet et al., 2017).

Competence is understood differently from country to country (Hyland, 1994). According to Westerhuis (2011, p. 80), "*[t]he differences between the Dutch, English, French and German conceptions of competence, each emanating from differences in the relations between the competence conception and VET*" [Vocational Education and Training]. However, the concept of competence is complex (Winch, 2010), and quite confusing (Westerhuis, 2011). Hyland (1994, p.19) commented on the ambiguities in the concept of competence as follows:

> *"the term 'competence' itself has a long-established history both in ordinary language and in the discourse of VET. The notion of the competent craftsman or artisan goes back a long way; in the British coal-mining industry, for instance, 'certificates of competency' for various job functions were being issued as long ago as the middle of the nineteenth century".*

Also, competence is conceptualised (Guthrie, 2009) and used in different perspectives (Jones & Moore, 1993). For example, in the late 1970s and early 1980s, the increase in youth unemployment and the difficulties surrounding the redeployment of unskilled workers in textile, iron and steel industries led France to embrace a knowledge-based model of competence in the VET systems (Brockmann, Clarke, Méhaut & Winch, 2008). Thus, the French competence model is conceptualised in terms of the capacity to build up – a dynamic process of an individual to develop, learn, and pass on knowledge. This model of competence is not solely aimed at functional employability but at enhancing the quality of jobs and people, and emphasises "*what individuals need to be able to do in relation to particular aspects of the occupation, rather than on formal course curricula and periods of time spent in education*" (Brockmann et al., 2008, p. 233). However, in 1986, England introduced the National Vocational Qualification (NVQ) system in an attempt to develop practical/functional skills for

low-skilled sectors. Competence in the English VET system is strongly demand-led and based on the analysis of the job functions. The English competence-based model (NVQ system) was specifically designed to accredit skills acquired in the workplace.

While both France and England have developed competence-based approaches, there is a distinction between the French knowledge-based model of competence and the English skills-based model (Brockmann et al., 2008). In the French sense, competence is multi-dimensional, based on a more holistic, comprehensive educational system, relying on the integration of practical and theoretical knowledge, whereas an employer-led functionalist system dominates the English skills-based model of competence (Brockmann et al., 2008). The French competence approach takes "*account of personal and social dimensions, acquired through life experience as well as through VET or work*" (Brockmann et al., 2008, p. 230). The role of the English NVQ systems is that "*knowledge needed for the execution of tasks is acquired through experience in the workplace*" and "*skills can be measured in terms of the practical performance of a task or job*" (Brockmann et al., 2008, p. 237). While the French knowledge-based model can equip employers to fit into the dynamic world of work, the English skills-based model is not geared to innovation but attached to the existing tasks of the workplace (Brockmann et al., 2008).

Several scholars have defined competency over the years; Table 4 presents some of these definitions.

Table 4: Some of the definitions of competency in the extant literature.

Author(s)	**Definition**
Boyatzis (1982, p. 21).	"*A job competency is an underlying characteristic of a person in that it may be a motive, trait, skill, aspect of one's self-image or social role, or body of knowledge which he or she uses*".
Woodruffe (1993, p. 29).	"*Competency is the set of behaviour patterns which are needed to allow the incumbent to perform tasks and functions with competence*".
Draganidis & Mentzas (2006, p. 53).	"*A competency is a combination of tacit and explicit knowledge, behaviour and skills, that gives someone the potential for effectiveness in task performance*".
Boyatzis (2008, p. 6).	"*A competency is defined as a capability or ability*".

Author(s)	Definition
Kaur & Bains (2013, p. 31).	"*It is defined as the sum of experiences, knowledge, skills and attitude which we acquire during our lifetime for effective performance in a task or job. Competency is the concept of knowledge, skills and attitude of the person*".
Croucamp (2013, p. 20).	"*A competency model is defined as the collection of abilities, knowledge, skills, and other characteristics (KSAOs) that are needed for effective performance in a specific job*".
Chouhan & Srivastava (2014, p. 16).	"*A competency is the capability of applying or using knowledge, skills, abilities, behaviours, and personal characteristics to successfully perform critical work tasks, specific functions, or operate in a given role or position*".
Khongmalai et al., (2016, p. 1219).	"*competency [consists] of knowledge, skills, and attitudes*".
Shet et al. (2017, p. 3).	"*A competency can be referred to as the ability to apply/use knowledge, behaviours, personal attributes, capabilities, and skills for crucial tasks or functions while working in a specified role/position".*
Arifin et al., (2017, p. 1204)	"*Competency is the list of knowledge, skills, abilities, behaviours, and personal ability towards effective job performance in profession*"
Yang et al., (2017, p. 17).	"*Competency, as defined...can be summarized by a few priorities: first, competency requires knowledge, skills and abilities; Secondly, competency can be observed and measured by concrete criteria; third, competency is associated with the performance output; and, finally, competency can be upgraded into something that can be taught and acquired through training*".

There is clearly no universal definition of competency. However, scholars (Arifin et al., 2017; Yang et al., 2017) have categorised competency into implicit (self-concepts, motives, traits) and explicit (skills, knowledge, abilities/attributes) elements. Based on the definition of competency from several authors (Arifin et al., 2017; Boyatzis, 1982; Boyatzis, 2008; Chouhan & Srivastava, 2014; Draganidis & Mentzas, 2006; Khongmalai et al., 2016; Kaur & Bains, 2013; Shet et al., 2017; Woodruffe, 1993; Yang et al., 2017), there is some level of agreement that competency comprises of the skills, knowledge, and abilities/attributes. The skills needed to perform a task successfully is central to competency. Khongmalai et al. (2016) found skills to be the most critical element of competency. The description of competence given by Ulrich and Dulebohn (2015) that "*[c]ompetence means that individuals have the knowledge, skills,*

and values required for the jobs the organisation has today as well as tomorrow" (Ulrich & Dulebohn, 2015, p. 194), is relevant in this constantly changing business world.

Thus, from the general education context, this thesis focuses on the explicit elements of competency, and views competency as the skills, knowledge, abilities and values needed to do today's task as well as tomorrow's task successfully.

2.3.1.2. Competency: Information Systems education context

According to Leidig, Ferguson and Reynolds (2019, p. 301), *"[c]ompetencies include the knowledge units, but also include skills that should be learned and demonstrated, along with dispositions, or character traits, that graduates should exhibit*". In relation to senior IS undergraduates, competency is defined as a graduate's ability to apply knowledge, skills and dispositions (also known as attitudes in MSIS2016) to complete IS tasks effectively (Leidig et al., 2020). The MSIS2016 is a global competency model for the IS programmes at the graduate level.

While knowledge is the "know-what", skill is the "know-how", and disposition is the "know-why" (Leidig et al., 2020). Knowledge ("know-what") indicates the core concepts of the discipline of study. Skill ("know-how") is the method and means by which knowledge ("know-what") is fulfilled. Disposition ("know-why") encompasses *"socio-emotional skills, behaviors, and attitudes that characterize the inclination to carry out tasks and the sensitivity to know when and how to engage in those tasks*" (Takada, Cuadros-Vargas, Impagliazzo, Gordon, Marshall, Topi, van der Veer & Waguespack, 2020, p. 4236). Implicitly, the completion of an IS undergraduate programme "*marks the ability to start on a path of life-long learning where learning-through-doing in a practical and professional context will continue and extend beyond the academy*" (Leidig et al., 2020, p. 35).

In conclusion, considering the definition of competency from the education literature and IS contexts, in this thesis,

> Competency is a graduate's ability to know the core concepts of the Information Systems discipline, how and why to apply the core concepts to complete today and

tomorrow's Information Systems' tasks successfully and effectively (Arifin et al., 2017; Yang et al., 2017; Leidig et al., 2020; Ulrich & Dulebohn, 2015).

2.3.2. Information Systems Curriculum development

The growth of the IS field has manifested in many ways; the field has witnessed a generation of a wealth of literature characterised as diverse and pluralistic (Hirschheim & Klein, 2012). Despite the undeniable growth, the IS field struggles and faces questions about its identity and legitimacy (Cecez-Kecmanovic, 2002). Relevant to the IS curriculum development is the work of Hirschheim and Klein (2012) that discussed over 40 years history of the IS discipline, and divided its developmental stages into four somewhat overlapping eras. Hirschheim and Klein (2012) highlight significant events that occurred in each era. Each era is first characterised by the significant development and advancements in technology, and mind shifts. Table 5 presents the summary of the significant curriculum development in each era. The debate regarding what the core of IS discipline is or should be persists throughout the four eras.

Table 5: Information Systems Curriculum development eras from 1960 – 2010 (Hirschheim & Klein, 2012, pp. 194-217).

Era	**Significant curriculum development**
First Era The mid 1960s to mid 1970s	• Because many individuals hired for IS jobs have no formal educational background adequate for their positions. The ACM (Association for Computing Machinery) formed a committee in higher education institutions in the US to draft formal guidelines for IS courses and to make recommendations appropriate for an IS program entry-level position. • The first ACM graduate curriculum for IS was published in 1972 (Ashenhurst, 1972), and ACM published the curriculum for an undergraduate IS degree program in 1973 (Couger, 1973). • An updated version of the ACM curriculum was later published in 1982 for both undergraduate and graduate programs (Nunamaker, Couger, & Davis, 1982).
	• In 1968, IFIP/BCS (International Federation for Information Processing/British Computer Society) academic institutions in Europe initiated a working group to prepare a suitable curriculum for an IS degree.

	• The curriculum was designed to prepare individuals for a professional career as information analysts and system designers and to accommodate individuals with different educational backgrounds and experiences, in such that institutions in different countries could adapt it as necessary. • The IFIP/BCS curriculum required students to have practical experience as part of their IS program. • The IFIP/BCS published their first completed report in 1974.
Second Era The mid 1970s to mid 1980s	• DPMA (Data Processing Management Association) Education Foundation published Computer Information Systems curriculum in 1981 to provide a structure for an IS degree (Adams & Athey, 1981). • The curriculum which focused only on the data processing skill sets, was initiated by practitioners who defined the skills and education required for an entry-level position of data processing personnel. • The curriculum employed strict rules, which only allows schools that adopted the curriculum to follow the structure without any modification.
Third Era - the mid 1980s to mid/late1990s	• A revised version of the IFIP/BCS curriculum was published in 1987 to equip future IS professionals with current and necessary skill sets. • The emergence of Enterprise Resource Planning (ERP) systems, particularly SAP, created a demand for students who had ERP skills and led several universities to join the SAP consortium and teach SAP in both undergraduate and graduate IS programs.
Fourth Era - the late 1990s to mid/late 2010	• ACM, AIS (Association for Information Systems) and AITP (Association of Information Technology Professionals) (formerly DPMA) collaboratively developed both IS'97 and IS2002. • IS2002 was a minor update of IS'97, and IS2002 was the basis for IS undergraduate programs accreditation. • The ACM and AIS actively and collaboratively revised the existing curricula and published the IS2010 curriculum for undergraduate degree programs in IS, which expanded the IS curriculum to other domains. • IS2010 curriculum is more universally adaptable than the previous curricula. IS2010 curriculum offers guidance regarding the core content of the curriculum that should be present everywhere, and as is it not directly linked to a degree structure in any specific environment.

The current era (from late 2010 till now) is the digital era or fourth industrial revolution era (Benbya, Nan, Tanriverdi & Yoo, 2020; Matthee & Turpin, 2019; Skilton & Hovsepian, 2017), changing the landscape of education (Shahroom & Hussin, 2018). The digital era is characterised by digital technologies, smart mobile devices, social media, the Internet of Things (IoT), Artificial Intelligence, smart networks, and the cloud (Benbya et al. 2020; Prifti, Knigge, Kienegger & Krcmar, 2017). Several important developmental changes have occurred in the technological environment (Prifti et al., 2017), having a profound impact on technologies that collect, store and utilise data and providing individuals and organisations with new ways to collaborate, co-create and perform business transactions and make data-based decisions (Leidig et al., 2020). "*Digitalisation enables the creation of new or improved business models and processes with digital technologies*" (Leidig et al., 2020, p. 24). IS has become ingrained in our everyday personal, business and professional lives and is now more society-centric than organisation-centric (Belanger, Van Slyke & Crossler, 2019; Leidig et al., 2020). Our daily experiences of interacting with digital tools is a dynamic emergent of complex sociotechnical systems presenting challenges and opportunities affecting human experiences in all dimensions (Benbya et al. 2020). "*Due to rapid economic and social change, schools/university have to prepare students for jobs that have not yet been created, technologies that have not yet been invented and problems that we don't yet know will arise*" (Shahroom & Hussin, 2018, p. 318).

During this era, ACM and AIS established an exploratory task force who recommended a joint process that led to a comprehensive revision of IS2010 (de Vreede, Karsten, Leidig, Nunamaker, 2018). Burns et al., (2018) investigated the knowledge and skills required by potential employers of students graduating from undergraduate IS programmes, and based on their findings, made the following three suggestions for improving IS2010:

- Increased prominence of soft skills: which can be achieved either by adding soft skill coverage to existing core courses or by adding a new core course.
- Increased prominence of programming skill: again, either by adding programming to an existing core course or adding a core course to the curriculum.
- As an applied discipline, Burns et al. (2018) suggest that an experiential component should be included in the model.

Building on the competency thinking in the IS2010 and MSIS2016, the latest iteration of the IS undergraduate curriculum is the IS2020 which combines the efforts of numerous individuals and reflects the interests of more faculty and practitioners (Leidig et al., 2020). As such, MSIS2016 and IS2020 are relevant to assessing the state of or identifying or establishing best practices framework for senior IS undergraduates, as discussed below.

2.3.2.1. The Information Systems postgraduate curriculum: MSIS2016 competency model

The MSIS2016 curriculum is the global competency model for Masters IS programmes, building on the four earlier curricula at the graduate level (Topi, Karsten, Brown, Alvaro, Donnellan, Shen, et al., 2017). MSIS2016 is the seventh collaborative effort of the ACM and AIS, and the first curriculum developed with a global process for a global audience (Topi et al., 2017). MSIS2016 is also the first curriculum guidance in IS that does not provide a predefined curriculum model but focuses on the competencies that graduates should have on completing their degree programme (Topi et al., 2017). MSIS2016 is highly participative and broadly representative of multiple perspectives worldwide on competency-driven approaches to developing and evaluating IS programmes (Topi et al., 2017). The competency-driven approach focuses on graduating students' competencies developed through programme learning outcomes rather than what is being taught (Topi et al., 2017).

The MSIS2016 competency model specifies four levels of competency attainment expected from an IS graduate: awareness, novice, support, and independent levels (Kevor et al., 2020). The fifth level, the expert level, cannot be covered within a graduate-level IS curriculum because employees need to perform IS roles by applying their competencies within organisational structures and processes to attain the expert level (Kevor et al., 2020). MSIS2016 competency model development followed a top-down approach. The highest level of the model are areas of (1) IS competencies, (2) individual foundational competencies, and (3) domain competencies. The IS competencies realm is further divided into competency areas, and further broken down into competency categories. Competency areas and categories are much more stable, depending less on technology, or local variation, than the competencies themselves. MSIS2016 serves as a guide for moving from competencies to an implementable curriculum for a Master's degree programme in IS (Topi et al., 2017). At IS Master's level, the competencies are aligned with a specific domain of practice currently (Shah, Kumar & Smart,

2018) such as business, education, healthcare, law, government and public administration, non-governmental organisations and other non-profits, etc., business being the most common domain of practice (Kevor et al., 2020).

The entry requirements into an IS Master's programme vary widely depending on the national or regional education system. Some programmes require a prior IS degree (or related field) or prior professional experience, while they are not required in some other IS Master's programmes. The professional competency models such as the European e-Competence Framework (e-CF - http://www.ecompetences.eu/) and the United Kingdom-based Skills Framework for the Information Age (SFIA - http://www.sfia.org.uk/) provided tentative analyses of job profiles and the expected graduate competencies for a Master's degree in IS (Topi et al., 2017). MSIS2016 specified eleven areas of Individual Foundational Competencies essential for an IS Master's degree graduate, and these competencies are defined in Table 6.

Table 6: Areas of Individual Foundational Competencies essential for an IS Master's degree graduate (Topi et al., 2017).

Competency	**Definition**
Critical thinking	"*Critical thinking is the use of those cognitive skills or strategies that increase the probability of a desirable outcome. It is used to describe thinking that is purposeful, reasoned, and goal directed—the kind of thinking involved in solving problems, formulating inferences, calculating likelihoods, and making decisions, when the thinker is using skills that are thoughtful and effective for the particular context and type of thinking task*" (Halpern, 2013, p. 8).
Creativity	Creativity is "*the production of novel and useful ideas in any domain*" (Amabile, Conti, Coon, Lazenby & Herron, 1996, p. 1155).
Collaboration and teamwork	"*[C]ollaboration is based on Stevens and Campion (1994), who identified the following five competency requirements for teamwork: conflict resolution, collaborative problem solving, communication, goal setting and performance management, and planning and task coordination*" (Topi et al., 2017, p. 24).
Ethical analysis	Ethical analysis is "*about defining the practices and rules that underpin responsible conduct between individuals and groups*" (Connock & Johns, 1995), and ethical competency requires "*taking action to ensure that these practices and rules are applied consistently in all day-to-day business situations*" (Orme & Ashton 2003, p. 185).

Competency	Definition
Intercultural	Intercultural competency is the "*ability to develop targeted knowledge, skills, and attitudes that lead to visible behavior and communication that are both effective and appropriate in intercultural interactions*" (Deardorff, 2006).
Leadership	Leadership is the process or act of influencing an organisation's activities in its efforts toward goal setting and goal achievement (Stogdill, 1950). Leadership competencies can be broadly categorised into four: supervisory/managerial, organisational leadership, personal mastery, and resource leadership (Joon Yoon, Hoon Song, Donahue & Woodley, 2010).
Mathematical and statistical competencies	For IS Master's degree graduates, "*the most important mathematical competency is the ability to choose and apply appropriate mathematical and statistical models and techniques to solve a broad range of problems in the domain of practice*" (Topi et al., 2017, p. 24).
Negotiation	Negotiation is "*a form of decision making in which two or more parties talk with one another in an effort to resolve their opposing interests*" (Pruitt, 1981, p. xi). Negotiation skills can be divided into five categories: analytical ability, empathy, planning ability, interactive skills, and communicating skills (Armstrong, 2006).
Oral communication	Oral communication competency is a student ability to "*orally communicate their conclusions, and the knowledge and rationale underpinning these, to specialist and non-specialist audiences clearly and unambiguously*" (Bologna Working Group, 2005).
Problem-solving	Problem solving is "*any goal-directed sequence of cognitive operations*" (Jonassen, 2000, p. 65). These operations are the "*need for a mental representation of the problem space and activity-based manipulation of the problem space*" (Topi et al., 2017, p. 25).
Written communication	Written communication competency is a student ability to communicate in writing "*their conclusions, and the knowledge and rationale underpinning these, to specialist and non-specialist audiences clearly and unambiguously*" (Bologna Working Group, 2005).

2.3.2.2. The Information Systems Undergraduate Curriculum: IS2020 competency model

Taking the initiative from the MSIS2016, the IS2020 undergraduate competency model, shown in Figure 1, is one of the first guidelines published as a living document with changes constantly propagated to a publicly available website (Leidig et al., 2020). The IS2020 competency model

is grounded in the industry's expected requirements, organisations' needs and perspectives of IS graduates' employers, and reflects input and support of other IS-related organisations (Leidig et al., 2020). The IS2020 competency model articulates competencies that graduates should have upon completing an IS undergraduate programme, and highlights both the required and optional competency areas. However, *"[s]ome of the recommended competency areas, like "Ethics, use and implications for society", or "IS practicum" may not require a separate course, but can be addressed as part of another course, or as an integrative theme addressed in many courses*" (Leidig et al., 2020, p. 31). Further details are provided on the required IS2020 competency areas in Table 7.

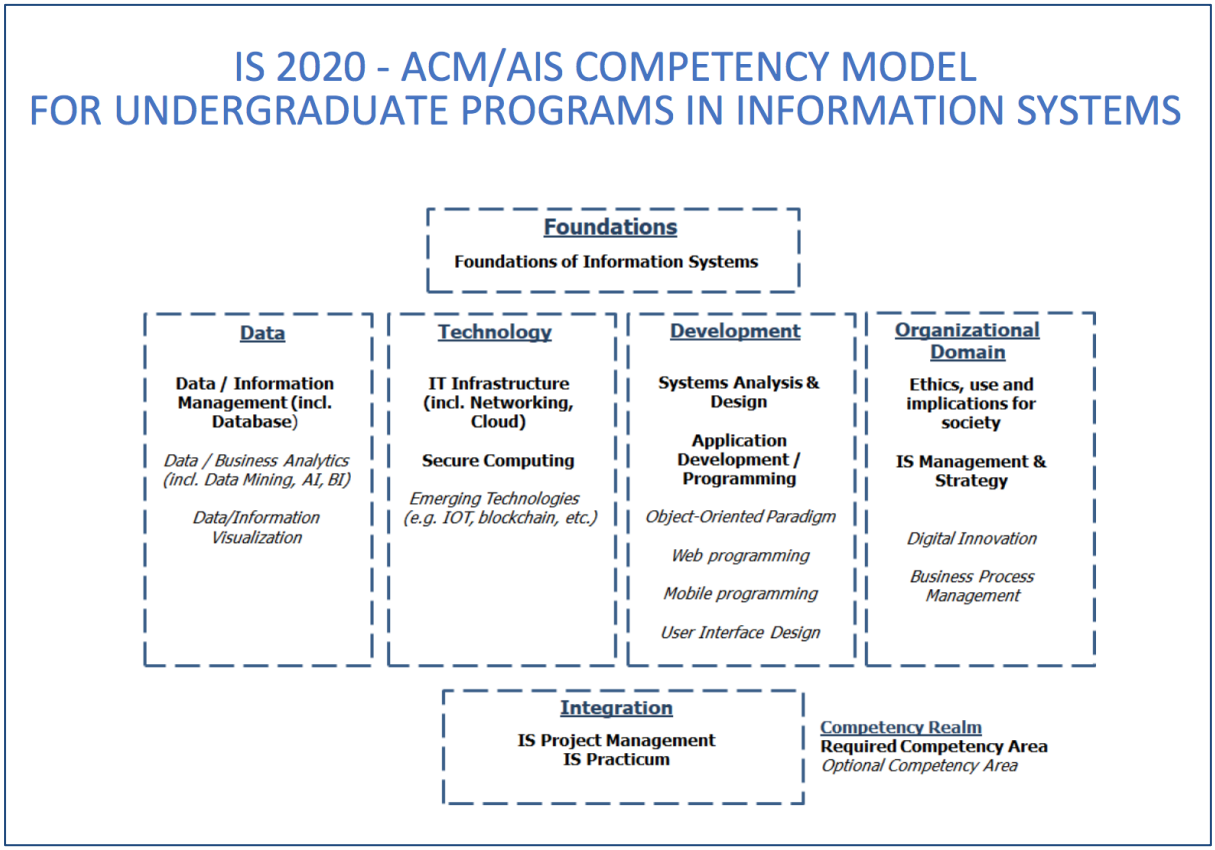


Figure 1: IS2020 Competency Model for undergraduate programs in IS (Leidig et al., 2020, p. 11).

Table 7: Required competency areas (Leidig et al., 2020, pp. 49-59).

Required Competency Area	Description
Foundations of IS	Introduced as part of an IS introductory course and refers to a student ability to understand the fundamental concepts of IS, which include hardware, software, and information acquisition, and the support IS provides for transactional, decisional, and collaborative business processes. This competency refers to a student's ability to understand the "*collection, processing, storage, distribution, and value of information and be able to make recommendations regarding IS that support and enable individuals in their daily lives as well as the management, customers, and suppliers of the enterprise.*" (Leidig et al., 2020, p. 51).
Data competency	Data and Information Management comprises competencies related to tools and techniques for managing data with database systems; how to use and build a database.
Technology competency	This competency area comprises IT infrastructure and secure computing. IT infrastructure looks at all aspects of IT infrastructure as it is used in an organisation. Secure computing is concerned with practices associated with ensuring secure business operations involving the creation, operation, defence, analysis and testing of secure computer systems.
Development competency	Focuses on aspects of the application/systems development life cycle such as agile software development methodology and SCRUM in software development, and design thinking and Human-Centered design approaches.
Organisational Domain competency	Focuses on the strategic management of IT in organisations to help organisations manage the IT function and its services and on the strategies to improve the value of IT for the organisation.
Integration competency	Integration competency is introduced towards the end of the undergraduate program to engage IS undergraduates in learning experiences that integrate and apply knowledge and skills learned across the curriculum

IS2020 follows and extends the competency thinking in the IS2010 curriculum because,

> "*competency-based requirements shift attention from course structures to required competences. The main emphasis is on ensuring that the program curriculum engages students to tasks that promote achievement of required skill levels and competencies. The focus shifts from course structures to student learning*" (Leidig et al., 2020, p. 32).

A competency-based approach encourages the IS undergraduate curriculum to focus on what graduates can do (learning outcome) rather than what they know. The learning outcome of a competency-based approach provides "*a clearer link between the expectations that a program has for its students, the expectations of students, and the expectations of stakeholders*" (Leidig et al., 2020, p. 31).

Some of the benefits of the competency-based approach as highlighted by scholars (Topi, 2019; Topi, 2018; Leidig et al., 2020) are:

- The competency-based approach focuses on what students need to learn rather than what educators need to teach.
- Expectations of graduates are effectively communicated to the external stakeholders.
- The competency-based approach encourages reflection on student learning and provides the best common currency for programmes globally.
- The competency-based approach is consistent with the outcomes-focused approach used by most accrediting agencies to evaluate programmes and strengthens the entire educational programmes' profile.

Thus, this review reveals that a competency-based approach will be appropriate for a South African senior IS undergraduate programme.

2.3.3. Market demand for IS/IT graduates

A review of popular job search websites in the United States indicates a healthy demand for IS/IT graduates (Boehler, Larson, & Shehane, 2020). The predicted IS/IT related job growth from 2016 to 2026, by the United States Bureau of Labor Statistics (2020) is higher than the average job growth for all occupations, while that for many IS/IT related occupations far exceeds the average growth projected (Boehler, Larson, & Shehane, 2020; Cummings & Janicki, 2020). Given that the market demand for IS skills continues to increase, one would

have expected an increase in IS enrolment, however, the number of IS programmes in the United States continues to decline (Boehler, Larson, & Shehane, 2020). Boehler, Larson and Shehane (2020, p. 235) highlight the competencies that IS graduates should possess upon graduation as:

> "*problem-solving and change management knowledge and skills, the ability to contribute to team objectives, awareness of business processes and procedures, an understanding of customer service focus, some project management experience, a great deal of planning and organization experience, perhaps experience in negotiation, and, hopefully, a good dose of decision-making skills. In addition, IS graduates should possess a collection of technical skills that set them apart from other business graduates*".

Boehler, Larson and Shehane (2020) further suggest that IS curricula may be susceptible to local biases, and that HEIs may therefore need to guard against limiting their graduates' mobility in an increasingly global workforce.

The South African labour market is characterised by "*high levels of unemployment on the one hand, and skills shortages, on the other*" (DHET, 2020, p. 4). Despite a decrease in hiring activity due to the fallout from COVID-19, CareerJunction (2020) reports that the IT sector remains the most sought-after sector in the South Africa labour market. The CareerJunction Index represents online labour dynamics in South Africa that analyses the relative ratio of supply and demand in the online job market (CareerJunction, 2020). Within the same period, according to Businesstech (2020), the five IS/IT positions in most demand are cloud computing, Artificial Intelligence and machine learning, Data scientist, Robotics and process automation, and Cybersecurity.

In 2019, the South African Department of Higher Education and Training (DHET) issued a call and engaged several stakeholders on the occupations to be listed in the 2020 Department's National List of Occupations in High Demand (DHET, 2020). After considering responses and comments received from 22 organisations and the potential impact of the COVID-19 pandemic, 345 occupations were listed as in high demand, out of which 26 are IS/IT occupations, as shown in Table 8. The DHET expects the IT sector to recover relatively quickly from the impact of COVID-19, or to show signs of increased labour demand due to COVID-19 (DHET, 2020).

Table 8: 2020 IS/IT occupations in high demand (DHET, 2020, pp. 10–25).

• Chief Information Officer	• Network Analyst	• ICT Systems Analyst
• ICT Project Manager	• Information Technology Manager	• Data Scientist
• Data Management Manager	• Information Systems Director	• Software Developer
• Programmer Analyst	• Applications Programmer	• Computer Network and Systems Engineer
• Developer Programmer	• Data entry operator	• Application Development Manager
• Multimedia Specialist	• Marine GIS Technician	• ICT Security Specialist
• Web Developer	• Systems Administrator	• Information Services Manager
• ICT Communications Assistant	• Computer Network Technician	• Computers Quality Assurance Analyst
• Geographic Information Systems Technicians	• Database Designer and Administrator	

2.3.4. A growing IS/IT skills gap

There is a growing ICT skills gap in South Africa (Kirlidog, van der Vyver, Zeeman & Coetzee, 2018; Schofield & Dwolatzk, 2019), as well as globally (Brown, 2019; CompTIA, 2017; Greef & van Rensburg, 2020) – a gap between what employers expect from both undergraduates and graduates and what HEIs provide (Vladiou, Constantinescu & Danciulescu, 2019). The ICT sector is an ever-changing environment where employees need to constantly upgrade their skills to remain up-to-date with the latest developments (Schofield & Dwolatzk, 2019). Researchers have noted that knowledge of IS is fundamental to accounting education and practice, and have proposed integrating more extensive IS content into the accounting curriculum to better prepare accounting graduates with more relevant skills (Rebele & Pierre, 2015; Woodside et al., 2020). This is also the case with many other disciplines.

A survey highlighted the state of ICT skills in South Africa and the poor state of education, particularly the very low number of learners achieving competence in STEM subjects, and lack of appropriate curricula, relevant teaching materials and skilled teachers (Schofield &

Dwolatzk, 2019). Schofield and Dwolatzk (2019) indicate that South Africa may need up to 50,000 ICT practitioners in the short to medium term and may need to up-skill millions of people to use the technology that is made available by the practitioner community. The "*employment opportunities in the IT sector of South Africa are not necessarily sparse, but rather that employers have difficulty in filling their positions with skilled candidates*" (Greef & van Rensburg, 2020, p. 3). Many employees are not fully competent to perform the required ICT task(s), which implies 'hard to fill' vacancies in the South African ICT sector (Schofield & Dwolatzk, 2019).

Impacting on IS/IT/ICT professionals' competency needs are changes in technology and data, changes in an organisation, combined with effects of individual and society trends. Thus, "*to solve problems in a user domain requires an increasing number of competencies, knowledge, and skills to tackle the multiple methods and perspectives required*" (Leidig et al., 2020, p. 24). Although many stakeholders are making efforts to improve the IS/IT/ICT competency and employability of graduates, "*the results tend to be counted in terms of hundreds or maybe thousands of candidates when what is needed is opportunities for hundreds of thousands or millions of people*" (Schofield & Dwolatzk, 2019, p. 1). I agree with Sahin and Celikkan (2020, p. 341) that *"[at] this point, a particularly important question is whether academia can equip students with the necessary [IS/IT] skills"*.

2.3.5. Bridging IS/IT skills gap

While the industry requires graduates with more relevant skills (Woodside et al., 2020), there is a consensus internationally that universities are not preparing graduates adequately for current IS/IT vocations (Greef & van Rensburg, 2020). Universities need to regularly modify their curriculum to meet industry demands (Cummings & Janicki, 2020) and embrace approaches such as **including exit-level projects in the curriculum** to adequately equip future IS/IT graduates with the competencies that industry expects. This will ensure a greater alignment between university education and industry expectations (Greef & van Rensburg, 2020).

With the HEIs emphasising the importance of developing globally-aware graduates, one of the essential soft skills the IS/IT graduates working in professional, global teams need is **intercultural communication competency** (Mitchell & Benyon, 2018; Prifti et al., 2017). Because the IS curriculum is already full of traditional knowledge requirements, the IS students are rarely exposed to professional norms and students from other societies (Mitchell & Benyon, 2018; Venables, Tan & Miliszewska, 2013). Mitchell and Benyon (2018) reported an assignment designed to increase IS students' intercultural communication competency using various technology tools. The assignment is a global technology collaboration project and included senior IS undergraduates in South Africa working together with IS students, ranging from sophomores to seniors, in a large University in the United States. Their findings show that it is possible to include an assignment within the IS curriculum to increase today's IS graduates' intercultural communication competency (Mitchell & Benyon, 2018).

Complex problem solving skills are important for IS/IT professionals to work in an ever-changing environment *"that requires them to think critically about how to make use of new and evolving technologies*" (Woods, 2020, p. 40), and need to be built into senior-level IS/IT curricula. Rather than students passively receiving information through the traditional lecture approach, Woods (2020) proposes an **active learning approach**, where senior-level students engage in analysis, discussion, and application of what they are learning. The students can work in teams of three to four students, research a topic, and present/debate their findings in a more dynamic environment. In a debate, both debate teams and the audience develop knowledge about the topic, and the debate teams engage in persuasive speaking to drive home their points, thereby building complex problem solving skills and improving their confidence in **oral communication skills** and public speaking (Woods, 2020). "*As expected from an active learning approach, debates offer a way to engage students in course material, develop critical thinking and communication skills, and promote mastery of course content*" (Woods, 2020, p. 41). However, it is necessary to set up the debate teams right from the beginning of the semester such that each debate team and the audience have sufficient time to research the topic relevant to the real-world, and to plan and prepare for an in-depth discussion of the topic.

Schofield and Dwolatzk (2019) suggest that universities must develop **future-ready curricula** to meet future demands. Several studies suggest **integrating industry content into university**

curricula to ensure industry alignment (Cavanagh, Burston, Southcombe & Bartram, 2015; Sarkar, Overton, Thompson & Rayner, 2016). However, universities are advised not to surrender the authority of curriculum development to industry, and not to tailor curricula too narrowly for specific jobs, so that university graduates can apply skills in new settings (Greef & van Rensburg, 2020).

A survey conducted by the Computing Technology Industry Association (CompTIA, 2017), an American non-profit professional body, where 600 professionals based in the United States participated, highlighted five top strategies for addressing the IS/IT skills gap. These were: providing **on-the-job experience**, such as internships; providing **intense job training**, such as apprenticeships; **early exposure to IS/IT careers**; recognised skills and knowledge **certifications or credentials**; and improved **evaluation methods to assess the skill levels** of students. CompTIA (2017) further reported that most respondents preferred to focus IS/IT skills gap improvement efforts on existing employees rather than the next generation of IS/IT employees. This sentiment would make gaining employment more difficult for less competent new IS/IT graduates.

Sahin and Celikkan (2020) present a quantitative analysis of the knowledge gap between software industry expectations and the skills taught in HEIs. This analysis could be important in designing and updating curricula of HEIs. Sahin and Celikkan (2020) found a lack of emphasis on **personal and non-technical skills** in undergraduate education, and that IS/IT professionals' and employers' two most demanded competencies are **analytical thinking and teamwork skills**, which should be more emphasised in curricula. They also note that **accreditation** is crucial for establishing effective IS/IT programmes that align with business life realities. The strict accreditation process helps HEIs reduce the knowledge and skills gap. Instead of relying solely on IT-based disciplines, Sahin and Celikkan (2020) recommend a **multidisciplinary approach to teaching soft skills**, which include communication, ethics, leadership, and customer relations. Rather than focusing on theoretical knowledge, IT professionals and employers comment that IS/IT courses should include **hands-on, innovative projects** which are **designed in collaboration with industry** to address the practical industry needs, thereby establishing and encouraging an **effective communication channel between students and industry**. Especially in the undergraduate program's final two years, these IT

professionals and employers further suggest that courses should be modified to ensure a **practical curriculum focus** on industry needs (Sahin & Celikkan, 2020).

Al-Hashimi, Hamdan, Razzaque, Al-Sartawi and Reyad (2020) also found that **soft skills (interpersonal and personal skills)** are more crucial for the early Management IS professionals' career success than technical skills. They reported that *"[t]he highest items based on curriculum priority are: Generating new ideas (creative thinking skills), accomplishing assignment, oral communication skills, working effectively in teams, persuading others, and writing clearly and effectively*" (Al-Hashimi, Hamdan, Razzaque, Al-Sartawi & Reyad, 2020, p. 780). Brown (2019) points to four primary causes of the IS/IT skills gap in the United States and suggests remedies that require **employers, recruiters and educators working together**. He suggests that the lack of company-supported training and professional development programmes could be addressed by HR professionals and employers building a **strong learning culture** that encourages knowledge sharing through peer-to-peer coaching, weekly lunchtime seminars or a mentorship programme, and by providing access to online learning or professional development courses. Brown (2019) adds that organisations should accept the ever-changing technology landscape challenge and become **flexible**, not too selective in their hiring strategy. Brown (2019) further suggests that education systems should focus more on **STEM curricula from early** on to help students manage technological change, and that organisations could also contribute by creating STEM workshops, coding camps and partnering with universities and postsecondary institutions.

In their study of IS, IT and Engineering students, Lin-Stephens, Smith, Richards, Pang, Uesi and Athanasou (2017) found a gap between what students believe contributes to their employability and what employers base their hiring decisions on. While the students focus on discipline-specific knowledge and skills, employers and industry stakeholders are highly concerned about **transformative qualities** which can help graduates innovate, adapt and contribute to organisational success in a meaningful way (Lin-Stephens, Smith, Richards, Pang, Uesi & Athanasou, 2017). Focusing on IS departments in the data science field, Triche, Firth and Harrington (2016) proposed a **Skill Set-based Framework for Student-employer Engagement**, which could be useful for bridging the IS/IT skills gap. The Framework highlights that academic IS departments need to identify top IS student recruiters, determine what skill sets they most seek, and then map those skills to the curriculum. Also, by establishing

a good working relationship and open communication lines with the recruiters – the top employers of their IS majors - IS department faculty can guide the recruiters on ways to present what they are looking for that better resonate with the targeted students (Triche, Firth & Harrington, 2016). The university career-development professionals can also provide career development activities and specialised assistance tailored to individual students' strengths and challenges (Triche, Firth & Harrington, 2016).

Many schools now have corporate or industry advisory boards to foster **strong academic-industry collaboration** (Schiller, Goul, Iyer, Sharda, Schrader & Asamoah, 2015). IS Departmental advisory boards can contribute to bridging the IS/IT skills gap by advising and providing a structured, easy to understand and sustainable model for academic-industry collaboration (Mandviwalla, Fadem, Goul, George & Hale, 2015). The industry can provide valuable advice on "real-world" problems, informing academia on evolving curriculum requirements, and finally providing job opportunities for graduates (Schiller, Goul, Iyer, Sharda, Schrader & Asamoah, 2015). As they rightly indicate:

> "*collaborating with the industry may drive new research and funding opportunities and cross-department, inter-disciplinary contacts that otherwise might not happen. It also benefits industry because it presents industry needs to universities and provides graduates with skills that employers need*" (Schiller, Goul, Iyer, Sharda, Schrader & Asamoah, 2015, p. 821).

2.4. Critical assessment

The critical assessment of the pertinent issues relevant to the senior IS undergraduates' main concern reveals a large body of literature focusing on IS undergraduate and Masters programmes, with little to nothing on the senior IS undergraduates' programme. There is an updated competency-based framework for IS undergraduate (IS2020) and for Masters (MSIS2016) programmes, however no specific framework was found in the literature for the senior IS undergraduate programme.

Lack of research which could serve as bridging the gap between the undergraduate and postgraduate programmes; addressing senior IS undergraduates' competency requirements for

the developing country context (South Africa), and the national demand for IS professionals contribute to an IS/IT/ICT skills gap, and affect the generation of industry-required competent IS/IT/ICT graduates. The question now is: What framework for their programme can equip the senior IS undergraduates with the industry-required IS competencies? Equally, knowledge relating to how the senior IS undergraduates mature competencies during their learning process is missing in the body of literature, necessitating asking the question: How do senior IS undergraduates mature competency during their learning process?

2.5. A suggested Framework for a South African senior IS undergraduates' programme

This section aims to suggest a framework for a South African senior IS undergraduates' programme, and the South African Higher Education Qualification Framework (HEQF) becomes relevant in achieving this aim.

The HEQF was published in 2007 to determine the purpose and characteristics of all higher education qualifications in South Africa. The HEQF was revised in 2013 and referred to as the Higher Education Qualification SubFramework (HEQSF). According to the CHE (2013, p. 34), the senior undergraduate program (otherwise known as Bachelor Honours Degree) is a

> "*specialisation qualification, characterised by the fact that it prepares students for* ***research-based*** *postgraduate study. This qualification typically follows a Bachelor's Degree, and serves to consolidate and deepen the student's expertise in a particular discipline, and to* ***develop research capacity*** *in the methodology and techniques of that discipline. This qualification demands a high level of theoretical engagement and intellectual independence. In some cases a Bachelor Honours Degree carries recognition by an appropriate professional or statutory body*".

Based on the review of the literature, what is expected of the South African senior IS undergraduates' programme is building on the foundations of IS undergraduate curricula (such as IS2020), meeting industry needs and the HEQSF requirements for the senior undergraduate program, and the entry requirements for IS Masters curricula (such as MSIS2016). A recommended Framework for the South African senior IS undergraduate programme is

positioned as filling the gap between the IS undergraduate programme and the Master's programme. Key elements are presented as follows:

- **Future-ready IS curriculum development**: The IS department/IS departmental advisory board needs to regularly identify top IS students' recruiters/employers, determine the required skills, and update their curriculum accordingly. The IS curriculum content should be innovative and have a practical focus on industry needs.

- **Exit-level projects require a collaborative effort**: After knowing the skill sets needed by the top IS students' recruiters/employers, the IS department should align the exit-level projects with industry expectations. The IS department should collaborate with industry to provide on-the-job experiences (such as internships) and training for its students.

- **Global collaboration projects:** Intercultural competency is one of the competencies required from graduates (Prifti et al., 2017). Intercultural communication competency is needed for senior IS undergraduates to successfully work in professional, global teams (Mitchell & Benyon, 2018). Various collaboration technology tools such as email, Skype, Facebook, WhatsApp, Microsoft Team, Zoom, Snapchat, FaceTime, and Instagram can be used to communicate and collaborate with students from different cultures across institutions. South African IS departments and their faculty can establish a connection with an international university to work with per semester. The two universities should agree on globalised projects and randomly pair their students. The students (partners) should be required to work together on a globalised topic, reflect on the similarities and differences they identify during their partnerships and write a report on their experiences (Mitchell & Benyon, 2018). The students should have the flexibility of choosing what collaborative technology to use, however, IS department/faculty should encourage some face-to-face, synchronous interaction. However, due to the challenge of the time differences, the instructors/project facilitator should regularly check on the students' progress on the projects.

- **Active learning approach**: The IS department should create a learning environment that permits students to actively engage in learning, where students work in a team of three or four on real-life projects and analyse, discuss, and apply what they are learning. This approach will assist students in building complex problem solving competencies.

- **Researching IS industry issues**: Students should be required to research, in teams, topics relevant to IS industry and present findings, engaging meaningfully with the whole class, and thereby developing critical thinking and oral communication competencies.

- **Accreditation**: IS departments should be ready to go through a strict accreditation process to ensure proper alignment of their curriculum content with business realities and reduce the IS/IT skills gap.

- **A multidisciplinary approach to teaching soft skills**: IS departments should focus on helping students develop personal and non-technical skills, specifically analytical thinking and teamwork skills. They should also embrace a multidisciplinary approach to teaching soft skills such as communication, ethics, leadership, and customer relations, and contributing to students' negotiation competencies.

2.6. Summary

This chapter provided a contextual literature review following the hermeneutic principle and identified and interpreted concepts relevant to the phenomenon of senior IS undergraduates and their learning process. It discussed the nature of the IS discipline and presented the academic positioning of IS programmes in various schools. The chapter further discussed the pertinent issues relevant to the senior IS undergraduates' main concern and critically assessed the literature around the issues. Finally, it suggested elements of a framework for the South African senior IS undergraduate programme, positioned as filling the gap between undergraduate programmes such as IS2020 and Masters' curricula such as MSIS2016.

The next chapter is the research methodology, that illuminates the philosophical assumptions and the approach that identified the senior IS undergraduates' main concern.

3. Research Methodology

In any research, there is a philosophical assumption that constitutes valid knowledge and how the knowledge can be obtained. In this chapter, I outline the philosophical stance with respect to the well-known knowledge paradigms used in IS. This methodology chapter provides an overview of the adopted research approach and offers justification for its selection as an appropriate approach for this thesis. The chapter is organised as follows: Section 3.1 covers the research philosophy with respect to the IS discipline. Section 3.2 presents the adopted research approach: classic grounded theory methodology with case data. Section 3.3 covers the criteria for evaluating classic grounded theory, while section 3.4 summarises the chapter.

3.1. Research philosophy

There are basic principles that govern any scientific research, which are the ontology, epistemology, and research strategy (Birks & Mills, 2011; Seddon & Scheepers, 2012).

3.1.1. Ontology

Orlikowski and Baroudi (1991) ontologically classified IS research as subjective (i.e. existing only through human actions) or objective (i.e. existing independently of humans). Ontologically, I have chosen the view that suits the research question that physical and social reality exists through human actions (subjective), the social construction of reality, and is a product of my consciousness as a researcher (Burrell & Morgan, 1979; Orlikowski & Baroudi, 1991).

3.1.2. Epistemology

The epistemology assumption is concerned with how valid knowledge about a phenomenon is obtained and evaluated. These are categorised in IS as predominantly either positivistic, interpretive, or critical (Klein & Myers, 1999; Orlikowski & Baroudi, 1991). To meet the objectives of this thesis, I hold an interpretive view of reality, as I make the assumption that knowledge and reality are social products that cannot be understood independently of the social actors (Orlikowski & Baroudi, 1991). I also make the assumption that reality is produced and reproduced through ongoing social interactions and cannot be measured in some objective way

(Orlikowski & Baroudi, 1991). My worldview is that a social process is an extension of human consciousness and subjective experience (Burrell & Morgan, 1979; Orlikowski & Baroudi, 1991).

Out of the three stances, positivist, interpretive, and critical, the interpretive stance is most appropriate for the thesis, because my aim was:

> "*to understand how members of a social group, through their participation in social processes, enact their particular realities and endow them with meaning, and to show how these meanings, beliefs and intentions of the members help to constitute their social action*" (Orlikowski & Baroudi, 1991, p. 13).

The positivist stance was considered unsuitable for the thesis because I aim to identify the main concern of senior IS undergraduates and explore how the concern is resolved through the meaning that senior IS undergraduates make of the main concern, which cannot be measured objectively but requires a subjectivist research approach. Likewise, the critical perspective was considered inappropriate for the thesis because I have no intention of critiquing social systems but aim to develop a theory that could explain how the main concern of senior IS undergraduates was resolved.

3.1.3. Research strategy (Induction, Deduction, Retroduction, Abduction)

Four primary research strategies are used for conducting social research; these being induction, deduction, retroduction, and abduction (Blaikie, 2000; Ngwenyama, 2014; Mueller & Urbach, 2013; Ochara, 2013). These strategies provide fundamentally different processes for generating new scientific knowledge (Blaikie, 2000; Ngwenyama, 2014), and "*different ways of answering research questions by specifying a starting-point, a series of steps and an end-point*" (Blaikie, 2000, p. 100). The choice of a research strategy should be dependent on the research questions and the research objectives (Blaikie, 2000). Table 9 presents a summary of each of the research strategies.

Table 9: Research Strategies (Blaikie, 2000, p. 100).

Research strategies	Description
Induction	"*starts with data collection, followed by data analysis, and then the development of generalisations that, with further testing, can become law-like propositions to be used to explain aspects of social life*"
Deduction	*"begins with an observed regularity that needs to be explained; a tentative theory is acquired or constructed; then hypotheses are deduced and then tested by collecting appropriate data"*
Retroduction	*"begins with an observed regularity, but this is followed by the construction of a hypothetical model of a possible structure or mechanism that could have produced this regularity. By observation and experiment, a search is then undertaken to establish whether the explanatory structure or mechanism exists"*
Abduction	*"begins by exploring through everyday language the knowledge that social actors use in the production, reproduction and interpretation of the phenomenon under investigation. This is followed by a redescription of this everyday account into a social scientific account, and, possibly, into a grounded explanation"*

My interest in this thesis is to find out the main concern of the senior IS undergraduates largely from the senior IS undergraduates and through their actions or interactions. Therefore, it was required that I speak with the senior IS undergraduates to discover their construction of social reality. The research strategy needed to be "*based on the way it is viewed by the participants*" (Blaikie, 2000, p. 98) and this view favoured the inductive and abductive research strategies.

3.2. Adopted research approach

Following on an overview of research methodology in Section 1.3, I considered that a better theory would emerge from an inductively developed social research than a theory logically deduced from any prior assumptions (Glaser & Strauss, 1967; Patton, 2015). For this thesis, Grounded Theory Methodology (GTM) is considered most appropriate as GTM "*offers a transcending view of a main concern in a substantive area and the social behaviour that explains how that concern is processed, managed, or resolved*" (Holton & Walsh, 2017, p.10). GTM as an inductive research approach with elements of both abductive and deductive analysis (Holton, 2017; Holton & Walsh, 2017) fit into the aim of this thesis. In subsection 3.2.1, I present a brief overview of the grounded theory's origin, which further explains why I consider

GTM as an appropriate approach for this thesis, and subsection 3.2.2 covers the nature and processes of GTM study.

3.2.1. A brief overview of the Grounded Theory's origin

The basic process of grounded theory, known as the constant comparative analysis was originated by Glaser in 1965 (Glaser, 1965; Glaser, 1998; Hernandez, 2010; Holton & Glaser, 2012). Afterwards, Glaser and Strauss collaborated on the studies, "*Awareness of Dying*" (Glaser & Strauss, 1967) and "*Time for dying*" (Glaser & Strauss, 1980) and further developed the grounded theory approach, until they disagreed on the precise nature of grounded theory (Holton & Walsh, 2017). The disagreement became obvious when Strauss and Corbin published their version of grounded theory, "*Basic of Qualitative Research"* (Strauss & Corbin, 1990).

Since the disagreement, which led to the discontinuity in the professional collaboration between Glaser and Strauss, several grounded theory approaches have emerged (Gibson & Hartman, 2014; Holton, 2008; Holton & Glaser, 2012; Holton & Walsh, 2017; Urquhart, 2013). In the IS discipline, Matavire and Brown (2008) identified four grounded theory approaches, namely Glaserian (also referred to as Classic or Orthodox), Straussian, Analytical, and mixed Grounded Theory. The most notable of the variation of grounded theory approaches has been the split between Glaserian and Straussian (Birks, Fernandez, Levina & Nasirin, 2013; Boadu & Sorour, 2015). As Holton (2008, p. 68) states, "*Glaser is generally recognised as having retained both the spirit and the substance of the original work*.

According to Wolfswinkel, Furtmueller and Wilderom (2013), several researchers have used grounded theory for different purposes over the years. Many scholars have suggested that excessive focus on the different approaches may not be critical to GTM studies (Birks et al., 2013, Glaser, 1998; Xie, 2009). I support the comment that "*[m]ethodologically, there are no right or wrong approaches to using grounded theory methods; however, there are differences that need to be taken into account*" (Birks & Mills, 2011, p. 8). The goal of the Glaserian approach (CGTM) is to develop a theory based on abstract conceptualisation (Fernandez, 2004; Hernandez, 2008), while the Straussian approach is used for "*rich and rigorous descriptions of a phenomenon*" (Birks et al., 2013, p. 2). CGTM is far less prescriptive than the Straussian

approach, and "*offers the flexibility of a number of potential coding paradigms, not just one*" (Fernandez, 2004, p. 46). Therefore, CGTM is more appropriate to meet the objectives of the thesis, as I aim to develop a theory that conceptualises and explains how the main concern of the senior IS undergraduates was resolved.

3.2.2. The nature and processes of Classic Grounded Theory Methodology (CGTM)

It is essential to clarify the nature or fundamental characteristics of CGTM to be followed in a study, since there are several schools of thought in the extant literature with regards to how a GTM study should be conducted (Boadu & Sorour, 2015). CGTM is a rigorous research process used to generate a theory from systematically obtained and systematically analysed empirical or social data (Glaser & Strauss, 1967; Glaser, 1978). This implies that CGT is a theory generation process, which is "*embedded in a tripartite relationship between collection, coding and analysis*" (Gibson & Hartman, 2014, p. 88). CGT provides the theoretical grasp of the problems and the processes of developing the theory from data obtained in a substantive area (Glaser, 1978).

The primary goal of CGTM is to generate a theory that explains the behavioural pattern relevant and problematic to the participants, and how the participants continuously resolve or process the problematic behaviour (Glaser, 1978). CGT focuses on explaining, "*what is going on to continually resolve a main concern*" of the participant (Glaser, 2005, p. 4). The resolution is otherwise known as the core category (Glaser, 1998; Hernandez, 2009). Embedded in CGTM is "*the infrastructure, the skeleton and a process by which data can be gathered and analysed*" (Birks et al., 2013, p. 2). However, these I basic principles govern the use of CGTM: no preconceived problem; conceptualisation; constant comparative analysis; theoretical sampling; coding; and memoing. In 3.2.2.1 – 3.2.2.7, I discuss the principles that guide CGTM studies, which I followed for this thesis.

3.2.2.1. No preconceived Problem

A "good" CGTM study begins with an area of interest rather than a preconceived professional problem (Glaser, 1998). This is to allow for openness and theoretical sensitivity and not to

anticipate or preconceive what the researcher will discover in the substantive area (Glaser, 1978). "*Theoretical sensitivity is the ability of the researcher to work with the data in both theoretical and sensitive ways... through immersion in the data, line by line, comparison by comparison, memo by memo, and code by code*" (Walker & Myrick, 2006, p. 552). No preconceived notion prevents personal biases and enables the researcher to capture happenings and record relevant events without being judgemental based on pre-existing knowledge (Glaser, 1978). All the theoretical ideas are set aside so as not to contaminate the researcher's ability to generate a grounded theory (Fernandez, 2004; Glaser, 1978).

A CGTM researcher is advised to delay reading the literature in the substantive area until "*when the theory seems sufficiently grounded and developed*" (Glaser, 1978, p.31). The literature should, therefore, be treated *"as another source of data to be integrated into the constant comparative analysis process once the core category, its properties and related categories have emerged and the basic conceptual development is well underway*" (Holton & Glaser, 2012, p. 26). The literature could be used "*in theoretical sampling for full saturation or emergent concepts as well as in theoretical coding for the emergence of relationships between concepts and overall integration of the theory*" (Holton & Walsh, 2017, p.33). After the substantive theory is grounded, the researcher is expected to integrate the ideas from the literature (the body of knowledge) with the substantive developed theory and compare the developed substantive theory with the existing formal theories or body of knowledge. Reviewing the literature from the onset might be a waste of time since it could be of little or no significance to the emerging concepts or theory (Holton & Walsh, 2017).

In support of no preconceived problem, the research questions in CGTM studies are usually open ended (broad), as well as the data collection and analysis processes (Gibson & Hartman, 2014). The openness of the CGTM in data collection is also revealed in the claim that 'all is data' (Glaser, 1978), which indicates, "*everything should be used as data*" (Gibson & Hartman, 2014, p. 35). As a general research approach, CGTM is "*a research paradigm befitting the discovery of new theories from any philosophical perspective*" (Holton & Walsh, 2017, p. 161). CGTM embraces all types of data whether quantitative or qualitative, allowing for triangulation of data sources, and reducing potential bias from either the participants or the researcher (Holton & Walsh, 2017).

As described in Table 10, there are five possible types of data: Baseline, Properlined, Vague, Zero and Interpreted data (Glaser, 2015; Tossy, 2012). However, knowing the type of data obtained is not critical to CGTM studies, but can help the researcher explain what is happening in the substantive area (Glaser, 2015). Thus, the researcher is encouraged to obtain data from a variety of sources and analyse whatever data is obtained (Glaser, 2011). In this thesis, data was obtained through a variety of sources such as direct observation, informal discussion, formal interviews, field notes, lecture videos, documentation, online surveys, seminar reflection, and scholarly literature. When I felt a participant was vague, I probed with additional questions to gain clarity, and I did not encounter a zero type of data.

Table 10: Types of Data (Tossy, 2012, pp. 55-56).

Data Type	**Description**
Baseline	"*the respondent is being as truthful as possible, as far as the interviewer can gauge*".
Properlined	"*the respondent deliberately edits the data so that it is not in conflict with the official line of argument of his employing authority*".
Vague	"*the respondent deliberately gives an indistinct version of reality to try and confuse the researcher, obfuscate the issue and throw the researcher off the scent*".
Zero	"*the respondent refuses to say anything at all in order to avoid saying anything which s/he might later regret*".
Interpreted	"*the respondent is filtering his/her messages either to deliberately complicate or to simplify her/his responses*".

3.2.2.2. Conceptualisation: not a detailed description but conceptualisation

Unlike a quantitative study that focuses on statistical verification or a qualitative study that aims at voluminous description, the goal of a CGTM study is neither of these, but conceptualisation (Glaser, 1978). A CGTM researcher identifies, discusses, and integrates emerged concepts from the substantive area to develop the substantive or formal theory, rather than providing a detailed description of happenings in the substantive area.

While description limits the idea to a particular situation, the idea can be generalised and modified to other places, times and people when conceptualised (Chametzky, 2016). CGTM is an approach that was discovered, and to discover is conceptual rather than story talk or detailed description because the data where the theory came from is often forgotten (Glaser, 2015). Also, a conceptual code is a relationship between the data and the theory (Gibson & Hartman, 2014).

3.2.2.3. Constant comparative analysis

Constant comparative analysis is a process of comparing different groups either because "*(a) they suggest the same category or (b) because a category that was developed through an analysis of the concerns of one group might be compared to how it is processed in another*" (Gibson & Hartman, 2014, p. 126). This comparison may indicate something about the nature of the category, which could be useful in developing the substantive theory. CGT cannot be developed without constant comparative analysis. In a CGTM study, the constant comparative analysis is done for conceptual reasons, and not for evaluation of evidence (Holton & Glaser, 2012; Glaser & Strauss, 1967; Gibson & Hartman, 2014). The process of constant comparative analysis entails: (a) comparing incidents applicable to each category, (b) integrating categories and their properties, (c) delimiting the theory, and (d) writing the theory (Holton & Glaser, 2012; Glaser & Strauss, 1967; Gibson & Hartman, 2014). The constant comparative analysis enables the researcher to identify many variations – uniformities and diversities - in the data (Fernandez, 2004) to develop the substantive or formal theory. The constant comparative analysis process begins preferably from the first day of collecting the field note (Glaser, 2011). A constant comparative analysis could be used to produce either a rich description of a

phenomenon, in the case of a Straussian grounded theory approach, or conceptualisation, in the case of a CGTM approach (Fernandez, 2004).

3.2.2.4. Theoretical sampling

Theoretical sampling is the process of collecting data for generating theory, where the analyst identifies and pursues clues that arise during data collection, coding and analysis in a grounded theory study (Birks & Mills, 2011; Glaser & Strauss, 1967). In a CGTM study, theoretical sampling, otherwise referred to as theory-directed sampling (Birks & Mills, 2011), is driven by the emerging theory. The initial selection is not based on a predetermined theoretical framework (Glaser & Strauss, 1967; Glaser, 1978); the emerging theory controls the data collection process, and dictates "*what data to collect next and where to find them*" (Glaser & Strauss, 1967, p. 45).

The initial theoretical sampling decision is, however, based on the prominent places where the relevant data could be obtained, and the data collection ceases when codes are saturated, elaborated and incorporated into the emerging theory, through the constant comparative analysis (Glaser & Strauss, 1967; Glaser, 1978; Goulding, 2002). Constant comparative sampling is used mainly to discover further information about a category (Gibson & Hartman, 2014).

3.2.2.5. Coding

Coding is a process of conceptualising the emerging pattern of a set of empirical data (Gibson & Hartman, 2014). Codes are generated through the process of constant comparative analysis, which "*requires continuous thought, analysis and search*" (Glaser & Strauss, 1967, p. 52). Coding generally has two purposes: to capture what is happening in the substantive area by securing codes or concepts or categories from the data, and articulating relationships within the observed data by integrating the categories into a unified theory (Gibson & Hartman, 2014). Coding can be categorised into substantive coding, and theoretical coding (Holton & Glaser, 2012; Holton & Walsh, 2017). The substantive coding and theoretical coding are further explained in 3.2.2.5.1 and 3.2.2.5.2 respectively.

3.2.2.5.1. Substantive coding

Substantive coding is the process of conceptualizing the empirical substance of the data (Glaser, 1978; Holton & Walsh, 2017). During substantive coding, the researcher generates substantive codes, which *"are the categories and properties of the theory that emerges from and conceptually images the substantive area being researched*" (Glaser & Holton, 2005b, p. 13). Substantive coding begins from the initial open coding of the empirical data to the emergence of a core category, followed by selective coding, where the data collection and analysis is delimited to the core category and its related categories (Holton & Glaser, 2012, p. 277-278). Substantive coding involves both open coding and selective coding processes.

Open coding

Open coding, which implies "*coding the data everywhere possible*", begins with the process of data collection, and is driven by the emerging theory (Glaser, 1978, p. 56). The open coding process involves theoretical sampling, systematic data collection, coding and constant comparative analysis (Gibson & Hartman, 2014). The researcher begins the open coding with the first field notes, preferably on the first day empirical data is obtained (Glaser, 1998). The open coding process forces the researcher to get out of the data, think and generate ideas through the constant comparative analysis to produce "*a set of categories that fit, work and relevant for the purposes of [the] theory*" (Gibson & Hartman, 2014, p. 91). The open coding process is aimed at generating codes or concepts - otherwise known as variables (Gibson & Hartman, 2014; Hernandez, 2009). Concepts are a higher level of abstraction of a conceptual idea, which are developed by comparing similarities and differences in the coded data (Holton & Walsh, 2017). The category is the abstraction of individual concepts as a latent pattern (Holton & Walsh, 2017). A good code has good imagery and analytic ability that relates sufficiently to, and illustrates the problems in, the substantive area.

There are two types of codes: *in vivo codes* and *sociological constructs* (Gibson & Hartman, 2014; Hernandez, 2009; Hernandez, 2010). *In vivo codes* are codes taken directly from the obtained data or field notes, they are directly related to the substantive area (Gibson & Hartman, 2014; Hernandez, 2009; Hernandez, 2010), while *sociological constructs* are well-known constructs "*in the literature and are simply recognized by the researcher as they emerge from the data*" (Hernandez, 2010, p. 156).

During the open coding phase, the researcher primarily captures actions and interactions happening in the substantive area (Gibson & Hartman, 2014). Interviews, field notes or other writing data are broken down into substantive codes (Hernandez, 2009). Specific rules that guide the open coding process (Gibson & Hartman, 2014; Glaser, 1978; Glaser, 1998; Glaser, 2015) are listed as follows:

1. Interrogate the data with a set of questions (questions such as *"What is this data a study of?", "What category does this incident indicate?", "what is happening in the data?", and "what accounts for continual resolving of this concern"* (Glaser, 1998, p. 140).

2. Analyse the data line by line or by taking the data in relevant larger chunks.

3. Personally code.

4. Always interrupt coding to memo ideas.

5. Remain within the confines of the substantive area, which is a specific setting and context, until the theory has emerged.

6. Do not assume the relevance of any 'face sheet' variable such as sex, race or age.

During open coding, the set of interrogated questions keep the researcher theoretically sensitive. A CGTM researcher is advised to personally code his or her data line by line or take in relevant larger chunks where necessary, and should always be ready to interrupt coding to memo ideas (Gibson & Hartman, 2014; Holton & Glaser, 2012). The researcher needs to remain in the substantive area until the theory is sufficiently developed and should not assume relevance of 'face sheet' variables unless they have emerged as relevant to the theory being developed (Gibson & Hartman, 2014; Glaser, 1978; Glaser, 2015). Usually, the outcome of the open coding process is codes that describe and group data together in the substantive area (Gibson & Hartman, 2014; Glaser, 1978; Glaser, 2015).

Through constant comparative analysis, a CGTM researcher first needs to identify a core category, because to stay focused, he or she is expected to theorise on only one core category at a time (Glaser, 1978; Glaser, 2015). For this thesis, I focused on only one core category,

which accounts for most of the variations around the concern of the participants and explains how the main concern of the participants is continually resolved (Glaser, 2005; Holton & Glaser, 2012). The core category must repeatedly be proven by comparing instances and concepts generated from many codes (Glaser, 1978; Glaser, 2005; Holton & Glaser, 2012). The core category must re-occur frequently and relate meaningfully to many other categories and their properties in the data. The core category must meet the following listed conditions (Glaser & Holton, 2005a):

1. Central and relates to as many other categories as possible.

2. Re-occurs frequently.

3. Given more time to saturate because of its relationship to the other variables.

4. Relates easily with the other categories.

5. May grab beyond the substantive field.

6. Should enable the development of the theory rather than make it difficult.

7. Should be completely variable and have frequent relations with other categories and be modifiable.

The open coding phase ends with the identification of the core category, and a series of well-developed categories, after which the researcher can proceed to selective coding (Gibson & Hartman, 2014).

Selective coding

Selective coding is a "*set of categories and their properties which fit, work and relevant for integrating into a theory*" (Glaser, 1978, p. 57). Selective coding focuses on developing the core category (Gibson & Hartman, 2014). The switch to selective coding requires a strategic decision to focus on only the key variables that are associated with or related to the core category (Gibson & Hartman, 2014). This phase only begins after the researcher has identified and selected the core category (Gibson & Hartman, 2014; Holton & Glaser, 2012). Jumping to selective coding before identifying and selecting a core category will only result in coding

chaos (Holton & Glaser, 2012). When coding selectively, the researcher "*delimits his coding to only those variables that relate to the core variable in sufficiently significant ways to be used in a parsimonious theory*" (Glaser, 1978, p. 61). The selective coding phase results in the saturation of all the categories that can be built into a substantive theory through the process of theoretical sampling (Hernandez, 2009). Thus, theoretical coding becomes relevant to the theory development process (Gibson & Hartman, 2014).

3.2.2.5.2. Theoretical coding

Theoretical coding refers to the process of integrating the emerging concepts that explain the relationship between the core category and their major-related concepts or categories into a coherent grounded theory (Gibson & Hartman, 2014; Holton & Walsh, 2017)**.** "*Theoretical codes conceptualise how the substantive codes may relate to each other*" (Glaser, 1978, p. 55). During theoretical coding, the researcher relates the substantive codes to each other and examines the nature of the relationships between the codes (Urquhart, 2013). Although "*theoretical codes are valuable and highly useful, they are not a requirement for a classic grounded theory study*" (Chametzky, 2016, p. 170). The researcher in the theoretical coding phase has two main goals: integrating the theory and delimiting the theory. Thus, theoretical codes are significantly used during memo sorting and integration (Gibson & Hartman, 2014). For further reading on theoretical codes, see Glaser (1994, 1978) and Glaser and Holton (2005a).

3.2.2.6. Memoing

Theoretical memos are the bedrock of theory generation, the written records of theoretical thinking, conscious and preconscious ideas about the codes and their relationships as they strike the analyst while coding (Glaser, 2014; Glaser, 1978). Theoretical memoing is the process whereby the researcher breaks off during coding to write up his/her ideas about the data obtained (Glaser, 1978; Urquhart, 2013). Glaser (2015) advised that the researcher must be ready to interrupt coding to memo ideas. Theoretical memos lead to abstraction, and theoretical memos are written throughout the constant comparative analysis. This could begin immediately that the researcher obtains the first data, and continues through to memo sorting, paper writing up and to the very end of the study (Glaser, 1978; Holton & Walsh, 2017).

While coding captures what is going on in the substantive area, memoing is the process of writing up the researcher's ideas about the codes and how they are related (Gibson & Hartman, 2014). Memoing is vital in a grounded theory study and highly important for generating a substantive theory (Glaser, 2014). It should be noted that *"[m]emoing ideas is not just for an idea dump; it is a memo bank of a constant source of stimulation for the meaning growth of emergent analysis*" (Glaser, 2014, p. 49). Memoing allows a researcher to be creative and meaningfully think differently about the data (Urquhart, 2013). The style of the memo is free and depends on the style with which the researcher is comfortable. There is no right or wrong way of writing memos. Hence, memos need not be criticised by the researcher or by any other person (Glaser, 2014).

3.2.2.7. Other important concepts: theoretical saturation and sorting

Other concepts that are worth noting in CGTM studies are theoretical saturation and sorting:

Theoretical saturation is the point where additional data yields no further theoretical elaboration or specification (Glaser, 2011; Holton & Walsh, 2017). A core category needs to be saturated to generate a substantive theory with well-connected concepts and explanatory power (Holton & Walsh, 2017).

Theoretical sorting begins once the categories that relate to the core category have been theoretically saturated (Glaser & Holton, 2007). Theoretical sorting is the last stage in the grounded theory process where the researcher's ideas are theoretically ordered, fractured data is put back together, and memos are set up in preparation for writing up (Gibson & Hartman, 2013; Glaser, 1978; Glaser, 1998). Sorting is not mainly writing up data, but a conceptual sorting of ideas that provides a fully integrated general and conceptual model (Gibson & Hartman, 2014; Glaser, 1978). Sorting generates a dense, complex and complete theory (Glaser, 1978). The researcher, in the theoretical sorting phase, reviews, sorts, and integrates only memos that relate to the core category, its properties and categories (Glaser & Holton, 2007).

3.2.3. Grounded Theory Methodology with case data

In this thesis, my interest is to generate a substantive theory using CGTM, with a case study for data collection. A case study is one of the preferred ways of doing grounded theory research in IS (Fernandez, 2004), and is a research strategy which focuses on understanding the dynamics present within single settings (Eisenhardt, 1989).

> "*Case study research is considered a viable IS research strategy, since (1) researchers can study information systems in a natural setting, learn about the state of the art, and generate theories from practice, (2) it allows the researcher to answer "how" and "why" questions, thus, to understand the nature and complexity of the processes taking place, and (3) it is an appropriate way to research an area in which few previous studies have been carried out*" (Mueller & Urbach, 2013, p. 9).

A case study can be either single case or multiple cases and can be used to describe, test theory or generate theory (Eisenhardt, 1989; Yin, 2009). Case studies can employ multiple levels of analysis within a single study (Eisenhardt, 1989; Yin, 2009), and the evidence could be qualitative, quantitative or both (Eisenhardt, 1989). Single cases can "*enable the creation of more complicated theories than multiple cases, because single-case researchers can fit their theory exactly to the many details of a particular case*" (Eisenhardt & Graebner, 2007, p. 30). "*Case studies typically combine data collection methods such as archives, interviews, questionnaires, and observations*" (Eisenhardt, 1989, p. 534). When building theory from case studies, the case(s) is/are selected based on theoretical reasons to replicate or extend the emergent theory or fill theoretical categories, thus selection of case(s) relies on theoretical sampling (Eisenhardt, 1989). In extreme situations where a limited number of cases exist, cases may be chosen randomly, where the research interest is transparently observable, although the random selection is not preferable (Eisenhardt, 1989). In theory building case studies, there is frequent overlapping of data collection with data analysis which gives the researcher the freedom to make an adjustment during the data collection process. The adjustment could be the addition of cases, the addition of data sources, or adjustment to data collection instruments if such an adjustment will help better ground the theory or provide new theoretical insight.

The analysis of case data is done in two stages. The first stage is the "*within-case analysis*" which helps a researcher to gain "*familiarity with data and preliminary theory generation*" (Eisenhardt, 1989, p. 533). The within-case analysis involves a detailed description of the case or each case. The second stage is "*[c]ross-case pattern search using divergent techniques*" which forces a researcher to "*look beyond initial impressions and see evidence through multiple lenses*" (Eisenhardt, 1989, p. 533). The cross-case analysis gives the researcher a unique insight from different types of data collection, which improves the likelihood of building an accurate and reliable theory that closely fit the empirical data.

According to Eisenhardt (1989), building grounded theory from case data has the following benefits:

- The emergent theory is likely to produce novel theory because creative insights often arise from juxtaposing contradictory or paradoxical evidence, thus generating theory which has less researcher bias than theory built from "*incremental studies or armchair, axiomatic deduction*" (Eisenhardt, 1989, p. 547).
- Due to close connection between the emergent theory and the data, "*the emergent theory is likely to be testable with constructs that can be readily measured and hypotheses that can be proven false*" (Eisenhardt, 1989, p. 547), and thus, the resulting hypotheses are likely to be verifiable.
- The emergent theory is "*likely to be empirically valid*" (Eisenhardt, 1989, p. 547) because the theory-building process is so closely tied with evidence, the emergent theory will intimately mirror reality, and thus be consistent with empirical observation.

"When is it appropriate to conduct theory building case study research?" (Eisenhardt, 1989, p. 547). Grounded theory building from case study research is particularly appropriate "*when little is known about a phenomenon, current perspectives seem inadequate because they have little empirical substantiation, or they conflict with each other or common sense. Or, sometimes, serendipitous findings in a theory-testing study suggest the need for a new perspective*". (Eisenhardt, 1989, p. 548). Grounded theory building from case study research is particularly appropriate when the case study does not rely on either prior empirical evidence or extant literature (Eisenhardt, 1989; Fernandez, 2004).

3.3. Criteria for evaluating Classic Grounded Theory (CGT)

There are no generally accepted criteria or guidelines for evaluating qualitative research, unlike quantitative research (Venkatesh, Brown & Bala, 2013). There is, however, some level of agreement that validation of qualitative research is essential (Maxwell, 1992; Venkatesh et al., 2013). Validity is "*the extent to which data are plausible, credible, and trustworthy, and thus can be defended when challenged*" (Venkatesh et al., 2013, p. 34). The issue of credibility and quality relate to three primary concerns in qualitative research, namely rigorous methods, the credibility of the researcher, and philosophical belief in the value of qualitative inquiry (Holton & Walsh, 2017; Patton, 2015).

The CGTM study "*involves discovering categories and verifying that they persist in the field*" (Gibson & Hartman, 2014, p. 92). Grounded theorists are, however, advised to be careful not to enrol in philosophical 'caricatures' while evaluating CGT (Holton & Walsh, 2017; Walsh, 2015; Walsh, Holton, Bailyn, Fernandez, Levina & Glaser, 2015a; Walsh, Holton, Bailyn, Fernandez, Levina & Glaser, 2015b). Charmaz (2014) proposes criteria of credibility, originality, resonance, and usefulness for evaluating a constructivist grounded theory. It is, however, essential to keep in mind the nature and purpose of the CGTM study while evaluating the theory. Holton and Walsh (2017, p. 154) advise that grounded theory evaluation should start by recalling its nature and purpose and they highlight that the purpose of a CGT study is:

> "*to systematically generate theory from data as an integrated set of concepts and as hypotheses about the interrelationships among these concepts that focus on a main issue or concern in the area under study and explain how that issue or concern is processed or resolved*".

The important question to consider when evaluating CGT is the emergent understanding or the usefulness of the theory that is generated (Baker, Wuest & Stern, 1992; Holton & Walsh, 2017; O'Connor, Netting & Thomas, 2008). As O'Connor et al. (2008, p. 36) suggest, the proper way to evaluate CGT is "*to demonstrate the clearest standards available, those suggested by its original developers*". These criteria are fit, workability, relevance, and modifiability (Glaser, 1992; 1978; Glaser & Strauss, 1967; Holton & Walsh, 2017).

- **Fit**: "*Fit is another word for validity*" (Glaser, 1998, p. 18). "*By "fit", we mean that the categories must be readily (not forcibly) applicable to and indicated by the data under study*" (Glaser & Strauss, 1967, p. 3). Fit refers to the closeness of the grounded theory to the pattern in the data; reflecting everyday reality (Glaser, 1998; Glaser & Strauss, 1967; Holton & Walsh, 2017). Indicating that the theory must "*fit reality in the eyes of the subjects, practitioners and researchers in the area*" (van Niekerk & Roode, 2009, p. 102). Grounded theory must have enough clear categories and hypotheses or propositions that adequately fit into the substantive area to which it will be applied (Glaser, 1998; Glaser & Strauss, 1967; Holton & Walsh, 2017). A theory that is carefully induced from diverse data will fit because the categories and concepts will be closely related to what is going on in the substantive area and will be highly applicable to the substantive area (Glaser & Strauss, 1967). Constant comparative analysis helps in shaping the fitness of CGT (Glaser, 1998; Holton & Walsh, 2017).

- **Workability**: "*by "work", we mean that they must be meaningfully relevant to and be able to explain the behaviour under study*" (Glaser & Strauss, 1967, p. 3). Workability means the concepts and their properties relate sufficiently to hypotheses or propositions that account for how the participants' main concern is resolved (Glaser, 1998; Holton & Walsh, 2017). Thus, work "*explains the major variations in behaviour in the area with respect to the major concerns of the subjects*" (van Niekerk & Roode, 2009, p. 102). The grounded theory workability criterion can be compared with external validity and transferability, which means, "*the theory is sufficiently abstract to transcend specific empirical incidents for theoretical generalizability*" (Holton & Walsh, 2017, p. 156). Replication of the study is possible because of the transparency of the research process through theoretical sampling and constant comparative analysis (Holton & Walsh, 2017).

- **Relevance**: refers to the usefulness or practical value of the theory (Glaser, 1998; Holton & Walsh, 2017). Relevance talks about the research importance, and that "*if it fits and works it has relevance*" (van Niekerk & Roode, 2009, p. 102). A study that no one, or only a few academics or funders are interested in lacks relevance (Glaser, 1998;

Holton & Walsh, 2017). Grounded theory must relate to the main concern of the participants under study (Glaser, 1998).

- **Modifiability**: A grounded theory must be modifiable; this indicates the significance of the theory (Glaser, 1998; Holton & Walsh, 2017). The theory is modified once there is new data with which to compare it (Glaser, 1998; Holton & Walsh, 2017). If there are new data to compare with, the theory warrants modifications (van Niekerk & Roode, 2009). The researcher checks for gaps between the category and the data, and subsequently modifies the category. Modifiability, however, neither connotes verification of theory as in hypothetical-deductive theory building, nor a detailed description as in qualitative research. The primary goal of a theory is to answer the questions of how, when, and why.

Holton and Walsh (2017) relate the criterion of fit to validity, workability to external validity and transferability, and relevance to the practical value or usefulness of the theory. In addition to the four criteria of fit, workability, relevance and modifiability proposed by Glaser & Strauss (1967), Holton and Walsh (2017, p. 156) echoed Glaser and Strauss's (1967) criteria of "*logical consistency, clarity, parsimony, density, scope [and] integration*". This implies that a grounded theory must be logical (*consistency*), organised and concise (*parsimony*), communicated clearly (*clarity*), and must sufficiently tap into the domain of the phenomenon under investigation (*scope*), and be presented as a set of integrated concepts, proposition or hypothesis integrated into a unified, coherent theory (*integration*). "*Density refers to the levels of conceptualisation, development of theoretical properties, and overall conceptual integration*" (Holton & Walsh, 2017, p. 156).

3.4. Summary

Chapter 3 presented the research methodology, and offered justification for the appropriateness of the adopted research approach, GTM, with case data. The chapter highlighted the criteria for evaluating CGT, and was theoretically focussed. The following chapter describes the case and chapter 5 explains how I went through the grounding process, with examples.

4. Case description

An overview of the CGTM was provided in Chapter 3. *"It is a capital mistake to theorise before one has data. Insensibly one begins to twist facts to suit theories, instead of theories to suit facts"* (Doyle, 1892, p. 7). In this chapter, I describe the case where I obtained the empirical data. The chapter is organised as follows: In section 4.1, I present some background history of the IS Department, from which I obtained the data, an overview of the IS undergraduate programme is presented in section 4.2, and section 4.3 covers the research population. Section 4.4 is an overview of the primary and secondary data sources. The employment outcome of the case is presented in section 4.5, and section 4.6 summarises the chapter.

4.1. Some background history of the IS Department

Based on the information gathered from the past Heads of the IS Department. In the early 80s, the IS Department was the Business Data Processing section of the Accounting Department until it became a separate Department of IS in the 90s. The IS Department followed the AIS curriculum closely and used IS97, IS2002, then IS2010 as guides for a curriculum. Initially, the IS courses were an IS1 half-course, IS2 and IS3 (both full courses), plus full-time and part-time IS Honours. The initial staff had IS and computing industry experience, but their academic qualifications were in other areas.

Finding local academic staff was a real challenge despite massive advertising, and the Department's many honours graduates preferred the lucrative salaries offered by industry, and did not stay on to lecture or study further. Some retired IT managers, who were willing to work part-time in the department, helped out, and gradually new staff wishing to pursue an academic career and carry out research were found, many of these from SADC (Southern African Development Community) countries.

Initially, the staff were mainly involved with a large teaching load as the subject grew in popularity. There was a massive shortage of IT professionals countrywide, and IS Honours graduates were sought after. In the late 90s, a research Centre was started, and research and publications grew greatly after 2000. The IS Department started to develop research themes using the large, competent part-time and full-time Honours classes to work on empirical

projects in small teams involving their academic leader. The themes were based on the staff member's research interests. This approach paid massive dividends in research output and was followed by a significant increase in successful Masters and Doctoral graduates, which were initially very low. As students specialised in IS, the number of courses and staff grew and, since then, the postgraduate qualification successes have blossomed.

4.2. Overview of the IS undergraduate programme

For this thesis, the senior IS undergraduates' programme situated within the department of IS in one of the leading HEIs in South Africa was selected. The senior IS undergraduates are students who enrolled in an optional fourth year IS undergraduate programme, i.e. after a three year IS undergraduate programme they may take an additional one-year qualification, which prepares them for a research-based postgraduate programme. The programme consolidates and deepens the students' expertise in the IS discipline and carries recognition by the British Computer Society (BCS) Chartered IT Professional (CITP). The BCS CITP recognises skills frameworks such as SFIA and e-CF, and the BCS CITP assessment criteria can be found in Appendix B (Figure 30).

The minimum entry requirements into the senior IS undergraduate's programme for the internal applicants, i.e. third year IS/Computer Science major students, are obtaining an overall credit weighted average of at least 65% and at least 55% for each course. They need to also submit a detailed CV, and provide answers to questions relating to any past and present work experience and activities, awards, skills, and qualifications gained, involvement with the IS industry, their intended career progression, and motivation for enrolment in the course. External applicants must additionally submit an authorised academic transcript of their marks and give contact details of two referees. The external applicants may also be requested to provide examples of their written or project work and may be required to attend an interview and complete an entrance examination (XXX Faculty Handbook, 2021).

The senior IS undergraduate programme is a one-year programme, which usually runs from February to November. Before COVID-19, the programme was conducted as face-to-face sessions with integrated web-based support materials and activities provided through a

Learning Management Systems (LMS). The LMS is the institution's online collaboration and learning environment for supporting courses and other related groups and communities. The programme requires the senior IS undergraduates to demonstrate and build on the skills learnt in their previous three-year IS undergraduate courses, while developing new skills in research. The contents of the IS undergraduate programme, from first-year to senior IS undergraduate level, are as follows:

4.2.1. The basic IS undergraduate courses

This section is focused on IS core courses from first-year to third-year undergraduate level. Other core or elective courses that the students do are Financial Accounting, Business Finance, Marketing, Professional Communication, People Management, etc.

The IS undergraduate programme is made up of two Level 1 IS core courses (XXX Faculty Handbook, 2021):

- **Foundations of IS** which introduces the IS undergraduates to information systems and their role in business and society, and discusses the fundamental knowledge of information systems, their functioning and contribution to globalisation. Topics such as electronic business, business intelligence, analysing information for decision-making, computational thinking, information security and privacy, and emerging technologies are covered. Both theoretical and practical aspects are covered through lectures and hands-on practical sessions.

- **Programming** which focuses on integrating good programming practices through planning and developing software programs; the course is practical-orientated, and students are required to do programming exercises.

There are five Level 2 IS core courses in the IS undergraduate programme (XXX Faculty Handbook, 2021):

- **Business intelligence and analytics** introduces the students to the main features of Business Intelligence (BI) and business analytics, including data warehousing and data marts, decision support systems, Online Analytical Processing, data mining and

analytics, corporate performance management, data visualisation, real-time BI, pervasive BI, mobile BI and big data analytics. Case studies and management approaches for implementation are covered and a hands-on project requires students to produce a management report after analysing data using commercial BI software.

- **Database/Information Management** introduces students to database concepts, advanced database design and implementation and new developments in the database field. This course has a strong practical component, and students are taught the practical aspects of designing, implementing and using databases. The course explores different database architectures and design approaches, data modelling techniques, data dictionaries, database implementation, database security and administration. The concepts are applicable to any development environment, and the workshops ensure the students can apply this theory to real-world applications.

- **Systems analysis and design** explores the role of the Systems Analyst in business, different approaches used in the development of IS, and the various tools and techniques used in the specification of system requirements. This course provides second-year IS undergraduates with an in-depth knowledge of the systems development process, with particular emphasis on the analysis stage of the life cycle. There is a strong practical component to the course, where students are taught to understand and use the common tools of object-oriented systems analysis. The course strongly focuses on the design of UML models including package, activity, use case, class, interaction and state machine diagrams.

- **IT infrastructure** provides students with an in-depth knowledge of hardware, software, data communications and networking theory. The course is designed to build the skills required for the management and building of distributed systems and commercial networks. This course provides the hardware and software technology background required for understanding various computer architectures for single and multiple users.

- The last course in the Level 2 IS undergraduate programme provides students with an in-depth knowledge of the **systems development process** with particular emphasis on the design and implementation stages of the life cycle. This course has a strong practical component, where students use object - oriented tools to design and construct a working system. Students are taught the object - oriented approach to design using UML notation, and program development using Visual C#, .net, iterative methodologies and systems implementation.

The IS undergraduate programme is made up of four Level 3 IS core courses (XXX Faculty Handbook, 2021):

- A **Systems Development (SD) project** enables third year IS undergraduates to understand the issues influencing ICT projects and experience developing and implementing such a project. The course combines project management's theoretical elements with the practical implementation of these concepts by completing a systems development team project, integrating practical and theoretical elements obtained and developed during other undergraduate IS courses. This course's theoretical parts aim to make the project team experiences true to life, aiding a project practitioner's development. The third year IS undergraduates learn that successful project management consists of a sound plan (using project management tools and techniques) and strong people management and teamwork to direct the plan and complete the project's deliverables. The basis for this development process is an interactive project team environment of learning through experiences and reflection. The practical part of this course involves applying and implementing these concepts following the full life cycle of a team-based IS project in a real-life setting.

- **IT Project Management Systems** enables third-year undergraduates to understand project management issues influencing business and IS/IT projects and experience such projects' execution. The course combines the theoretical elements of project management (and people management) with the practical implementation of these concepts by completing a team project. The course integrates practical and theoretical elements obtained and developed in other undergraduate IS courses.

- **Business Process Management & Enterprise Systems** examines the role, relationship and effect IT Applications have on businesses and vice versa. It heavily emphasises Enterprise Resource Planning (ERP) systems, business processes, and Business Process Management (BPM). The course aims to expose the third-year IS undergraduates to methodologies and techniques to identify, model, measure and improve processes. Students are introduced to technologies that can be used as part of process improvement initiatives, and technologies such as ERP that impact business processes. The course included a group assignment to allow students to apply their analytical skills to improving an existing process. Students are introduced to S/4 HANA (SAP High-Performance Analytic Appliance fourth version) and acquire a basic working knowledge of the Application.

- **Electronic Commerce** provides third year IS undergraduates with an understanding of electronic commerce and covers both theoretical e-commerce issues as well as the practical skills related to e-commerce. The theory component covers the fundamentals of e-commerce, an overview of the underlying internet technologies, e-tailing, e-business models, payment systems, marketing, legal issues, management and future trends, and user experience design. The practical component includes website planning and structuring, advanced HTML (Hypertext Markup Language) editing, client-side and server-side scripting, database connectivity, marketing, and website usability. The practical component culminates in a group project in which an e-commerce website is built.

The basic IS undergraduate courses are mapped against the IS2020 Model, presented in Table 11, which reveals that **IS management & Strategy** is the only required competency not covered. It is worth noting that **Ethics, use and implications for society** and **IS Practicum** (in the IS2020 Model) are not separate courses in the basic three-year IS undergraduate programme but are integrative themes addressed in many of the IS undergraduates' courses. There is no explicit course for **secure computing**, but the content is touched on in the IT infrastructure and Systems Development project.

Table 11: The basic IS undergraduate courses and the IS2020 Model.

Empirical Case		**Content of IS2020 Model**	
Level of undergraduate study	***Content covered***	***Required Competency***	***Optional Competency***
Level 1	Foundations of IS	Foundations of IS	
	Programming	Application Development / Programming	
Level 2	Business intelligence and analytics		Data / Business Analytic
	Database / Information Management	Data / Information Management	
	Systems analysis & design	Systems analysis & design	Object-Oriented Paradigm
	IT infrastructure	IT infrastructure Secure computing	
	Systems development process	Systems analysis & design	Object-Oriented Paradigm
Level 3	Systems Development project	IS project Management, Secure computing	
	IT Project Management Systems	IS project Management IS Practicum	
	Business Process Management & Enterprise Systems		Business process Management
	Electronic Commerce		Web programming, User interface design

4.2.2. The senior IS undergraduate programme

The senior IS undergraduate programme aims to provide students with an understanding of the business perspective, complexities and issues in the development and management of IS, and how IS and IT can be used to run and improve businesses and society. The programme further aims to provide these students with a range of experiences through active learning, making them fit for the workplace. The programme's content is acceptable and relevant to the industry, as industry and employers are integrated into the content's development and delivery process. As a result, in 2019, the IS Honours (senior IS undergraduates) programme was accredited with an A1 recommendation by the BCS CITP accreditation (BCS accreditation for YYY, 2019). BCS commended the senior IS undergraduate programme on providing an example of good practice in social engagement (XXX IS Departmental website, 2019).

As at the time of accreditation, according to the course outline, the senior IS undergraduate programme comprises of four courses:

- Two seminar-driven courses, the first focusing on Technology (**Application & Technical Development**), and the second on technology management (**Information Systems Management**). Senior IS undergraduates are expected to research, present and discuss current issues in the field of IS development and management in seminars. The seminar courses aim to develop strong communication, interpersonal and change agent skills through various activities. The activities include researching a contemporary issue in IS, tutoring junior IS undergraduates, becoming involved in a community outreach project, attending a Global Citizenship module, being active in online class forums, submitting reflection pieces, and engaging with industry practitioners. The course also aims to develop a community spirit through the Community Involvement Programme. Selection of the various IS application and technical development and IS Management topics is based on current research from academia and industry. There is no textbook for the two seminars driven courses. Students are required to research a topic, and firstly produce a seminar paper in collaboration with an academic. Once the seminar paper has been approved by the academic, students have to develop and present a seminar on the topic, and then facilitate a question-and-answer session. Practitioners from IS industries are invited to present their experience on the topic after the students' presentations.

- A **Systems Development (SD) project** completed by a team of four. The course aims to equip senior IS undergraduates with problem-solving, team management, and technical skills, for them to be ready for a professional work environment. They have to identify and analyse a real-world IS problem, then design and develop (by programming) a fully functioning Information System, using and integrating Analysis, Design, Programming and Testing skills learned during other undergraduate courses in their projects. The course combines theoretical elements of agile project management and software development methodologies with the practical implementation of these concepts by completing the team projects. Projects are formulated by industry sponsors and are related to real-life business problems that need to be solved to bring business

value. The students are required to use agile methodologies (Scrum/Kanban) to manage their projects and to work independently, liaise with their sponsors to gather requirements and produce a workable solution in four iterations.

- A written **Empirical Research (ER) project** on an IS topic. Each student works with an academic mentor to research, collect and analyse data, and produce a written empirical report. Senior IS undergraduates are taught research techniques and are expected to develop critical reading, analysis and research design skills and demonstrate good writing skills. They select research areas, prepare research proposals, and are assigned to mentors to guide them through the research process. Seminars covering academic writing and research methodology are provided.

The senior IS undergraduate curriculum is mapped with the IS2020 Model, presented in Table 12, which reveals that their programme covers the required **IS management & Strategy** competency area in the IS2020 Model. As Mitchell and Benyon (2018, p. 2) noted, maybe the basic three-year IS undergraduate curriculum in this empirical case is "*already full with traditional knowledge requirements*", that is why the **IS Management & Strategy** competency area is introduced at the senior IS undergraduate level.

Table 12: Mapping the senior IS undergraduates' curriculum with the IS2020 Model.

Empirical Case		**Content of IS2020 Model**
Year of undergraduate study	***Content covered***	***Required Competency***
Year 4 (Senior IS undergraduate)	Application & Technical Development	Application Development
	Information Systems Management	IS management & Strategy
	Empirical Research (ER) project	IS Practicum
	Systems Development project	IS Practicum / IS project Management

The exit level team projects (SD projects) have a practical focus on industry needs and provide on-the-job experience. The weekly seminars follow an active learning approach, and develop

problem-solving, critical thinking, oral communication and negotiation competencies. These have a strong IS industry practitioners' presence, thereby helping senior IS undergraduates learn about the industry's required competencies.

Table 13 compares the competencies provided in the senior IS undergraduate programme with the MSIS2016 areas of individual Foundational Competencies (in Table 6). The senior IS undergraduate programme covers six out of the eleven areas of individual Foundational Competencies specified in the MSIS2016 Model.

Table 13: The senior IS undergraduates and the MSIS2016's Individual Foundational Competencies.

Year of undergraduate study	***Content covered***	***Competencies provided***	***MSIS2016: Areas of Individual Foundational Competencies covered***
Year 4 (Senior IS)	Application & Technical Development Information Systems Management	Oral communication, interpersonal, change agent, research, collaboration and teamwork	Critical thinking, creativity, collaboration and teamwork, oral communication, problem-solving, and written communication
	Empirical Research (ER) project	Critical reading, analysis, research design, and writing communication	
	Systems Development project	problem-solving, team management, and technical	

The senior IS undergraduate programme fills the gap between the IS undergraduate programme (IS2020) and Masters programmes (MSIS2016). The programme focuses on the required competency area of IS2020 while preparing the senior IS undergraduates for a Master's programme in IS. The senior IS undergraduate programme strongly complies with the suggested framework presented in section 2.5. One aspect of the suggested framework that needs to be strengthened in the senior IS undergraduate programme is the global collaboration projects, which can help develop globally-aware senior students and build intercultural competency. Building intercultural communication competencies requires not only pairing local students (students from within South Africa) or pairing local students with a few international students from other African countries, which is currently the case in the senior IS

undergraduate programme, but requires collaborating with students from different cultures across international institutions (Mitchell & Benyon, 2018).

Apart from the **IS Management & Strategy** competency area, which is introduced at the senior IS undergraduate level, the basic three-year IS undergraduate programmes closely reflect the content of the IS2020 framework, presented in Figure 1. This adherence to the IS2020 competency model found in this empirical case differs from the low adherence to the MSIS2016 competency model found in the study examining the nature of graduate IS programmes in Sub-Saharan Africa (Kevor, 2020). The content and approach of this empirical case is in line with the suggested framework of section 2.5, and reinforces the literature-based findings.

Though the descriptions of the case curricula are from the Handbook 2021, they have remained stable since 2015/2016 when the primary empirical data was collected. It should be noted too that the literature draws on recent developments, e.g. IS2020 and MSIS2016 models.

4.3. Research population and sample

In this section, I offer a description of the students selected for the thesis, following the theoretical sampling principle. I obtained data from two sets (2015 and 2016 academic years) of the senior IS undergraduates who enrolled in the same IS department at the same HEI. The selection of the first set was based on its likelihood of offering theoretical insights into senior IS undergraduates' main concern, while the selection of the second set was for illuminating and elaborating the emergent theory.

I collected data from April 2015 - June 2016 (for fourteen months) until I reached saturation. The data I obtained cut across all the possible demographics in the selected senior IS undergraduates' classes. Although gender and race are not the criteria for selecting whom to participate in the study, I theoretically sampled the participants. I obtained data from Black, Coloured, White, Indian, male and female senior IS undergraduates, and male and female lecturers. Table 14 and Table 15 present the full list of the participants with details concerning the research population, the mode of data collection and the round of data collection. For

confidentiality in this thesis I took out the column that had the population group information (Black, Coloured, White, and Indian).

> **Note:** For confidentiality, easy identification and data analysis purposes, all participants were given pseudonyms followed by the year, and the round of data collection. Zelda-2015-1 represents data collected from Zelda (a pseudonym for a student participant), a student in the 2015 senior IS undergraduate class (-2015), the (-1) indicates this was the first round of data collected.
>
> Likewise, Pr.Kyle-2015/2016-1 represents, the first (-1) round of data collected from Pr.Kyle, a pseudonym for a Professor (hence the prefix Pr.) who was involved with lecturing the 2015 and 2016 Honours' classes.
>
> The full list of the participants is provided in Table 14 and Table 15.

Table 14: List of senior Information Systems undergraduate participants.

Data sample **(**Pseudonym, year, interaction number**)**	**Mode of collection**
Noel-2015-1, Noel-2015-2	Face-to-face group discussion & Survey
Gabriel-2015-1, Gabriel-2015-2, Gabriel-2015-3	Face-to-face group discussion, face-to-face interview & Survey
Zelda-2015-1, Zelda-2015-2, Zelda-2015-3	Face-to-face interview & Survey
Keira-2015-1, Jul15-2015-2, Jun16-2015-3	Face-to-face interview & Survey
Dylan-2015-1	Face-to-face interview
Natalie-2015-1, Natalie-2015-2, Natalie-2015-3	Face-to-face interview & Survey

Data sample **(**Pseudonym, year, interaction number**)**	**Mode of collection**
George-2015-1	Face-to-face interview
Tyler-2015-1, Tyler-2015-2, Tyler-2015-3, Tyler-2015-4	Face-to-face interview, Face-to-face group discussion & Survey
Michael-2015-1	Face-to-face interview
Dominic-2015-1, Dominic-2015-2	Face-to-face interview & Survey
Giselle-2015-1, Giselle-2015-2, Giselle-2015-3, Giselle-2015-4	Face-to-face interview & Face-to-face group discussion
Andrew-2015-1, Andrew-2015-2	Face-to-face interview & Survey
Roy-2015-1	Face-to-face interview
Bryce-2015-1, Bryce-2015-2, Bryce-2015-3, Bryce-2015-4	Face-to-face interview & Survey
Yale-2015-1, Jun16-2015-2	Face-to-face interview & Survey
Lila-2015-1, Lila-2015-2	Telephonic interview & Survey
Naomi-2015-1	Telephonic interview
Mason-2015-1, Mason-2015-2	Face-to-face interview & Face-to-face group discussion
Owen-2016-1, Owen-2016-2	face -to-face interview & survey
Connor-2016-1	face -to-face interview
Sophia-2016-1	face -to-face interview

Data sample **(**Pseudonym, year, interaction number**)**	**Mode of collection**
Drake-2016-1, Drake-2016-2, Drake-Seminar reflection-3	face -to-face interview & survey, documentation
Jessica-2015-1	Survey
Damien-2015-1	Survey
Silas-2015-1	Survey
Caleb-2016-1	Survey
Claire-2016-1	Survey
Dean-2016-1	Survey
Hailey-2016-1	Survey
Jennifer-2016-1	Survey
Khalil-2016-1	Survey
Mabel-2016-1	Survey
Maddock-2016-1	Survey
Nell-2016-1	Survey
Scott-2016-1, Scott-Seminar reflection-2	Survey & documentation
Seth-2016-1	Survey
Vanessa-2016-1	Survey

Data sample **(**Pseudonym, year, interaction number**)**	**Mode of collection**
William-2016-1	Survey
CE-2015-1, CE-2015-2, CE-2016-3, CE-2016-4	Web base course evaluation (questionnaire)
Honour Course outline-2015-1, Honour Course outline-2016-2	Documentation
Seminar reflection (Students' personal submission)	

Table 15: List of Information Systems Academic participants.

Data sample	**Gender**	**Mode of collection**
Pr.Leah-2015-1	Female	Face-to-face informal discussion
Pr.Kyle-2015/2016-1, Pr.Kyle-2015/2016-2, Pr.Kyle-2015/2016-3	Male	Face-to-face interview, informal discussion, email follow up
Mr.Jacob-2015-1	Male	Face-to-face interview

The total number of senior IS undergraduates in the 2015 class was 28, while 27 students were in the 2016 class. The total number of senior IS undergraduates and their lecturers that participated in this study was 41, comprising 21 students from the 2015 class, 17 students from the 2016 class, and three lecturers. There were 26 males and 15 females. In total, I conducted 25 face-to-face and telephonic interviews and two face-to-face group discussions, and obtained survey responses from 29 students, analysed four web-based senior IS undergraduate course evaluations, two senior IS undergraduate course outlines, analysed four out of twelve senior IS undergraduate seminar reflections and watched eight recorded videos of their lectures.

It was relatively easy for me to set up interviews with the senior IS undergraduates because the students had a Computer laboratory dedicated to them, where each student is provided with a workspace (a Personal Computer (PC), a table and a chair). To minimise power imbalances between the senior IS undergraduates and myself as a researcher, I conducted all the face-to-face interviews within the IS Department. A flexible and semi-structured approach was used to obtain data from the senior IS undergraduates. This approach allowed them to take the lead and have their voices heard. Although I was more comfortable interviewing the black senior IS undergraduates, being a black person myself, I did not allow the personal bias to influence the process of inviting whom to participate in the study. I selected the participants theoretically and did not try to over-represent or under-represent a group, and I made the follow-up surveys open to all the senior IS undergraduates who enrolled in the 2015 and 2016 programmes. A list of the questions asked can be found in Appendix D (**Error! Reference source not found.**). I felt that there was no impairment in my ability to present an unbiased analysis of data because I had never registered for or attended the IS Honours programme.

4.4. Primary and secondary Data sources

In this section, I provide an overview of the primary and secondary data sources. A detailed grounding process of the emerging concept is provided in chapter 5. In the attempt to find the main concern of the senior IS undergraduates during their learning process, I adopted three different data collection strategies, as can be seen in Table 14 and Table 15, namely direct observation, informal discussion, and formal (face-to-face) interviews. After identifying the students' main concern, other sources of data I used for memoing were telephonic interviews, field notes, lecture videos, documentation (course evaluation, and senior IS undergraduates course outline), online surveys, and seminar reflection. I consulted the extant literature when the theory seemed sufficiently grounded and developed.

Combining class observations, lecture videos, course evaluation and surveys with face-to-face interviews and telephonic interviews was useful for triangulation, to support what the participants said, and not rely solely on the senior IS undergraduates' words. The surveys and delayed literature review helped me to saturate the emerged concepts, and the survey was also useful for participant validation. The course evaluations and the seminar reflections, which

were designed by others independently of this thesis and my consciousness, provided support for the core category and its process.

4.5. Employment outcome of the empirical case

After the substantive theory emerged and the thesis was fully completed, the employment outcome data of the senior IS undergraduates were obtained from the Careers Service of the Institution where this thesis was conducted. The employment data analysis reveals that the senior IS undergraduate programme has a very high employment outcome, which further confirms the appropriateness of the chosen case. Out of the 66 graduates from the senior IS undergraduate classes who participated over the four years (2013 – 2017) in the graduate exit survey administered by the Institution's Careers Service, 74% (49) were employed immediately after graduation, as depicted in Figure 2.

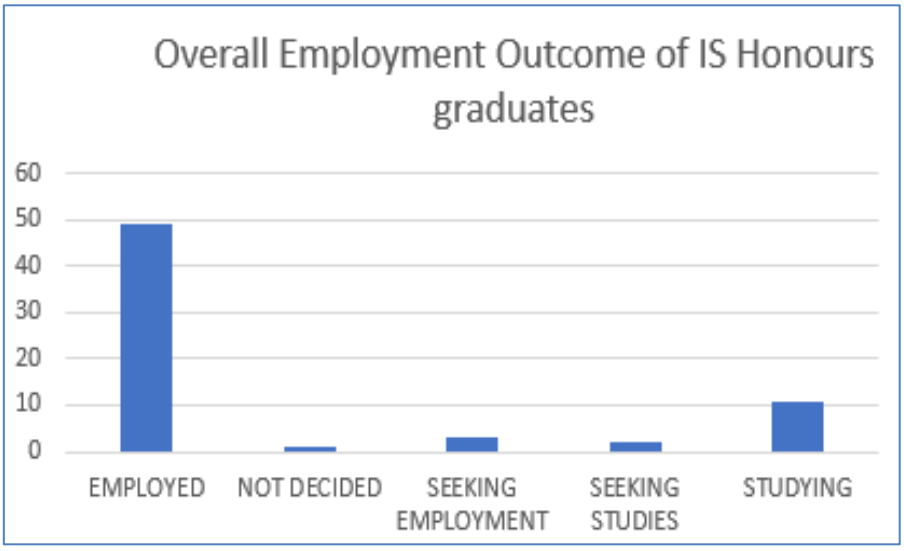


Figure 2: Overall Employment Outcome of IS Honours graduates from 2013 – 2017.

The high employment outcome of these students was consistent over the four years (2013 - 2017) of the study as shown in Figure 3. However, Figure 2 and Figure 3 should be treated separately rather than being part of a 100% total, as the participants of the graduate exit survey were able to select more than one main activity.

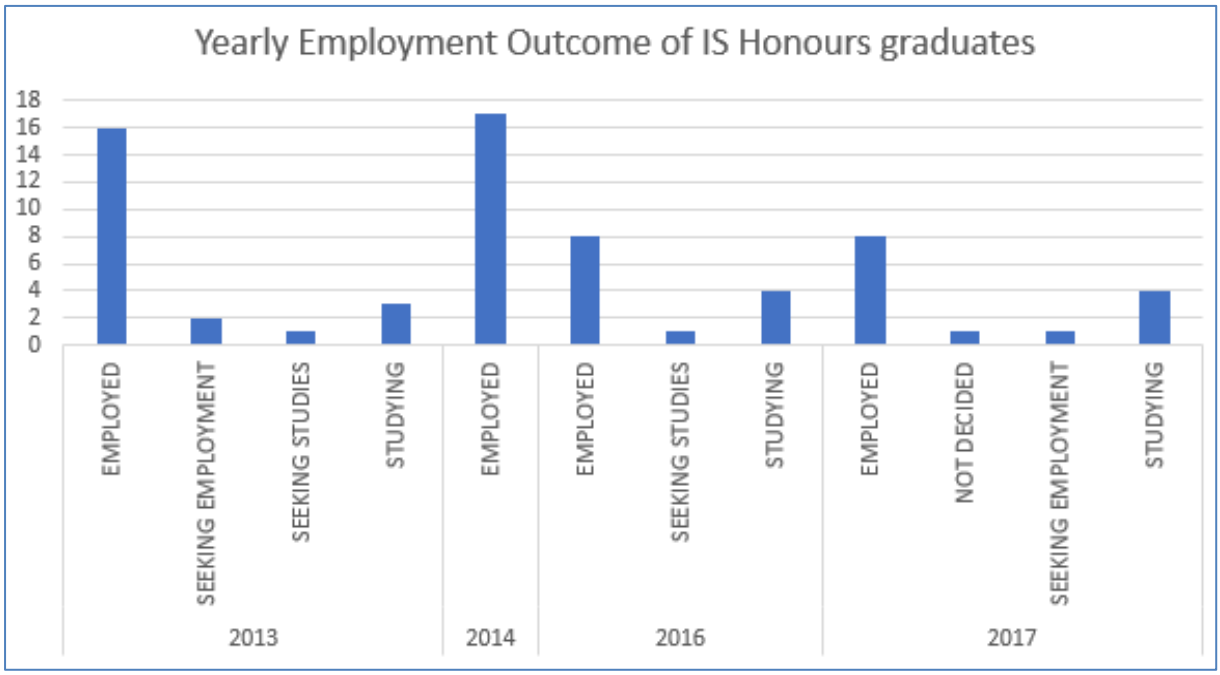


Figure 3: Yearly Employment Outcome of IS Honours graduates from 2013 – 2017.

4.6. Summary

This chapter provided a background to the substantive research area (the empirical case) where the data for the thesis were obtained. The chapter described the case: an overview of the research field, research population and sample, and the primary and secondary data sources. The employment outcome of the case was presented to justify the appropriateness of the case further. The next chapter presents the step-by-step conceptual grounding process followed.

5. Conceptual grounding process

In this chapter, I present the grounding process followed in this thesis. The grounding process refers to how "*you go through the series of the stages involved in producing the grounded theory*" (Gibson & Hartman, 2014, p. 142). Figure 4 is a graphical representation of the step-by-step grounding process through which I identify the main concern of the senior IS undergraduates, explore how the main concern was resolved and generate a substantive theory that conceptualises and explains how the main concern was resolved. As can be deduced from Figure 4, the reader should note that the conceptual grounding process is not a straightforward linear process as presented here in this chapter.

The chapter was organised as follows: I cover entering the research field in sections 5.1 (preconceived idea) and 5.2 (personal struggles). This is followed by the systematic data collection, coding, and analysis in section 5.3. Reflection on the conceptual grounding process is presented in section 5.4, while section 5.5 summarises the chapter.

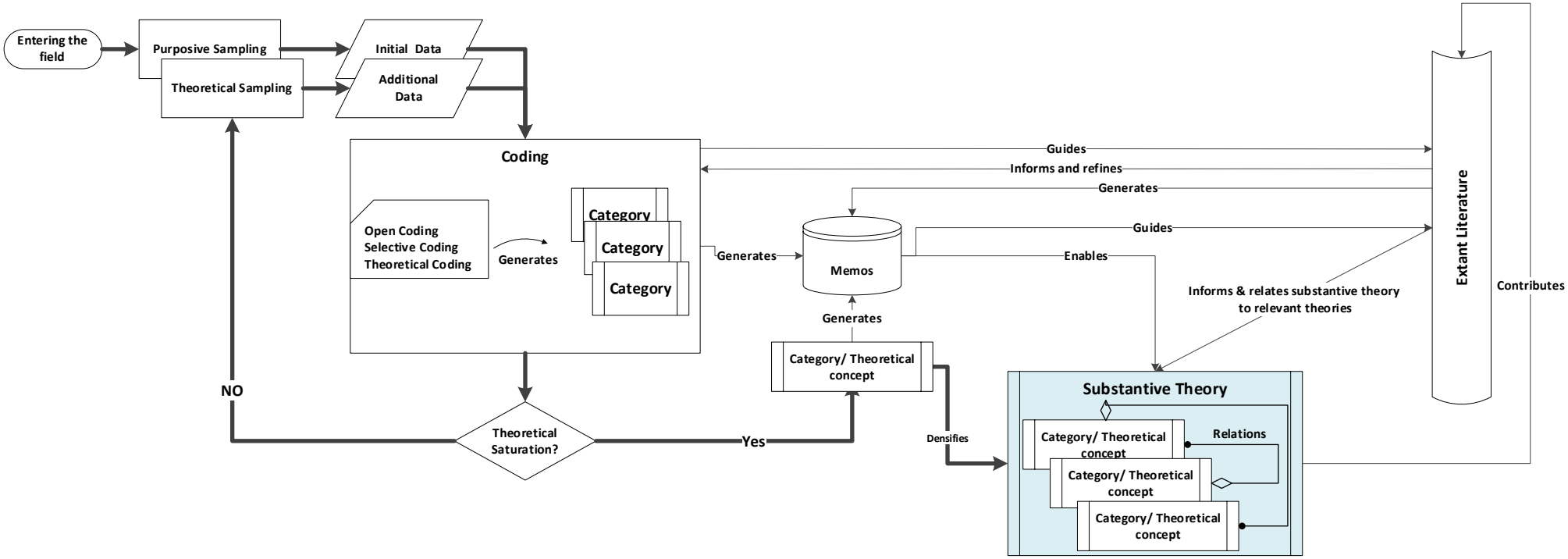


Figure 4: A step-by-step grounding process followed in the thesis.

5.1. Entering the field: Preconceived idea

This section responds to a special call arguing for the inclusion of backstories when reporting the grounded theory development process (Levina, 2021). The initial research field selection was based on convenience and the preconceived problem of unintended consequences of mobile technology usage in undergraduate teaching and learning processes. Once I had obtained ethical approval, I started attending IS classes to observe and identify the appropriate and suitable field(s) or programme(s) for the study. I first attended a third year IS undergraduate class, followed by a senior IS undergraduate class. Then, I thought the thesis would be a comparative study of the third year and senior IS undergraduate's classes.

I was open to obtain data from the third year, and the senior IS undergraduates. However, during my early interrogation with the senior IS undergraduates, I perceived that senior IS undergraduates would be the most appropriate participants for the thesis. Because, unlike the third year IS undergraduate programme, mobile technology usage such as a Smartphone, Tablet, or iPad, was part of the senior IS undergraduates' teaching and learning processes.

For example, Zelda-2015-1 said, *"we are required to bring mobile devices into our lectures"*. Keira-2015-1 added that "*in my Honours class, the lecturer advised us to use mobile technology in the class"*. In one of the discussions I had with Pr.Kyle-2015/2016-1, he revealed that "*Honours students are not allowed to be in the class without a mobile technology device"*.

Pr.Kyle-2015/2016-1 further said, "*students are required to participate in the seminars. Students use Mobile Technology to answer questions in class, to check and verify information, to communicate, and to participate in real-time voting"*. George-2015-1 commented on the need for mobile technology in the senior IS undergraduates' programme, "*for many reasons you will need mobile technology to engage during the seminar, you might be asked to view some websites or take part in an opinion poll during the lecture"*.

These statements further illustrate that the senior IS undergraduates were required to use mobile technology to participate or engage in their programme. Consequently, I believed that selecting the senior IS undergraduates as my unit of analysis would make it possible for me to meet the

preconceived/initial objectives of (1) examining the unintended consequences of mobile technology usage; (2) developing a substantive theory that explains how senior IS undergraduates and academics cope with the unintended consequences of mobile technology usage.

I started the data collection by attending the senior IS undergraduate classes to observe and identify their main concern. The first class I attended was a reflection class, where I had the opportunity to ask Noel (Noel-2015-1) and Gabriel (Gabriel-2015-1), who were sitting next to each other in the seminar room, to comment generally about the senior IS undergraduate programme. Shortly after the class started, I made some observations regarding mobile technology usage and class participation, and I took some notes, thus, the initial data collection and analysis began. Afterwards, I noted a concept, *mobile technology preventing community versus students' collaboration*, which I considered *juicy*. The so-call *juicy* concept is related to the preconceived idea of unintended consequences of mobile technology usage in education. I followed up on the *juicy* concept for two weeks and stopped when there was no further lead on the concept. Later, I pursued another concept that emerged, *technology dependency*, for a couple of weeks before I realised that *technology dependency* had nothing to do with the students' concern, but *technology dependency* is a negative consequence of technology usage in the undergraduates' learning process (Michael-2015-1; Mr.Jacob-2015-1; Pr.Leah-2015-1).

At this point, it became clear to me that the preconceived idea of unintended consequences of mobile technology usage in teaching and learning processes would most likely lead nowhere. Then I decided to be open, and consider what was emerging, rather than pursuing any preconceived ideas. I consequently focused on understanding the main concern of senior IS undergraduates during their learning process. I understood that investigating their main concern was a risk because their primary concern might not be related to unintended consequences of mobile technology usage or the teaching or learning process. Nonetheless, to avoid forcing the data, I took the risk and aimed to accept whatever emerged. I believe that early identification of the research question and possible constructs could be helpful, however, they are tentative and "*no construct is guaranteed a place in the resultant theory, no matter how well it is measured. Also, the research question may shift during the research*" (Eisenhardt, 1989, p. 536).

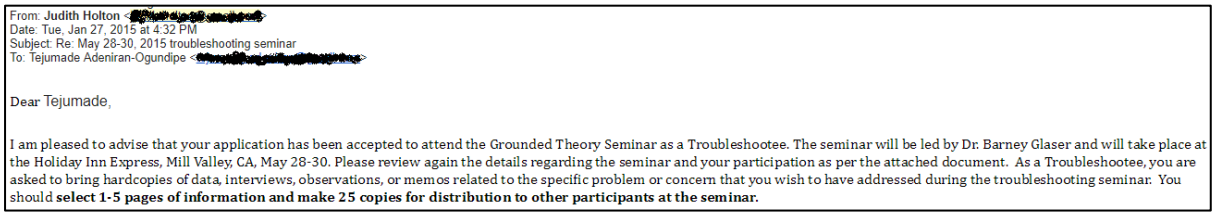
5.2. Entering the field: Personal struggles

Identifying the research field was not as difficult as believing in my ability to conceptualise and tolerate some level of confusion. After the data collection began, I felt incompetent and did not trust my ability to just listen to the senior IS undergraduates and their lecturers and develop memos after each of the interviews. It was particularly hard for me to believe that it was possible to write a whole PhD thesis from interviews, field notes and memos. Thus, my initial decision to tape record the interviews and transcribe as against Glaser's advice (Glaser, 1998; Glaser, 2015).

The first nine contacts with the participants (seven formal interviews with senior IS undergraduates, and two face-to-face interviews with lecturers) were digitally recorded and fully transcribed because I felt incompetent to just listen to the participants. The challenge I encountered after analysing nine fully transcribed interviews, line-by-line was that I perceived that the analysis and codes were highly descriptive, and I struggled to believe that I named the concepts appropriately. I spent much time transcribing the detailed interview data, which later led to some level of confusion because of the descriptive details.

Later, I dropped the idea of full transcription of recorded interviews when I realised that the field note is sufficient for a "*grounded theory researcher to capture the participant's main concern and how that concern is resolved without the burden of laborious transcribing following by the tedium of reading through and coding lengthy transcriptions*" (Holton & Glaser, 2012, p. 279). Consequently, the discussion time with the participants at each contact was kept very short to between 10 - 30 minutes, while field notes were taken immediately after each discussion, to be able to capture exact words and views of the participants. However, as concepts began to emerge, the process of transcribing and coding of the tape-recorded data assisted me to master the line-by-line CGT coding process. I wrote memos from field notes since "*Glaser (1978) is not referring to the line-by-line coding of interview transcripts [as data] but rather to the coding of field notes – abbreviated notations captured during periods of field observation, interviews, conversations, focus groups, and so on*" (Holton & Walsh, 2017, p. 81). When necessary, I listened to the previously tape-recorded interviews to develop further memos and concepts.

The initial grounding process was based on trial and error and was full of uncertainty of my grounding process skills in theoretical sampling, coding, and analysis. At some points, I had a fear of what if "this" does not result in what anyone would find interesting. I, however, gained confidence after I attended a grounded theory seminar led by Glaser, which took place at the Holiday Inn Express, Mill Valley, CA, from 28-30 May 2015. One of the requirements for participating in the seminar as a troubleshootee was to provide 25 copies of data, interviews, observations or memos to be distributed to other Classic Grounded Theorists to code at the seminar. Part of the email I received from Professor Holton in response to my application to attend the grounded theory seminar as a troubleshootee attests to this, as presented in Figure 5.



From: **Judith Holton** <[redacted]>
Date: Tue, Jan 27, 2015 at 4:32 PM
Subject: Re: May 28-30, 2015 troubleshooting seminar
To: Tejumade Adeniran-Ogundipe <[redacted]>

Dear Tejumade,

I am pleased to advise that your application has been accepted to attend the Grounded Theory Seminar as a Troubleshootee. The seminar will be led by Dr. Barney Glaser and will take place at the Holiday Inn Express, Mill Valley, CA, May 28-30. Please review again the details regarding the seminar and your participation as per the attached document. As a Troubleshootee, you are asked to bring hardcopies of data, interviews, observations, or memos related to the specific problem or concern that you wish to have addressed during the troubleshooting seminar. You should **select 1-5 pages of information and make 25 copies for distribution to other participants at the seminar.**

Figure 5: A confirmation email to attend a Grounded Theory troubleshooting seminar as a troubleshootee.

During the seminar, I had the opportunity to meet other Classic Grounded Theorists, who shared my interests. My grounding process skills unfolded when the initial data I obtained was jointly analysed by 25 Classic Grounded Theorists, such as Barney Glaser, Judith Holton, Carolyn Phillips, Alvita Nathaniel, Laura Stough, Markko Hamalainen, and the same concepts that I previously coded, emerged. Through the presentations and discussions led by multiple Classic Grounded Theorists, in a room of supportive, non-competitive colleagues, I gained an understanding of how to deal with confusion and get away from elaborate description to conceptualisation, which is a key aspect of the CGTM approach. The overall comment at the grounded theory seminar was for me to go into the field to establish whether the emerged concern was relevant to the senior IS undergraduates.

Consequently, I understood what Glaser (1998) and Holton and Walsh (2017) had said, that CGT study is a delayed action learning process. CGT study requires "*an ability to conceptualize data, an ability to tolerate some confusion, and an ability to tolerate confusion's attendant regression*" (Glaser, 2010, p.4). It was then possible for me to proceed with the data analysis process without further asking, "*am I doing it right?"* Participating in Glaser's

troubleshooting seminar as a troubleshootee was confidence building and contributed greatly to my understanding of CGTM.

5.3. Systematic data collection, coding, and analysis

The first one-on-one interviews were semi-structured, which started with me asking the senior IS undergraduates to describe the IS Honours' programme, and their concerns if any. The semi-structured questions were purposely kept broad to open the study to several interpretations by the senior IS undergraduates. In the following subsections, I present an overview of open coding and analysis, identification of the main concern, and the emergence of the core category respectively.

5.3.1. Open coding and analysis

As this thesis was my first attempt at conducting an interpretive study, I tried different ways to analyse the data. First, I used the questions, "*What is this data a study of?", "What category does this incident indicate?", "what is happening in the data?", and "what accounts for continual resolving of this concern"* (Glaser, 1998, p. 140) to code (highlight) the field note line-by-line, as shown in Figure 6. Figure 7 is the field note I took from my first interview with Zelda-2015-1 where she was referring to the importance of technology to an IS student and how the senior IS undergraduates have become technology-dependent because of the way they were trained.

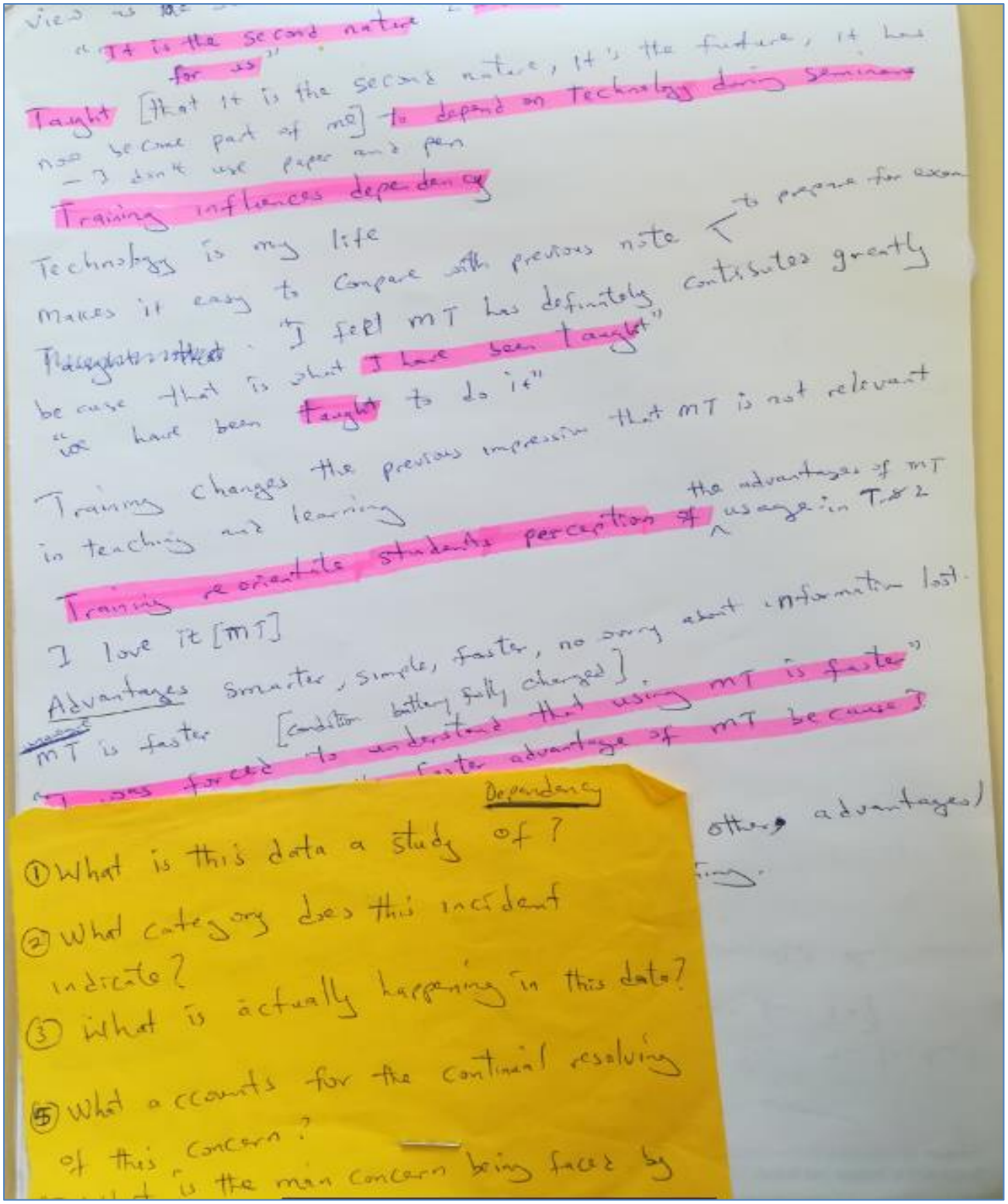


Figure 6: Line by line coding of field note.

After several interviews, I tried to identify the key concepts that emerged and write them out on paper, as shown in Figure 6, where I differentiated the students' views in teaching and learning from the lecturers' views. Since CGT is conceptual rather than saying stories or giving

the detailed description (Glaser, 2015), I decided not to provide an elaborate description of the data in my write-up. Often, the data where CGT comes from is forgotten (Glaser, 2015).

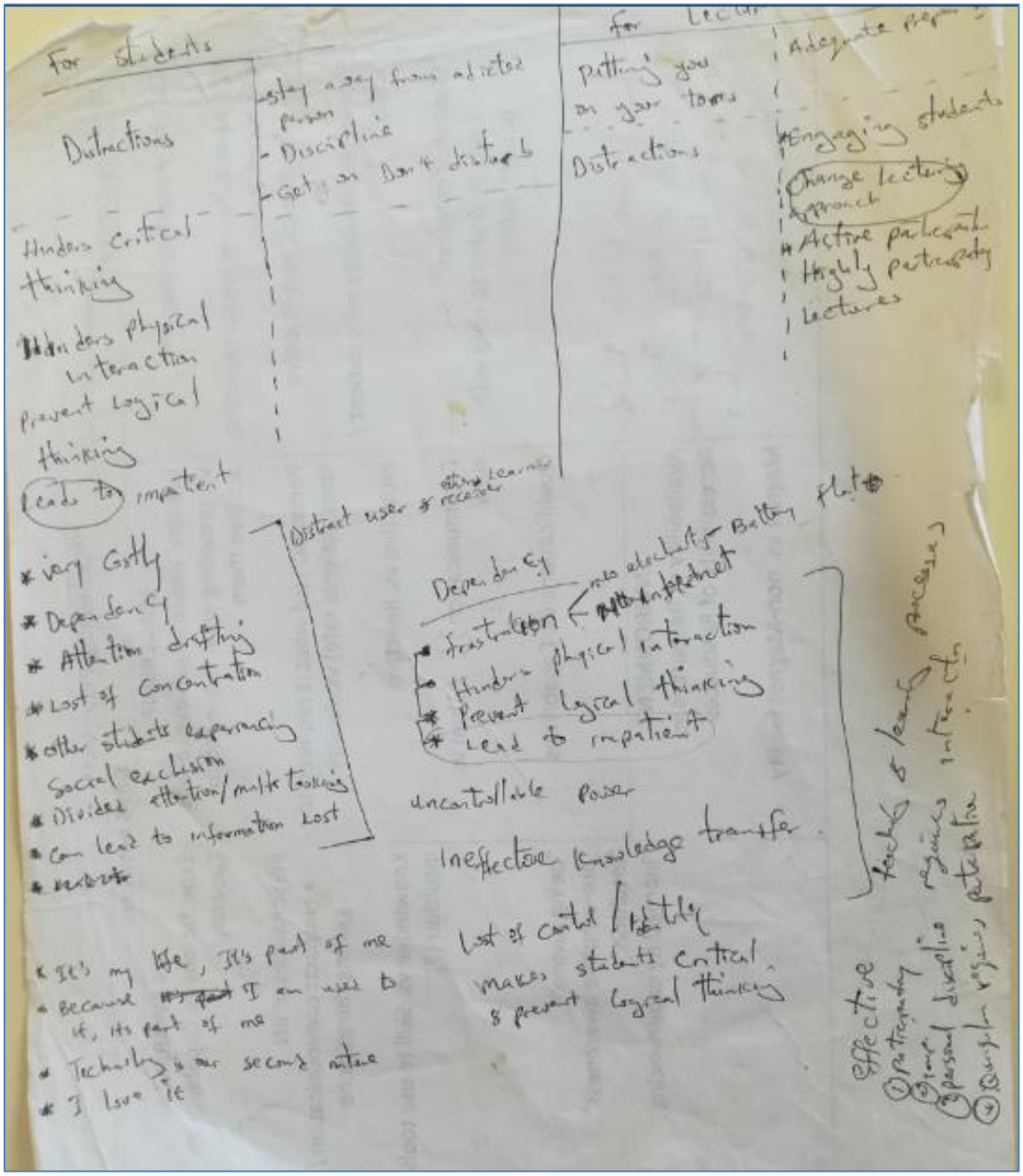


Figure 7: Coding field note on paper.

For easy conceptualisation, I proceeded to write out the concepts that emerged on small cards. Figure 8 presents a few of the cards I wrote at the early stage of the research.

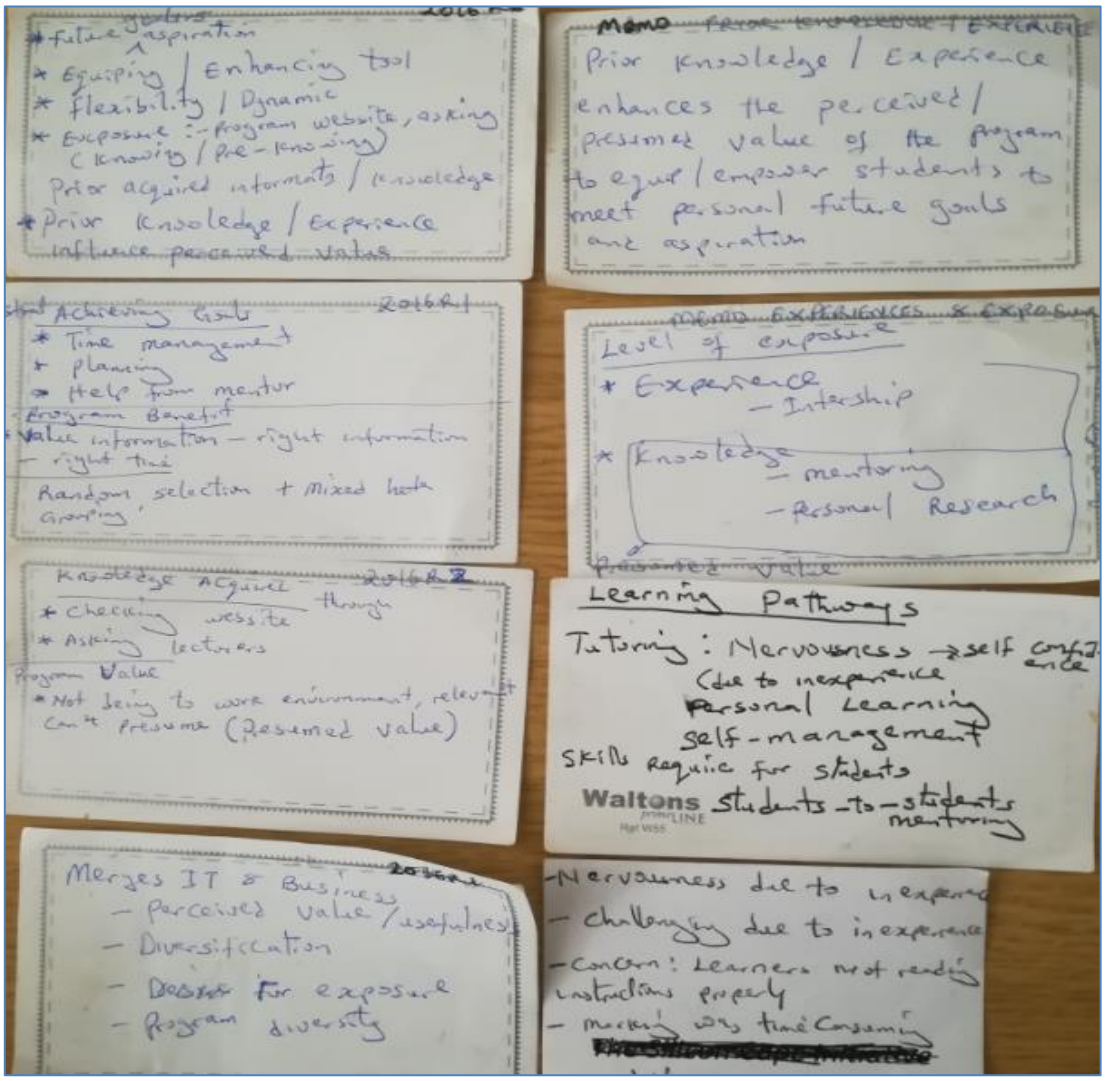


Figure 8: Coding using cards.

When I realised that writing out the concepts on paper was not effective, I changed to using Word Processing Software. Figure 9 is the example of line-by-line coding of course evaluation using Word Processing Software.

Figure 9: Coding Course Evaluation data line-by-line using Word Processing Software.

Then, I discovered that Nvivo Software is compatible with doing a grounded theory study and useful for data referencing, and thorough, transparent and transportable analysis (Bringer, Johnston & Brackenridge, 2004; Holton & Walsh, 2017). Thus, I loaded the empirical data into NVivo 11 qualitative data analysis Software and coded as shown in Figure 10.

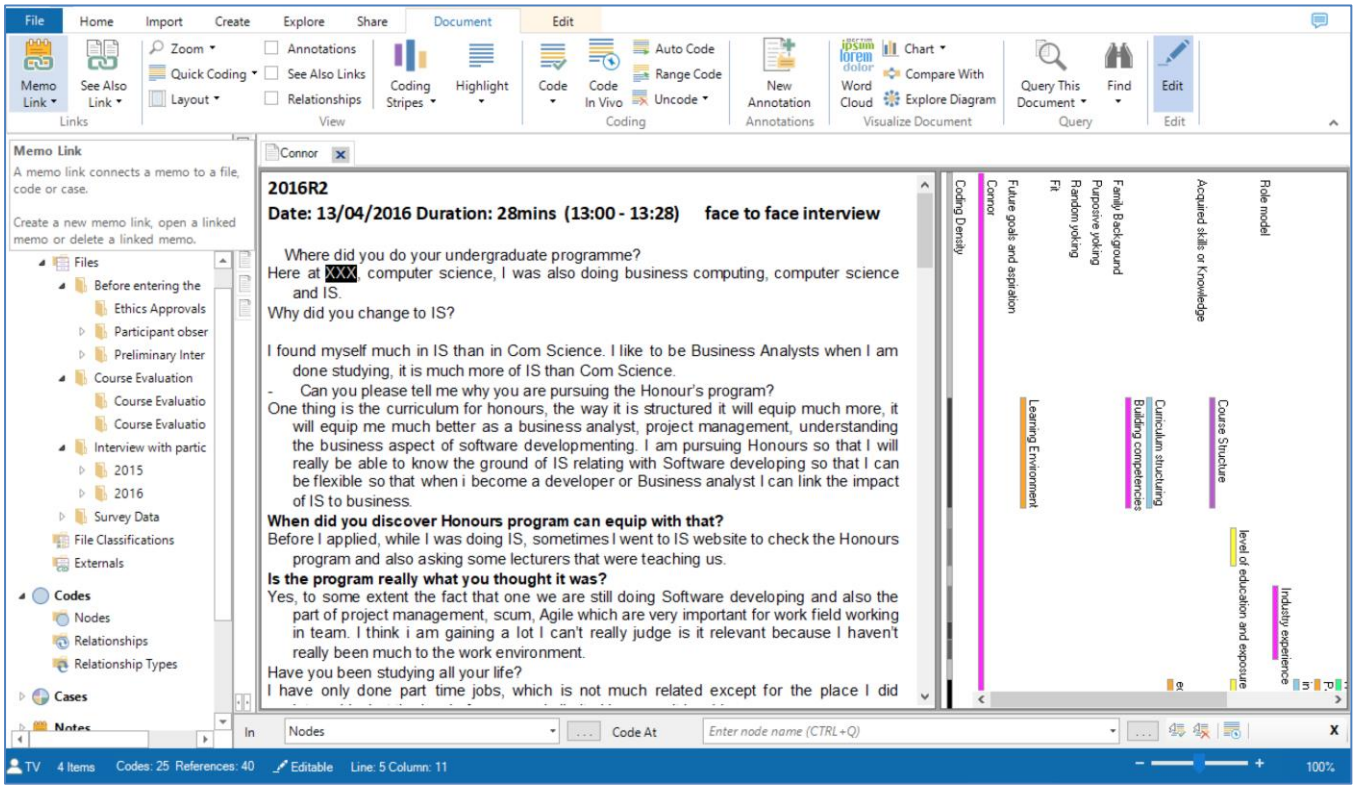


Figure 10: Coding face-to-face interview empirical data using Nvivo Software.

5.3.1.1. Identifying the main concern

At the initial phase of the open coding process, I erroneously thought the main concern of the senior IS undergraduates was *future job security* as some students (Tyler-2015-2, Mason-2015-1, Natalie-2015-2, Giselle-2015-3, CE-2015-1) had mentioned security. Tyler-2015-2 said, "*I was looking for a career that gives so much security"*, Mason-2015-1 said, "*I wanted to achieve my Honour's degree … in order to secure a good job"*. Natalie-2015-2 said, she wants the certificate, the qualification that *"will set me apart"*.

However, as the data collection progressed, through constant comparative analysis, I started noticing students saying, "*I have to be able to meet the need of the industry, not to appear as a novice"* (Giselle-2015-1). Lila-2015-1 spoke about her goal and driving force during the IS Honours' programme that "*I believe the degree will give me an edge in the industry, make me employable, add value to me and I will become competitive and add value to the industry*". Natalie-2015-2 added that "*I wanted the qualification that would add value to me"*. I started noticing the students' desire to add value to themselves. Using the questions in Table 16, as previously mentioned in subsection 5.3.1, the constant comparative analysis continued with

validation of the senior IS undergraduates' main concern until I obtained data from the 2016 data.

Table 16: Questions that assisted in the identification of the main concern (Glaser, 1998, p. 140).

WHAT IS THEIR MAIN CONCERN?
1. "What is this data a study of?"
2. "What category does this incident indicate?"
3. "What is happening in the data?", and
4. "What accounts for the continual resolving of this concern?"

While collecting data from the 2016 senior IS undergraduates, I considered it inappropriate to impose or assume the pattern I noticed in the 2015 data. I, however, decided to allow the data to speak for itself. Sophia-2016-1 indicated that "*after my 3rd year, I particularly felt I wasn't ready for the industry, not having enough competency for the type of work that I will be expected to do, especially because I want to go into the corporate world. And I don't necessarily know much and what is expected of me"*. Connor-2016-1 said, "*I am pursuing Honours so that I will really be able to know the ground of IS*". The reason Drake-2016-1 gave for enrolling in the IS Honours programme is "*I found out that Information Systems honours program will give me the skill set that would get me where I wanted to go"*. Gabriel-2015-2 said "*as an IS student, you should know IT and IS world, like accounting students will know about accounting*". Tyler-2015-2 added that "*learning came as a result of the different problems we faced in the SD group. We had low technical skill (lack of skill in the SD group). It's a group that can be classified as technically disadvantaged*".

The issue that emerged across the coded data as the main concern of both 2015 and 2016 senior IS undergraduates is the *perceived lack of IS competency*. Figure 11 is the data incidences of the *perceived lack of IS competency*, and more evidence is provided in 5.3.1.2 because identifying the main concern and emergence of core category processes intertwine. The main concern, *perceived lack of IS competency* is the students' perception of their lack of skills,

knowledge, abilities, and values needed to do a particular IS task successfully (Petrova & Claxton, 2005; Shinnar, Giacomin & Janssen, 2012).

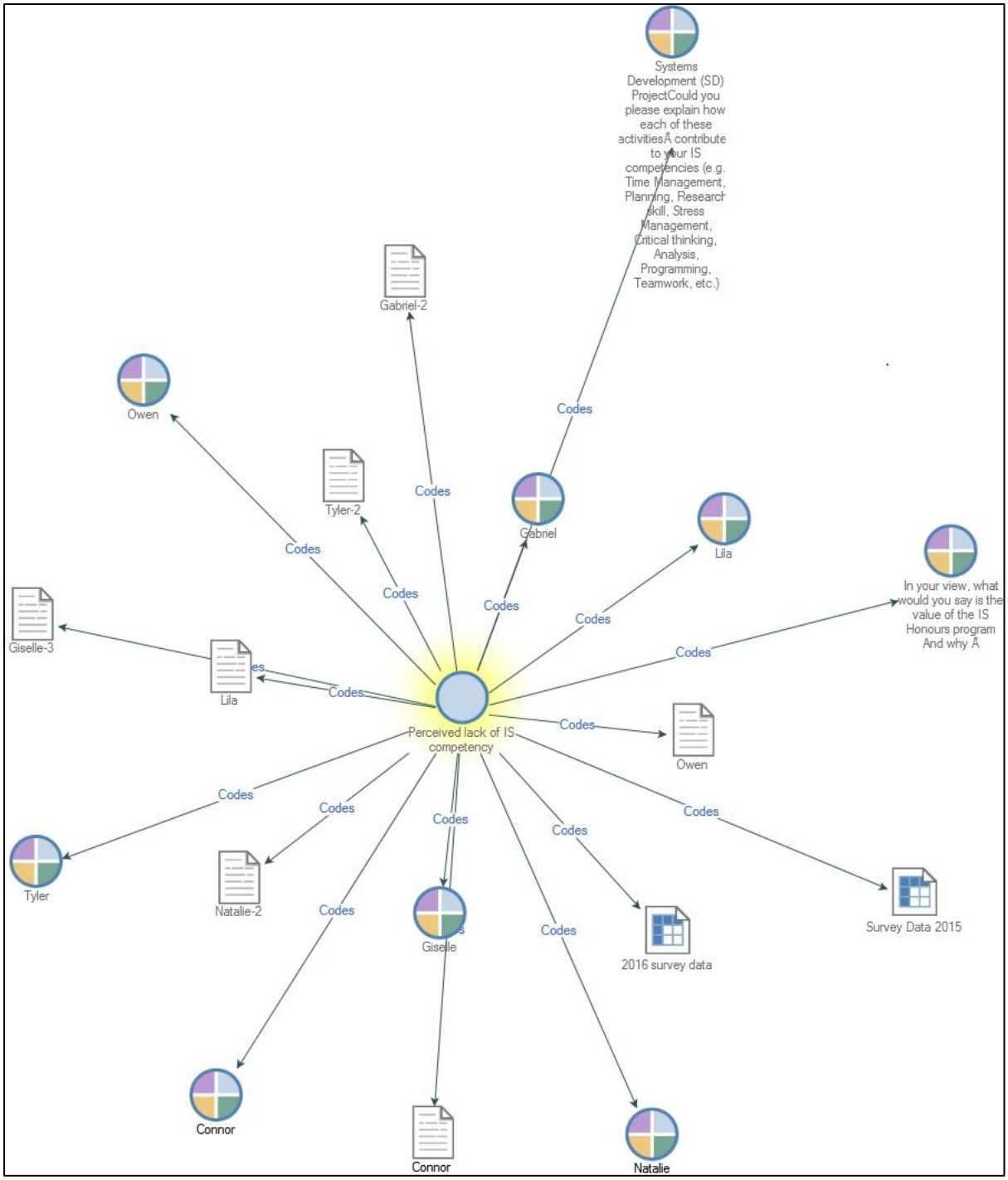


Figure 11: Data incidences of the perceived lack of IS competency.

The *perceived lack of IS competency* manifested in different aspects of the data obtained. An announcement sent out to the senior IS undergraduates through the institution's LMS

confirmed that employers were seeking for IS graduates; graduates here refers to students who have completed the 3rd year programme (all the senior IS undergraduates). The LMS announcement read thus:

> *"If you do not have a job as yet, please contact XXX urgently. XXX is the Head of Employer Relations Careers Services, and she has companies asking "Where are IS Graduates?". Why are IS graduates not applying for jobs in 2015? PS: Some employers are coming to Expo to look for people - companies don't know where to find IS graduates"* (LMS Announcement-2015-1).

The LMS Announcement could imply that the IS graduates did not perceive themselves as fully ready for the working environment ("*why are IS graduates not applying for jobs?*") (LMS Announcement-2015-1), which could be because of their *perceived lack of IS competency*, since the students were not applying for jobs at this stage.

5.3.1.2. The emergence of the core category

After I identified that the senior IS undergraduates' main concern was *perceived lack of IS competency*, my next agenda was to discover the core category, which explains how their main concern, *perceived lack of IS competency* was resolved. Then, I focused my further data collection and analysis on identifying the core category. However, until the core category emerged, I continued the open coding of all the data obtained using the questions in Table 17 (in addition to the questions in Table 16) and wrote memos.

Table 17: Additional questions that assisted in the conceptual development of the theory of Competency Maturing (Saldana, 2015, pp. 21-22).

HOW IS THIS CONCERN RESOLVED?
1. "What are people doing? What are they trying to accomplish?"
2. "How, exactly do they do this? What specific means and strategies do they use?"
3. "How do members talk about, characterise, and understand what is going on?"
4. "What assumptions are they making?"
5. "What do I see going on here? What did I learn from these notes?"
6. "Why did I include them?"

I coded and recoded data several times using Nvivo 11, focusing on the interpretation and the meaning of concepts that could assist in the conceptualisation and theorisation. The earlier open coding yielded 190 substantive codes, which was largely descriptive. An example of the initial substantive codes with a revised version is provided in the Appendix C (Table 19 and Table 20). The emerged concepts were used to create conceptual diagrams that show the relationship between concepts, which were constantly modified and added to as new concepts emerged. Some of the conceptual diagrams are presented in the next chapter (in chapter 6).

What is the core category?

The question that I could not ignore as I continued coding was *what the core category is*? As I re-analysed the previous data I collected, to see the emerging pattern and how students continuously processed, managed, or resolved their *perceived lack of IS competency,* I realised that *inexperience,* which resulted from a *lack of relevant experience,* or *limited experience* or *limited educational exposure,* contributed significantly to the senior IS undergraduates' *perceived lack of IS competency*. Drake-2016-1 commented on his reason for not taking up employment after his 3rd-year undergraduate programme that "*Honours for me will be a year that I would grow a lot. Undergraduate [3rd-year undergraduate] obviously have these skills, but one is still inexperienced"*. Connor-2016-1, at the start of his IS Honours programme, also

commented on his lack of experience that, "*I think I am gaining a lot [in the Information Systems Honours' programme] I can't really judge if it's relevant because I haven't really been in the work environment*".

In my quest to explore how the senior IS undergraduates resolve their *perceived lack of IS competency*, I began to ask questions about the students' goals and driving force. Giselle-2015-3 said, *"I wanted to be an all rounded graduate [by enrolling in IS Honours], wanted more exposure and experience, wanted to add more value to myself"*. Naomi-2015-1 spoke about her goals when she said, "*my main goal [for IS Honours] was to get skills enough to do the job appropriately, and my personal goal is to have a career that makes me happy"*.

After about seven months in the field, collecting, coding and analysing data line-by-line and conducting a constant comparative analysis, I noticed the words engage, engaging, engagement appear more frequently. Figure 12 presents an engaged text search query, which clearly shows that the senior IS undergraduates were talking about IS Honours being an engaging programme, and compels them to engage with IS contents, peers and IS practitioners.

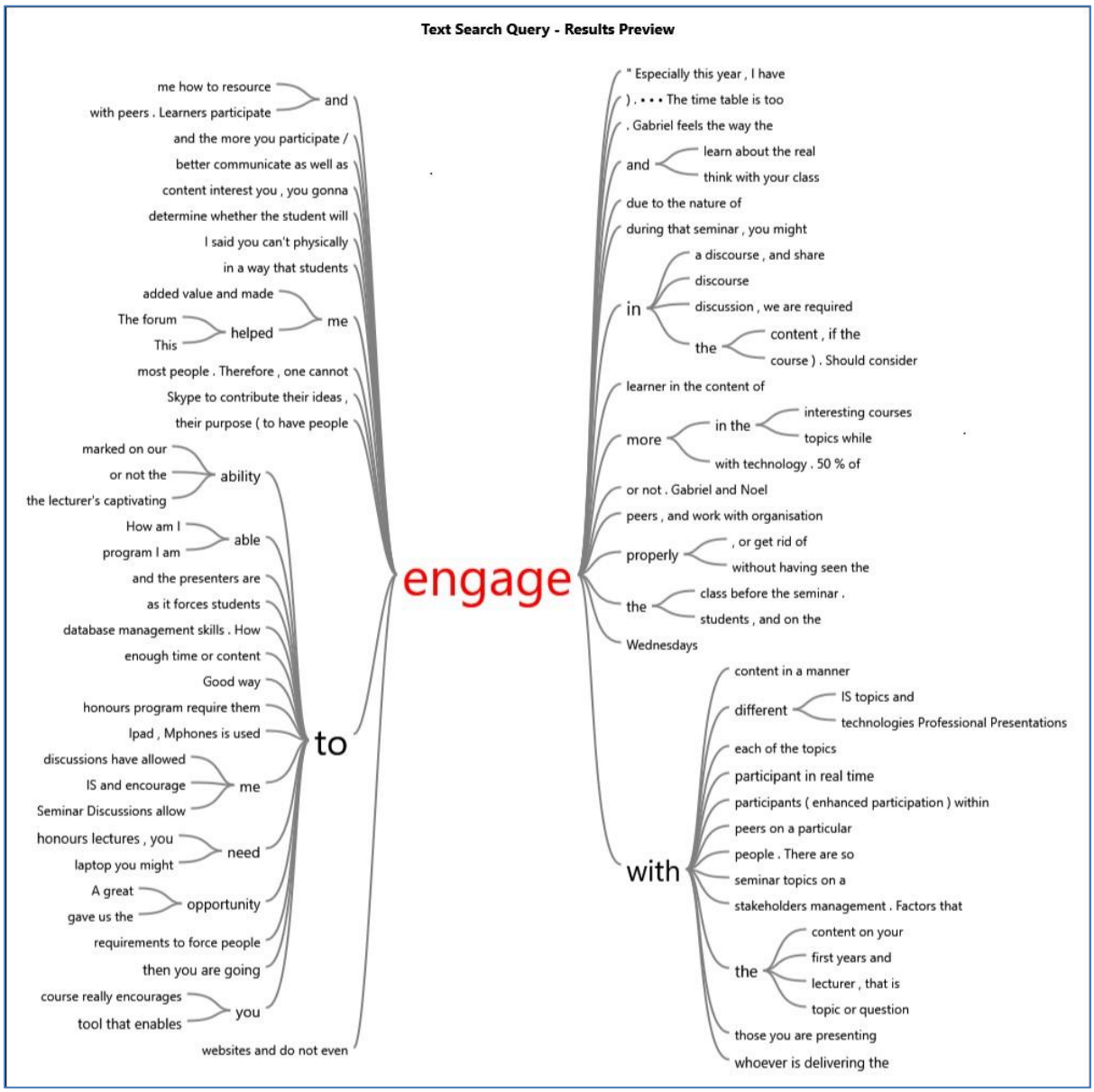


Figure 12: An engaged text search query.

George-2015-1 spoke about engagement when he said,

> *"…based on the nature of honours lectures, you need to **engage** with whoever is delivering the lecture. And they will need to ask you questions; they will need to get feedback from you. The lecturer might open up a whole new discussion during the lecture… It might be beneficial because **engaging** face to face with the lecturer will*

> *enable you to ask a lot of questions...So those benefits of* ***engaging*** physically *in a classroom or lecture room will be lost if you are absent"*.

Although the senior IS undergraduates were required to attend classes and participate, they went beyond basic participation. Even though the seminar sessions were recorded, and the students had unrestricted access to the recordings, the need for personal or individual *engagement* made it impossible for them to sit back at home or stay in their residences and watch the recorded seminar sessions. They view personal *engagement* as an integral part of the Honours programme (Damien-2015-1, Dean-2016-1, Claire-2016-1, Jennifer-2016-1, Michael-2015-1, Vanessa-2016-1, William-2016-1).

With the words *engage, engaging, engagement* in mind, I recoded the data. Then I discovered that the word; *engage* actually occurred from my first day on the field when Noel-2015-1 said, "*if what they are saying interests you then you are going to engage in the content"*. In addition, Tyler-2015-1 said, "*I prefer to attend classes even if all the lectures are recorded because I prefer physical contact for better understanding and the recording seems unreal to me*". I probably overlooked the concept of *engagement* because of the preconceived problem of unintended consequences of mobile technology usage which was soon abandoned.

Generally, the senior IS undergraduates viewed the IS Honours programme to be highly *engaging*. Specifically, Gabriel-2015-3 said that it is a "*good way to engage and think with your classmates"*. Lila-2015-1 added that the Honours programme "*taught me how to resource and engage in discourse"*. When the students were asked to describe their experiences in the IS Honours programme in the Course Evaluations, they used different words such as: *"maximum participation, was engaging and informative"* (CE-2015-1), "*continuous involvement, good interactions, course really encourages you to engage, more interactive, really an engaging course, teaches us to be part of engagements without fear, very engaging"* (CE-2016-3), "*very topical IT topics and trends are discussed with engagement of students"* (CE-2016-4).

The stemmed words frequency query in Nvivo shows that *engage* has a count of 325, as shown in Figure 13. Due to the frequent occurrence of the words *engage, engaging, engagement*, I initially perceived that *engaging* was the core category. However, frequency is not the only criterion for selecting and confirming a core category, but also centrality, relevance, grab and

variability (Glaser, 1978; Glaser & Holton, 2004; Holton & Walsh, 2017). Then I began to question whether *engaging* fulfilled the conditions of being the core category as listed in 3.2.2.5.1. After noting down the memos, I theoretically obtained further data to understand what was happening in the field as well as what accounted for the continual resolving of the senior IS undergraduates' *perceived lack of IS competency*. Then I discovered the pattern through which they continuously resolved their main concern (*perceived lack of IS competency*); I initially named the pattern "*building competency"*.

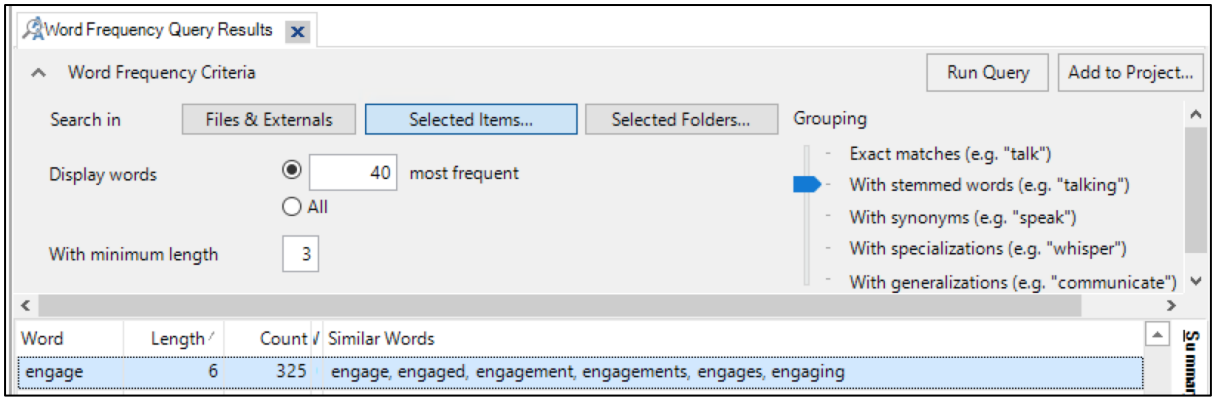


Figure 13: The stemmed words frequency query.

As soon as the pattern of the core category emerged, I stopped the open coding process and began selective coding to determine how other concepts obtained from the open coding process related to the core category, and to elaborate on the concepts which related significantly to the core category. I began to ask questions such as in Figure 14. In addition to the sample of the survey questions, Appendix D presents a sample of the interview questions (**Error! Reference source not found.**), follow-up interview questions (Figure 33), field note (Figure 34), observation note (Figure 35), follow up face-to-face interview (Figure 36), conceptual memo (Figure 37), project journal (Figure 38), and a conceptual diagram (Figure 39).

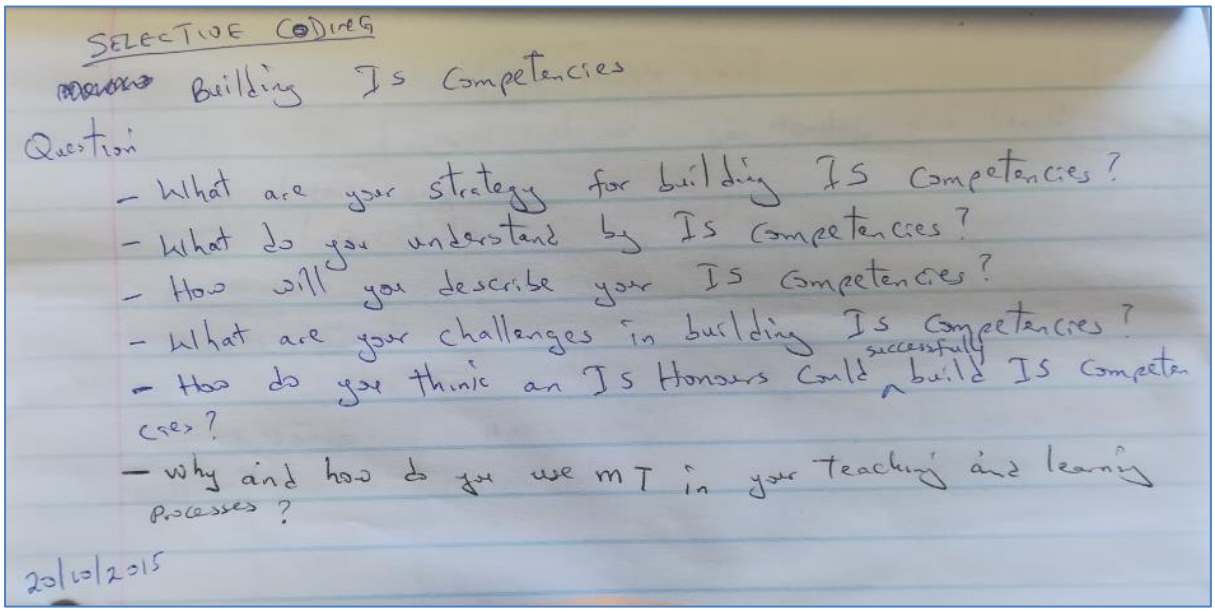


Figure 14: A sample of interview questions at the selective coding phase.

As I began to compare codes, memos, instances and concepts, I discovered that the core category was not *building competency* but a Basic Social Process of *Competency Maturing* (details are provided in chapter 6). How the senior IS undergraduates resolved their *perceived lack of IS competency* was not a process of adding one skill or knowledge on top of another (*building competency*) but a natural process of maturing; growing, developing and acquiring (*Competency Maturing*). For example, they commented that the Honours programme gave "*a lot of room to grow*" (Noel-2015-2), "*it really allowed me to grow*" (Lila-survey), "the course helped me grow" (CE-2016-4), "*the main concern of perceived lack of IS competency is resolved through the process of Competency Maturing*" (Memo: *Competency Maturing*). Figure 15 presents a text search query of *Competency*, which reveals that the senior IS undergraduates had certain skills, abilities, knowledge and values before their enrolment that the IS Honours programme assisted them to grow, develop or acquire additional ones (*mature*). As the selective coding and saturation of the core category phases involved reading and integrating the extant literature, further details on a substantive theory of *Competency Maturing* are provided in chapter 6.

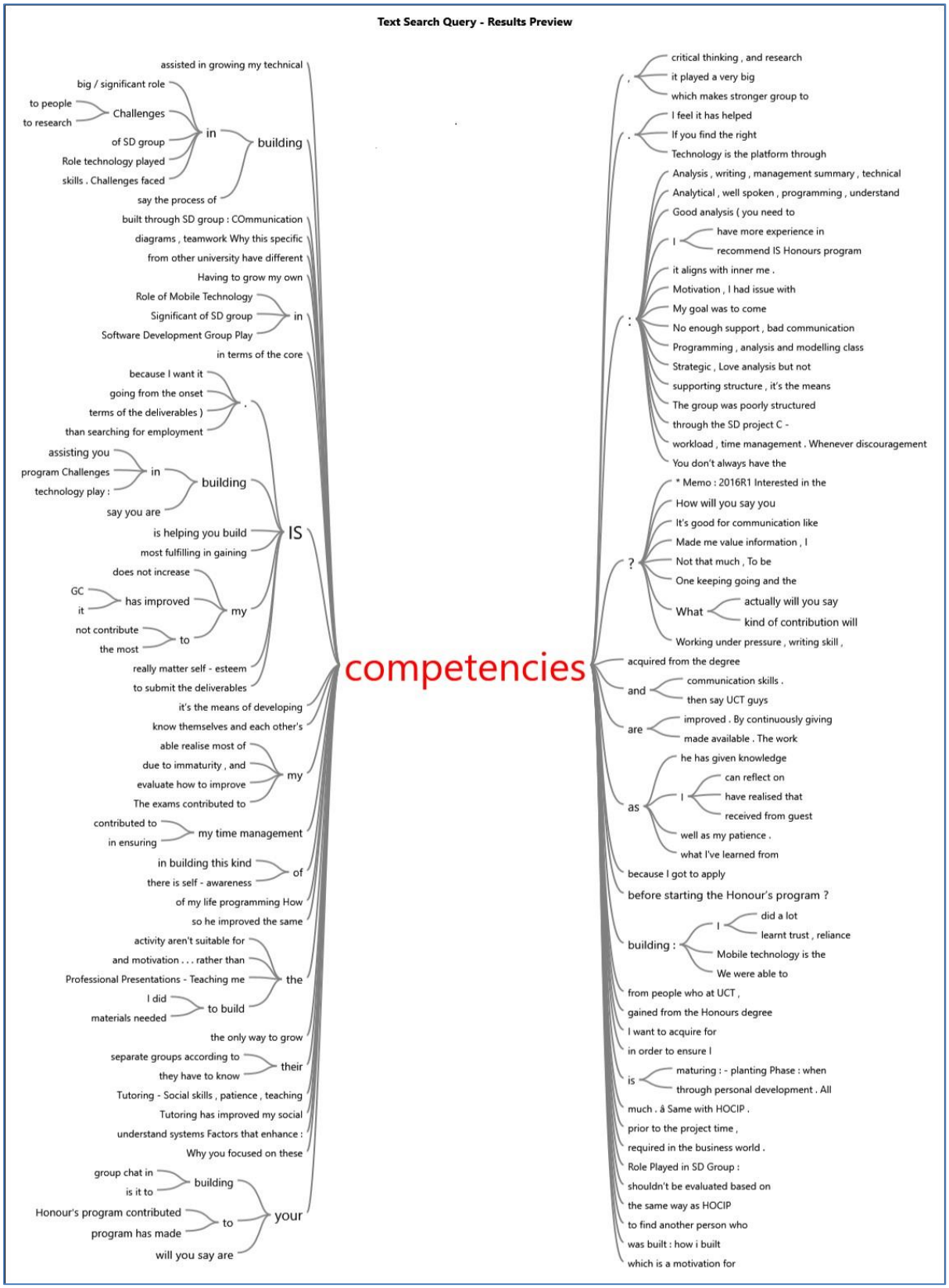


Figure 15: A text search query of competency.

As expected of any CGTM study, I delimited further data collection and data analysis to only concepts that related sufficiently to a substantive theory of *Competency Maturing* and its related categories (Glaser & Holton, 2005a), because a Classic Grounded Theorist focuses on "*generating a theory of a concept – or how a core category continually resolves a main concern*" (Glaser, 2014, p. 90-91). In other to saturate the core category of *Competency Maturing*, I theoretically sampled and selectively coded further data, wrote further memos and obtained survey data. After obtaining the survey data, I used Nvivo Software to create a semantic word cloud of the survey data as shown in Figure 16, which clearly shows skills is the most frequently used word in the survey data.

Figure 16: A word cloud of the survey data.

Then I combined the course evaluation data, obtained from the senior IS undergraduates independently of this thesis, with the survey data to create a semantic word cloud as shown in Figure 17. Both word clouds, although different, have similarities. The semantic word clouds gave a useful visual indication of what the participants were talking about, which confirmed the emerged concepts and that skill is the most frequently used word both in the survey data and course evaluation.

Figure 17: A word cloud of the course evaluation and survey data.

I theoretically coded data and memo to integrate the emerging concepts into a coherent grounded theory of *Competency Maturing* (Glaser, 1978; Gibson & Hartman, 2014; Holton & Walsh, 2017)**.** Although memoing slowed the pace of generating the concepts, memoing assisted me in verifying the fit, work, and relevance of the core category, and was helpful in integrating the substantive theory of *Competency Maturing*. It emerged that *Competency Maturing* is a process that involves "*continuous building of knowledge and engagement*" (CE-2015-1), a process that occurs within an *organic learning environment*.

Although *engaging* did not emerge as the core category, each *student engagement* in an *organic learning environment* is an inherent concept in the process of *Competency Maturing*, and *student engagement* in an *organic learning environment* begins the *Competency Maturing* process. I subsequently discovered that *Competency Maturing* grabs, relates easily and frequently to many other categories, and is easily modifiable. Further details on the evaluation of the core category is provided in chapter 6, section 6.6.

5.3.2. Selective coding and its outcome

During the selective coding process, the open codes (listed in Appendix C - Table 19 and Table 20) were pre-sorted to visualise which concepts relate sufficiently to the senior IS undergraduates' main concern. Additional data were obtained through the theoretical sampling process to saturate the concepts that related sufficiently to Competency Maturing and their properties and categories. A saturation point was reached when additional data added no new concept or yielded no further elaboration, and data collection stopped. Table 18 presents the selective coding process's overall outcome, showing the concepts' relationships and quantitative indicators. However, caution should be taken while interpreting Table 18. A high number of references for a concept does not imply a stronger concept, and a low number of references does not necessarily imply a weak concept.

Table 18: Outcome of selective coding process.

Name	Files	References
Characteristics of an Organic learning environment	31	270
Authentic	14	79
Intellectual power sharing	1	5
Intellectual power tapping	8	17
Autonomy-supportive structured	5	23
Inclusive culture	3	3
Iterative and in-class feedback	3	3
Multiple stakeholders	20	131
Optimal challenges	6	14
Reflective practice	5	15
Competency Maturing Phase	42	546
Self-Awareness of competencies	8	21
Self-development	22	147

Name	Files	References
Collaborative tackling	19	61
Self-tackling	13	69
Student engagement	39	378
Engaging with	20	181
Engaging with academics	4	4
Engaging with community	2	25
Engaging with Information Systems content	4	10
Engaging with junior IS undergrad	1	1
Engaging with peers	19	80
Engaging with professionals	7	61
Facilitation	8	29
Facilitation effectiveness	3	3
Peer evaluation	1	2
Peer Facilitation	2	3
Peer review	1	5
Presentation & delivery style	5	16
Lecturer's engaging ability	2	3
Student presentations	3	7
Information Systems content	8	23
Content Diversity	6	8
Content Dynamism	6	13
Levels of student engagement	12	37
Behavioural Engagement	3	4

Name	Files	References
Emotional Engagement	2	2
Intellectual Engagement	9	31
intellectual power sharing	1	5
Intellectual power tapping	7	15
Student characteristics	21	68
Family Background	9	19
Culture	2	2
Family needs	1	1
Family values	1	1
Level of educational experiences and exposure	10	19
Parent or Relative education	4	5
Societal and family influence	2	2
socioeconomic status	3	9
High class	2	2
Low class	2	2
Middle class	2	2
Financial and future job security	2	4
Industry Awareness	8	32
Industry experience	5	14
Internship	5	6
Part time jobs	1	2
work shadowing	2	2
Perceived lack of IS competency	11	23

Name	Files	References
Practicalization of theoretical knowledge	12	37
Producers of educational resources	11	23
Facilitator	3	4
Lecturer involvement	1	1
Mentor	2	2
learners as co-producers of educational resources	2	3
Practitioners	7	9
Professional presentations	3	3
Resultant effects of Competency Maturing process	19	235
Acquiring skills and experiences	6	34
Confidence building	8	22
Improving skills and knowledge	8	32
Relevancy	16	133
Life Relevance	6	20
Personal Relevance	5	13
Relevance to	16	94
Relevance to Current Interest	3	7
Relevance to future goals and aspiration	15	38
Relevance to Identity	3	6
Sense of fulfilment	7	14
Supporting Competency Maturing phases	11	43
Learning by doing	9	33
Spontaneous learning	5	10

Name	Files	References
Work ready	4	6

5.3.3. Theoretical coding

After the core category and its related concepts were saturated, all the related concepts were sorted and integrated to reveal how the concepts relate to a substantive theory of *Competency Maturing*. It was realised that *student engagement*, *self-awareness of competencies*, and *self-development* were part of the *Competency Maturing* process, and *Competency Maturing* fits into a Basic Social Process framework.

A substantive theory of *Competency Maturing* is a Basic Social Process (BSP) that explains how the students continuously resolve their *perceived lack of IS competency*. "*BSPs are [processual] or, as we say, they "process out". They have two or more clear emergent stages*" (Glaser & Holton, 2005a, p. 1-2). "*A process is something that occurs over time and involves change over time*" (Glaser & Holton, 2005a, p. 6). For further details on BSP, the reader is advised to read Glaser & Holton (2005a) and Glaser (1978). Further discussions on the outcome of theoretical coding are presented in chapter 6.

5.4. Reflection on the conceptual development process

After I put aside the preconceived problem of unintended consequences of mobile technology usage in undergraduate teaching and learning processes, I began broadly to examine the main concern of senior IS undergraduates during their learning process. Then I coded the data as much as possible and analysed the data to extract a set of categories and their properties. It became easier for me to conceptualise because the preconceived problem was no longer the focus of my line-by-line and in vivo coding. With the help of open coding, constant comparative analysis and theoretical sampling, the main concern of senior IS undergraduates emerged as *perceived lack of IS competency*.

Had I not set aside the preconceived problem of unintended consequences of mobile technology usage in an undergraduate teaching and learning process, I would not have discovered that the main concern of senior IS undergraduates was *perceived lack of IS competency*. Neither would I have discovered that their *perceived lack of IS competency* is continuously resolved through a Basic Social Process of *Competency Maturing* (elaborated on in chapter 6). I would have probably forced the data or gave up on doing a grounded theory study.

As I collected data and concepts emerged, I used Nvivo Software to store the data and memos. On several occasions when I could not write the memos down immediately, I used my mobile phone to record memos of the ideas that came to mind. Although Glaser advises against using software tools for data analysis to guide against technological traps (Glaser, 1998), I, however, had a different experience. Nvivo software was significantly useful in this thesis for line-by-line open coding, in vivo coding, memoing, project journal writing, data storage, easy data referencing, and thorough, transparent and transportable analysis. However, Nvivo software is not as intelligent as I thought, but relied on my coding ability, and could not provide me with everything I needed for the theory development. I also used paper, small cards, word processing software and flowcharting software (Microsoft Visio) before I arrived at a substantive theory of *Competency Maturing*.

5.5. Summary

This chapter presented a step-by-step grounding process model through which I identified the main concern of the senior IS undergraduates. The chapter also discussed the process of arriving at the core category, which accounts for the continual resolving of their main concern (using open coding and selective coding). The chapter also presented a reflection on the conceptual development process of the thesis. The concepts which emerged and are relevant in resolving the senior IS undergraduates' *perceived lack of IS competency* are sorted, integrated, and elaborated on in the next chapter.

6. Theory of Competency Maturing

In this chapter, I discuss the outcome of the theoretical coding based on the senior IS undergraduates' perceptions of their IS Competency Maturing process. For simplicity and easy comprehension of a substantive theory of *Competency Maturing*, I present the findings in reverse order to how the grounded theory process was ideally applied in the thesis. The conceptual overview of a substantive theory of *Competency Maturing* is presented first, before presenting the related high-level concepts with examples. It should be noted that all the concepts are grounded; all the concepts earn their way into a substantive theory of *Competency Maturing* and are not forced. I list a few of many quotes for illustration and imagery because according to Glaser (1978, p. 134), "*[i]ndicators for the concepts which are descriptive statements are used only for illustration and imagery. They support the concept, they are not the story itself*".

The extant literature is integrated into the analysis as an additional source of data, because after the core category has emerged, the researcher "*can turn to the literature of his[/her] relevant field as more data to be constantly compared in elaborating and saturating emergent concepts, developing further their properties and dimensions*" (Holton & Walsh, 2017, p. 124). Holton and Glaser (2012, p. 26) also agree that the extant literature can be treated *"as another source of data to be integrated into the constant comparative analysis process once the core category, its properties and related categories have emerged and the basic conceptual development is well underway*". The extant literature can also be used "*in theoretical sampling for full saturation or emergent concepts as well as in theoretical coding for the emergence of relationships between concepts and overall integration of the theory*" (Holton & Walsh, 2017, p.33). In this thesis, the extant literature is also useful in labelling, modifying, or refining the emerging concepts.

The high-level concepts are presented in italics and are underlined, such as *student engagement*, and *Competency Maturing*. I decided to capitalise *Competency Maturing* because *Competency Maturing* is the theory being developed. Figure 18 is a diagrammatical representation that consolidates all the concepts that relate sufficiently to a substantive theory of *Competency Maturing*. The underlined concepts that make up the diagram emerged through the grounded theory process of data obtained from senior IS undergraduates, and each of the concepts with

a few quotes (data) and comments from the literature are explained in this chapter, which is organised as follows:

Section 6.1 presents a conceptual overview of a substantive theory of *Competency Maturing*. An *organic learning environment* that supports the *Competency Maturing* process is presented in section 6.2. Section 6.3 explains the three phases of a substantive theory of *Competency Maturing*, while Section 6.4 presents the concepts of *learning by doing* and *spontaneous learning* that supports the *Competency Maturing* process. Section 6.5 explains the resultant effect of senior IS undergraduates going through a *Competency Maturing* process, and Section 6.6 presents the evaluation of a substantive theory of *Competency Maturing*. Section 6.7 summarises the chapter and lists the propositions that cover the substantive theory of *Competency Maturing* diagram.

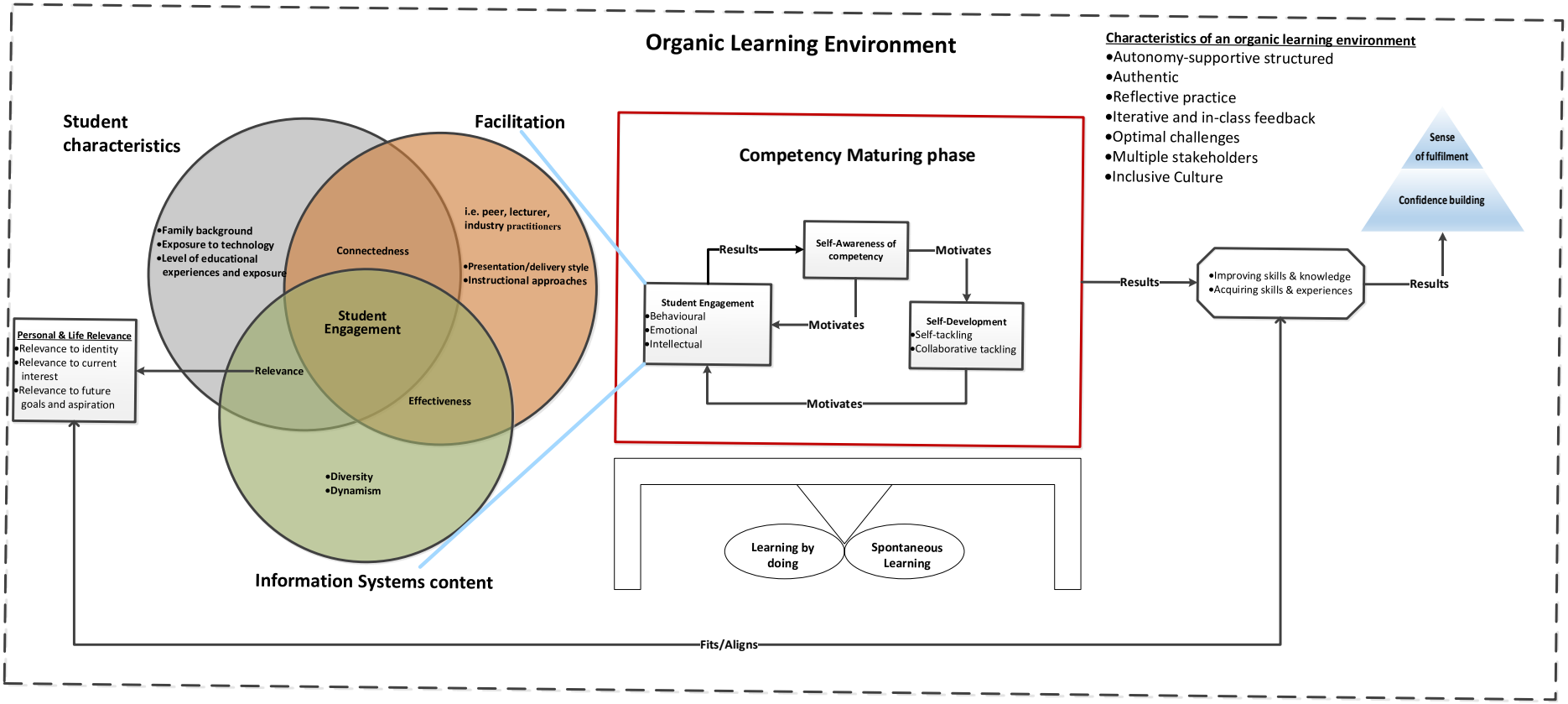


Figure 18: A substantive theory of Competency Maturing.

6.1. Conceptual overview: A substantive theory of Competency Maturing

This section presents the detail and dynamics of the final end result of the long grounded theory process presented in Figure 18. Full justification of the concepts that make up the diagram (Figure 18) and their relationship with each other through the grounded theory process is provided in sections 6.2 to 6.5. The senior IS undergraduates first *engage* in an *organic learning environment*, after which they discover their *strengths* and *weaknesses (self-awareness of competency)*, and then decide to *develop themselves* (*self-development*) to achieve their *personal goals*. Figure 19 is the first diagrammatical attempt to conceptualise the phases of a substantive theory of *Competency Maturing*.

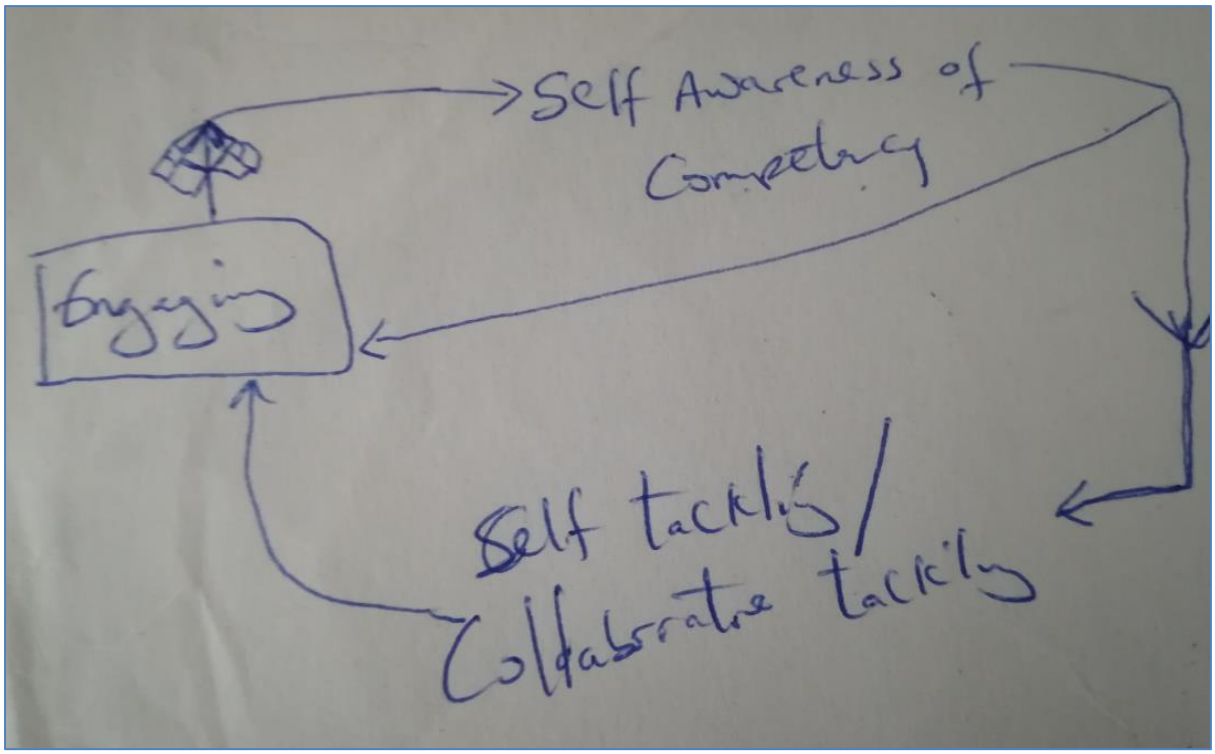


Figure 19: First attempt at conceptualising a substantive theory of Competency Maturing.

The grounded theory process found that a substantive theory of *Competency Maturing* is a continuous process by which senior IS undergraduates develop their existing competencies and acquire additional competencies that have *personal* or *life relevance*, through *student engagement* with peers, academics, and industry practitioners, and with a wide variety of *IS*

contents shared within an *organic learning environment*. *Competency maturing* process has three phases that are supported by *learning by doing* and *spontaneous learning*. Within an *organic learning environment*, *Competency Maturing* is a continuous process of *student engagement*, *self-awareness of competency*, and *self-development* which results in *improving skills and knowledge*, and *acquiring skills and experiences* and leads to the *sense of fulfilment* and *confidence building*. Figure 20 is the hierarchy chart of the *Competency Maturing* phase and its resulting effects.

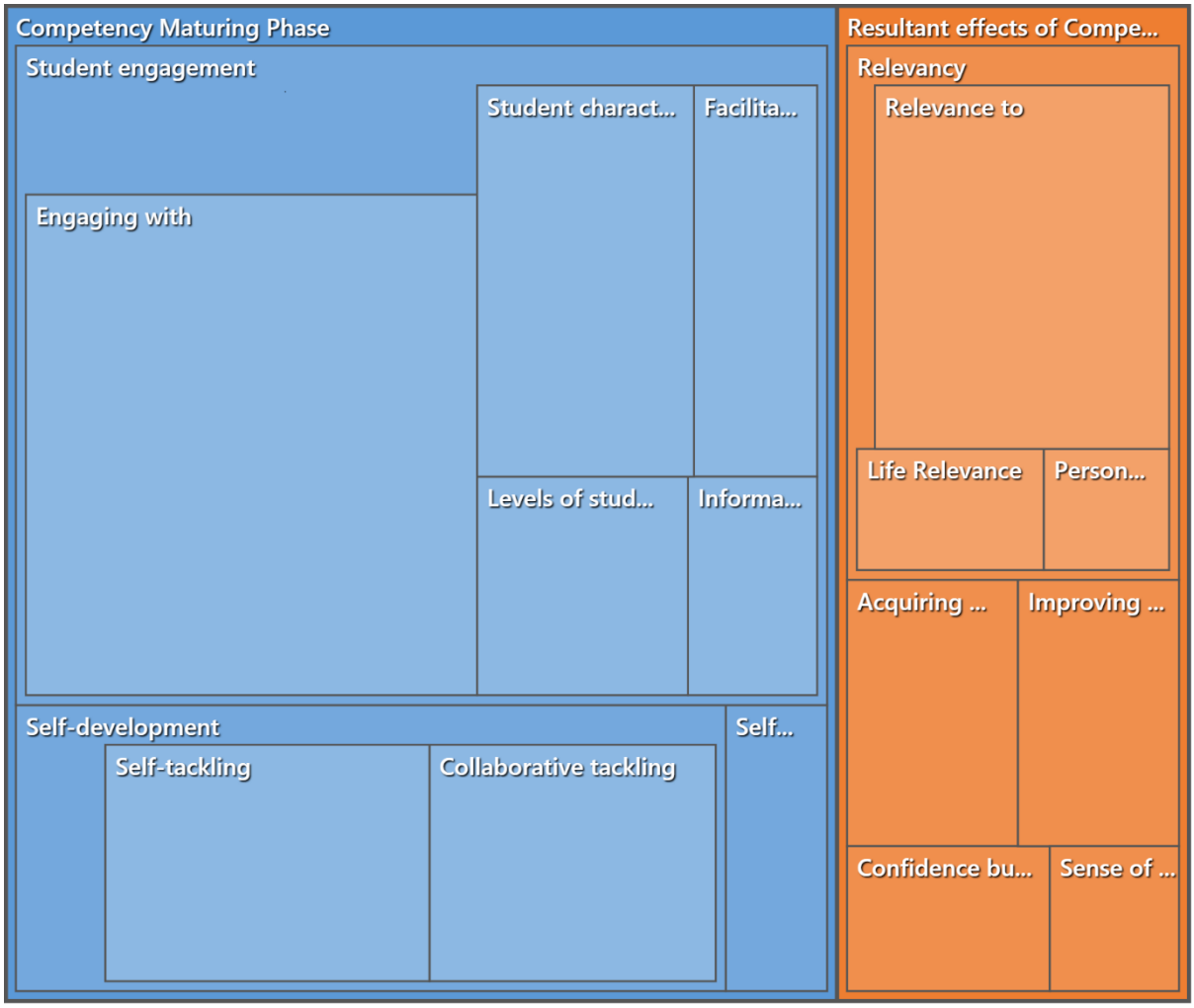


Figure 20: The hierarchy chart of the Competency Maturing phase and its resultant effect base on items coded.

An *organic learning environment* is a natural learning space that respects and responds to the senior IS undergraduates' individual and collective needs (goals, values and interests), where educational resources (IS contents) are sufficiently abundant and well organised, allowing them

to learn by doing and spontaneously develop and improve their competencies (skills, knowledge and acquire experiences). An *organic learning environment* allows for an interplay between the learning environment and the external environment; allowing for constant modification of what goes on within the learning environment. This *organic learning environment* has seven characteristics, namely *autonomy-supportive structure*, *authenticity*, *reflective practice*, *iterative and in-class feedback*, *optimal challenges*, *multiple stakeholders*, and *inclusive culture*.

Student engagement, which is a multi-faceted meta-construct comprising of *student characteristics*, *facilitation*, *IS contents*, an *organic learning environment* and their relationships, begins the three phases of the *Competency Maturing* process. The three interrelated levels of *student engagement* are *behavioural engagement*, *emotional engagement*, and *intellectual engagement*:

- *Behavioural engagement*, being the lowest level of *student engagement*, is characterised by the senior IS undergraduates' willingness to arrive punctually for, and embrace the culture and the norms of the learning environment.
- *Emotional engagement* talks about the senior IS undergraduates' *sense of connectedness* to the learning environment, and focuses on their positive (and negative) reactions to peers, academics, and industry practitioners. The understanding of the practical value of the *IS contents* shared within an *organic learning environment* moves them from a lower level of *student engagement* (*behavioural engagement*) to a higher level of *student engagement* (*emotional engagement*).
- The highest level of *student engagement* is the *intellectual engagement* where senior IS undergraduates engage in deep learning; engaging in sharing intellectual ideas with other people (peers, junior IS undergraduates, and academics) and learning from peers, academic and industry practitioners.

The *Students engagement* phase results in *self-awareness of competency*, where the senior IS undergraduates compare their acquired skills with the standard or expected skills. *Self-awareness of competency* is a phase where they, through *student engagement* (engagement with

peers, academics and industry practitioners), *reflective practice*, and practicalization of theoretical knowledge, acknowledge their weaknesses and abilities (strength).

Within an *organic learning environment*, the three phases of a *Competency Maturing* process rely on the senior IS undergraduates' ability to engage in *learning by doing* and *spontaneous learning*. As the name implies, *learning by doing* is simply learning from doing or learning from engaging in an activity; learning through experience. *Learning by doing* is a process whereby performance increases with experience. *Spontaneous learning*, on the other hand, is a gradual or sudden process of discovering, developing or acquiring competencies through normal, natural, or "*everyday experiences generally without prior planning*". The resultant effects of the senior IS undergraduates going through a *Competency Maturing* process are *improving skills and knowledge* and *acquiring skills and experiences* that have *personal* and or *life relevance* which lead to the *sense of fulfilment* and *confidence building*. A *sense of fulfilment* is the *"result of a life dominated by the experience and realisation of personal values*" (Langle, 2003, p. 111).

All the above concepts are presented in detail in the subsections 6.2 – 6.5. The next subsection focuses on explaining the characteristics of an *organic learning environment*.

6.2. An organic learning environment

An *organic learning environment* is an intellectually stimulating learning environment (Trowler, 2010), which is "*a virtual and physical environment in which educational materials are sufficiently abundant, and sufficiently well-organised, to allow for spontaneous learning*" (Nyíri, 1997, p. 353). Michaelson, McKerron and Davison (2015, p. 27509) define organic learning as "*implicit learning that occurs through experiences that arise naturally throughout the course of everyday life*". Similar to an *organic learning environment* in the literature, is an organic knowledge-building model, which is based on the notion that learning instructions should be based on how individuals naturally learn (Moller et al., 2002). An organic knowledge-building model is "*a type of instructional design in which an environment is created*

to facilitate learning by providing any tool or idea necessary to help learners achieve their goals" (Bueno, 2005, p. 21).

An *organic learning environment* fosters skills acquisition and knowledge-building, places students' goals, values and interests at the centre, and is more student-driven and focused than the traditional instructional style (Bueno, 2005; Moller et al., 2002; Nyíri, 1997; Trowler, 2010). In an "*organic learning environment, [students] become the owner of the learning process and can actively engage*" (Eachempati, KS & Ismail, 2018, p. 4). Gordon and Oliver (2015, p. 90) found postgraduate students reporting that "*when the instructor created an organic learning environment it opened up space for growth and led to collaborative learning among students*".

The senior IS undergraduates resolve their *perceived lack of IS competency* within an *organic learning environment*. The broken lines in the consolidated diagram of a substantive theory of *Competency Maturing* (Figure 18) imply that the boundary of an *organic learning environment* is not solid (Moller et al., 2002), giving room for interaction between the learning environment, context, problem, the students and the external environment. The *organic learning environment* make it possible for them to use technology to bring the world into the classroom. For instance,

> Lila-2015-1 said, "*I would say how I build competency is more of organic, learning in class, relating with people"*. Keira-2015-1 said, "*for instance with my iPad or phone, maybe a new grammar or vocabulary was mentioned during the seminar, I want to research about it, I will rush to my phone or iPad… I will go right to Google and search to know what other people are saying about it"*.

The most salient characteristics of an organic learning environment that resolve the senior IS undergraduates' *perceived lack of IS competency* and support *student engagement* and *Competency Maturing* are the *autonomy-supportive structure*, *authenticity*, *reflective practice*, *iterative and in-class feedback*, *optimal challenges*, *multiple stakeholders*, and *inclusive culture*. These characteristics are elaborated on in subsections 6.2.1 – 6.2.7 respectively.

6.2.1. Autonomy-supportive structure

An *autonomy-supportive structured* environment is a learning environment where academics provide the senior IS undergraduates with clear and relevant information and ways of achieving students' goals that identify, nurture and build the students' inner motivational resources.

The senior IS undergraduates mature their competency in an *autonomy-supportive structured* environment. For instance,

> The senior IS undergraduates say "*you need support structure"* (Giselle-2015-3) to mature competency and that the academics provide them with "*the support structure*" (Mabel-2016-1). They receive enormous support from the academics (from the course convenor and from their individual supervisors), especially from the course convenor because "*the course convenor was always available"* (Silas-2015-1) to provide the needed support. Mabel-2016-1 added that the *"course convenor has taught me a lot… He is a great lecturer that allows us to achieve a lot in a few months"*. Keira-2015-3 also said, "*the academics gave enough support throughout the course"*.
>
> The IS Honours programme is *"structured for the senior IS undergraduates to work in a team and come up with innovative ideas"* (Memo: *Autonomy-supportive structured* environment). The senior IS undergraduates mature competency through "*great teachings and well-structured seminars"* (CE-2016-1). The IS Honours course structure encourages *"the senior IS undergraduates to be out of their comfort zone, think for themselves, and develop additional skills. The academics (course convenor or supervisors) gave enough support; are always available to provide support throughout the course"* (Memo: *Autonomy-supportive structured* environment).

Each of the senior IS undergraduates has inner resources; "*different people have different skills"* (Giselle-2015-3). These inner resources can be nurtured when academics adopt an *autonomy-supportive structured* style, otherwise frustrated when the instructional style is chaotic and controlling. An *autonomy-supportive structured* environment allows them to experience personal growth (mature). For example,

> Zelda-2015-1 comment that "*during our group meeting, this is what we do – we have done something called bring your own piece, it's a group of six of us. So, what we do is basically we share what we want our business to do, so it was just a whole three months of us teaching each other about what the business is going to do, the processes, how the business will run...*".
>
> Lila-2015-2 said, "*I have never had as much independence as that in university before, and it really allowed me to grow as a person"*.

While it is the responsibility of the senior IS undergraduates to make use of educational resources (*IS contents*), creating an *autonomy-supportive structured* environment that makes learning possible is primarily the responsibility of institutions, academics or educational practitioners (Krause & Coates, 2008). An *autonomy-supportive structured* environment enables the students to function as *co-producer of educational resources*, engage more in *IS contents*, take ownership of, feel more committed and responsible for their learning and mature competency.

> For example, Tyler-2015-1 said, "*the structure of the course and lack of skill in my SD [Systems Development] group – a group that can be classified as technically disadvantaged, as I needed to pull weight – forced me to develop other skills"*. As Seth-2016-1 noted, "*poor presentations from peers and industry practitioners, just like poor presentations from lecturers do not inspire me to learn"*. Scholars have equally noted that *"[l]earning styles affect an individual's selection of the things to be learnt, desire for learning, and his/her attitude towards learning contexts"* (Molnar & Sik, 2014, p. 88).

As students have preferred learning styles, academics also have preferred teaching or instructional styles, which have direct positive or negative effects on students' learning (Molnar & Sik, 2014; Shawer, 2017). Creating an *organic learning environment* that fosters *Competency Maturing* and *student engagement* will require the academics to discover the preferred learning styles of the students, and adapt the teaching styles that correlate with their preferred learning styles. A variety of presentation styles will be appropriate for a senior IS undergraduate's learning environment. For example,

> One of the senior IS undergraduates commented thus, "*I enjoyed different presentation styles (mix of students, lecturers [academics] and guest lecturers [industry practitioners])"* (CE-2016-4).

Some scholars suggest that incorporating an ***autonomy-supportive structure*** into the curriculum is an important pedagogical consideration (Meng & Keng, 2016; Wang, Morin, Ryan & Liu, 2016). Although no study could be found where an ***autonomy-supportive structure*** is explicitly defined, scholars only define autonomy-support and structure in isolation.

An autonomy-support has been defined as

> "*the interpersonal behaviour [academics] provide during instruction to identify, nurture, and build students' inner motivational resources... Thus, autonomy support refers to an atmosphere where students are not pressured to behave in a specific way, and where they are, instead, encouraged to be themselves*" (Núñez & León, 2015, p. 277).

Academic "*support has consistently been shown to be a positive influence on training effectiveness*" (Kozlowski & Salas, 2010, p. 316). In an autonomy-supportive environment, students' needs are identified, and their inner motivational resources are nurtured and developed through learning activities or educational activities that are built around students' personal goals, needs, interests, and preferences (Jang et al., 2010). An autonomy-supportive environment acknowledges the students' perspective and feelings, relies on non-controlling informational language, and nurtures the inner motivational resources of the students (Jang et al., 2010).

Structure from the extant literature *"refers to the amount and clarity of information that [academics] provide to students about expectations and ways of effectively achieving desired educational outcomes*" (Jang, Reeve & Deci, 2010, p. 589). In a structured environment, the academics support students' perception of competence, and

- *"present clear, understandable, explicit, and detailed directions";*
- *"offer a programme of action to guide students' ongoing activity"; and*

- *"offer constructive feedback on how students can gain control over valued outcomes*" (Jang et al., 2010, p. 589-590).

Competency Maturing requires not an autonomy-supportive or a structured environment but *autonomy-supportive structured* environment. Scholars have indicated that "*[p]roviding students with both autonomy-support and structure has shown positive benefits"* (Oga-Baldwin & Nakata, 2015, p. 169). The findings of Meng and Keng (2016, p. 7) support that "*students in the autonomy-supportive structure group will be more autonomously motivated, engaged and physically active than students in the autonomy-support only group*". Apart from the academics creating an *autonomy-supportive structured* environment for *Competency Maturing* and *student engagement*, senior IS undergraduates need additional external support. As the boundary of an *organic learning environment* is not solid, these students receive support from technology, peers, industry practitioners, friends and family. For example,

> Tyler-2015-2 said, "*the role technology played in building competencies is supporting structure, it provides the platform through which one access the internet where the materials needed to build the competencies are made available".* Giselle-2015-3 commented on the support she received from peers, industry practitioners and family when she said, "*I had to depend on peer-to-peer tutoring, I also learnt much more from external presenters [industry practitioners]. You need contributions from different people… You need a support structure from friends and family"*. Naomi-2015-1 added that "*I can say I enjoyed family support*".

6.2.2. An authentic learning environment

An *authentic learning environment* is an environment that allows senior IS undergraduates to explore, discuss, and construct concepts and relationships based on real-life problems and projects that are relevant to them. An *authentic learning environment* is a learner-centered, realistic and effective environment (Herrington & Herrington, 2007), that "*reflects the way knowledge and skills will be used in real life*" (Gulikers, Bastiaens & Martens, 2005, p. 509). The essence of the *authentic learning environment* and an authentic task "*is to show students relevance and stimulate them to develop competencies that are relevant for their future professional or daily lives*" (Gulikers et al., 2005, p. 510).

These students receive "*very hands-on/practical experience"* (CE-2015-1), have the opportunity to relate, discuss, and work in groups on real-life problems and projects that are *relevant to their identity*, *current interest*, or their *future goals and aspiration*. Thus, the senior IS undergraduates experience the authenticity in an *authentic learning environment* where they carry out authentic tasks. For example, Silas-2015-1 commented on the authenticity of their learning environment when he said,

> *"The SD [Systems Development] project allowed us to really delve into developing solutions that are of value to organisations. It gave us an insight as to how to interact with business in proposing how we think we can solve a particular problem. One really could get a sense as to how important it is to understand the organisation's vision and strategy before getting carried away in presenting a solution".*

In the course evaluation, the senior IS undergraduates commented a lot about the authenticity of the programme that,

> *"This course really encourages you to engage and learn about the real-world applications of the various topics that we cover. Great that it is not just theory based … The focus less on theory and more on the application is much better than how we are normally tested at the undergrad level. This method is also much more modern, like today, I can Google any theory, but I must know how to apply that theory… The seminar series provided a deeper theoretical foundation for us, and the guest lecturers [industry practitioners] applied the theory within a real-world context… Very valuable… Provides a deeper theoretical foundation within the field of Information Systems"* (CE-2016-3).

Involving in *intellectual power-sharing* and *intellectual power tapping*, the senior IS undergraduates work in a team of three or four to provide a solution to a real-life problem. *Intellectual power-sharing* is the senior IS undergraduates' ability to share intellectual ideas with other people, which could be peers, junior IS undergraduates, and academics. *Intellectual power tapping* is their ability to learn from peers, academic and industry practitioners. For example,

> Pr.Kyle-2015/2016-1 said "*the empirical research was previously defined by academics but becoming defined by the companies, where the senior Information Systems undergraduates come up with a proposal of what business wants. They apply theoretical knowledge to the practical situation. Students work in groups and find an organisation that has a real problem and offer a solution".*
>
> Connor-2016-1 said *"some of the lecturers do inspire you like now we have supervisors who are really helping… colleagues are most important … so we tap knowledge from one another"*. Gabriel-2015-3 also commented that "*this course is a good way to engage and think with your classmates".*

An *authentic learning environment* allows students to put their theoretical knowledge into practical use. Giselle-2015-3 commented "*we were able to put our theoretical knowledge into practical context"*. Thus, learning in an *authentic learning environment* is an active process – a learning process by doing. Authenticity is not an objective feature of the senior IS undergraduates, academics, industry practitioners, and the learning environment in isolation, it is a result of the dynamic interaction among all these people and the *organic learning environment*. This view supports the co-evolutionary model proposed by Barab, Squire and Dueber (2000, p. 41) that "*argued that authenticity lies in the learner-perceived relations between the practices they are carrying out and the use value of these practices*". Scholars have noted that students engage more with authentic work that extends beyond the learning environment wall, and intellectually involves solving real-life problems (Shernoff et al., 2014). An *authentic learning environment* motivates students to develop the knowledge, skills, and attitudes needed for effective performance in the real world (Gill et al., 2016; Gulikers et al., 2005).

6.2.3. Reflective practice

Reflective practice is the process through which students or professionals learn to improve their skills and acquire knowledge by examining, thinking and evaluating their actions and experiences (van Hilten, 2018). *Reflective practice* is an important, "*natural, and essential, part of the learning process*", which often focuses on "*observing, being, and listening*"

(Hedberg, 2009, p, 10). Through reflection, experience gains meaning, which can be translated into learning (Hedberg, 2009).

Reflective practice forms a continuous part of the senior IS undergraduate programme and contributes to them resolving their *perceived lack of IS competency*.

> Maddock-2016-1 commented that "*by reviewing my peers, it has improved my IS competencies as I can reflect on errors my peers made and ensure I do not make such".* The academics "*organise reflective sessions during which the students reflect on how they are doing, comment on how, what, and why they are doing it"* (Pr.Kyle-2015/2016-3). The reflective practice *"made one ask the question of what do we really know"* (Silas-2015-1) and "*help a lot to recollect the activities we have done"* (Owen-2016-2).

Reflective practice could be done consciously or unconsciously, during and after the learning process, as supported by the following memo on *self-reflective practice*:

> *"The senior IS undergraduates' program continuously gives room for reflection. Students, consciously and unconsciously, engage in the self-reflective practice. The students engage in self-reflective practice consciously when they are required to write on the three most important things learnt, and how the seminar change their opinions, and submit for evaluation – here students are force to engage in self-reflective practice after the learning experience. In addition, the students engage in self-reflective practice unconsciously on weekly bases - there is usually an industry expert (Industry practitioner) who comes to present during the seminar to elaborate on the seminar topics and makes the students understand what is expected outside the wall of the university. The students personally get to evaluate themselves and consider whether they have measured up to the industry standards - In this case, students unconsciously engage in self-reflective practice during the learning experience" (*Memo: Reflective-Practice).
>
> Some of the senior IS undergraduates only rush to answer the reflective questions a few days before the submission deadline. However, most of the students significantly

> benefit from the *reflective practice* when they answer reflective questions immediately after each seminar. These students presented a deeper understanding of the ideas discussed because they were able to evaluate themselves and the knowledge they had acquired from each of the seminar topics. Most students who responded to the reflective questions long after the presentation could only give general comments on the subject because they had forgotten what was discussed during most of the seminar sessions.

While in the senior IS undergraduate programme, reflection was done during and after the learning experiences, it would also be beneficial for pre-learning reflection to be conducted. Pre-learning reflection is the reflection done before the commencement of the programme; this can be done by asking these students to identify their specific personal goals before the commencement of the programme. They could benefit from pre-learning reflection because "*[p]ersonal learning goals get students more creatively engaged in their own learning, taking them out of a passive learning mode*" (Hedberg, 2009, p, 20). Pre-learning reflection could build a knowledge base and serve as a reference point for future learning reflections for the students.

I acknowledge that reflection is hard work that requires rigour and active process, however, *"[w]hen we reflect, we give the learning a space to be processed, understood, and more likely integrated into future thoughts and actions*" (Hedberg, 2009, p, 11). The *reflective practice* could result in *subject reflective learning*, *personal reflective learning* or *critical reflective learning* (Hedberg, 2009). Although, only two, *subject reflective learning* and *personal reflective learning*, were empirically supported in this thesis as can be seen from one of my memo's on *reflective practice*:

> *"The first reflective question (what are the three most important things learnt?) focus on the subject – subject reflective learning. The second question (how does the seminar change your opinions?) focus on understanding what the learning means to the students - personal reflective learning" (*Memo: Reflective-Practice).

While, *subject reflective learning* focuses on the concept or subject matter; *personal reflective learning* focuses on personal insights gained; and *critical reflective learning* involves understanding the meaning of general and contextual matters; and in the case of *critical*

reflective learning, educational enterprise is viewed from a broader perspective (Hedberg, 2009; Ng & Tan, 2009). The *critical reflective learning* question could be "*what are the broader implications of my learning*?" (Hedberg, 2009, p. 14).

Reflection is recognised as a practice that supports deeper learning (Daly, Mosyjowski & Seifert, 2016). Through *reflective practice*, assumptions could be challenged, and deep and meaningful learning could occur (Hedberg, 2009). In support of the findings of *reflective practice* in this thesis, Hedberg (2009, p, 29) said, *"I have seen reflection add to the learning of undergraduate business students as well as part-time and executive MBA students"*. Further, Hedberg (2009, p, 31) added that *"[r]eflection puts the students in charge of their own learning… One result I consistently have noticed is that students seem more engaged, more responsible, and more present in their learning"*.

6.2.4. Iterative and in-class feedback

Iterative feedback is a process of arriving at a desired or close to the desired result by repeating the students' deliverable assessment process (Dawson et al., 2018). *In-class feedback* serves as individual assessment feedback to the group of students presenting during the seminar and collective feedback to the other groups, given them insight into what and how things should be done correctly. Thus, when the academics in an *organic learning environment* adopt an *iterative and in-class feedback* approach, multiple purposes would be served.

Iterative and in-class feedback is one of the effective processes of improving the quality of students' subsequent work (Dawson, Henderson, Mahoney, Phillips, Ryan, Boud & Molloy, 2018). One of the features of effective feedback is that "*feedback needs to be iterative and connected*" (Dawson et al., 2018, p. 7). "*The sense of personal strength and weakness requires honest feedback that shapes*" an individual (Shi, 2017, p. 81). Providing feedback to students has long been recognised as central to and an indispensable part of effective learning in higher education (Carless, Salter, Yang & Lam, 2011; Hounsell, McCune, Hounsell & Litjens, 2008). Studies have shown that *in-class feedback* improves learning; as feedback is given to students at the same time learning occurs, thus students can identify and correct their misconceptions (Koile & Singer, 2006).

The senior IS undergraduates benefit greatly from the *iterative and in-class feedback* process. As Pr.Kyle-2015/2016-2 commented, "*three weeks before the seminar, students [the senior Information Systems undergraduates] submit version V1 [Version 1] to the course convenor to comment on, then V2, V3, ...until the course convenor is satisfied with the quality of the work done"*. One of the senior IS undergraduates commented in the course evaluation that *"the course taught me to write and learn from my mistakes"* (CE-2015-2). Another form of feedback that one of the students mentioned in passing is peer feedback, commenting that peer feedback could be used as a measure to evaluate student's performance in teamwork:

> "*in the case of students not performing, some measures should be put in place, perhaps a peer evaluation of some sort, as an equal mark for someone who has not participated to the best of their abilities may be frustrating and unfair"* (CE-2015-1).

Peer feedback is used in this thesis to indicate a process of a student completing and submitting a peer feedback form to evaluate another student's performance in a pair or group task. Although the benefits of peer feedback are enumerated in the extant literature (Adachi, Tai & Dawson, 2018), there is no indication that peer feedback is used in the senior IS undergraduate programme or contributes to their maturing competency. The near absence of peer feedback found in this research concurs with what Dawson et al. (2018, p. 7) observed that the

> *"near absence of peer feedback is potentially unsurprising, as although we are aware of some use of peer feedback within our contexts, we are also aware of resistance to these approaches from students and educators".*

6.2.5. Optimal challenges

Optimal challenges refer to IS contents (i.e. educational activities involved with and the educational resources shared within the senior IS undergraduates' learning environment), which challenge them intellectually.

The senior IS undergraduates commented on how the programme challenged and assisted them in acquiring additional skills and to self-develop, thus:

> Khalil-2016-1 said, "*every week has its own challenges, and through those challenges, I learn and gain a lot of skills"*. Also, students added in the course evaluation that "*I felt like I learnt a lot and worked in a high-pressure environment"* (CE-2015-1), "*Honours programme challenged me and as a result, made me grow as an individual"* (CE-2015-2). Another student commented that "*this course teaches you a lot, the learning curve is quite steep but exciting… It challenges your thinking and reasoning* (CE-2016-3).

Besides the *optimal challenges* assisting the senior IS undergraduates to acquire additional skills and self-develop, *optimal challenges* also help them to mature competency. For example,

> Noel-2015-2 said, "*senior IS undergraduates' programme is very time intensive and required a lot from students (and me) in terms of personal capacity. Therefore, they allowed me to grow a lot especially in terms of the core competencies gained from the Honours degree"*. Connor-2016-1 also said, "*the challenge, which is good, is the exposure which IS is given us right now" and* Mabel-2016-1 added that "*scary experience but it surprised me that I could do it"*.
>
> Another student added in the course evaluation that, *"How the course is structured helps us to scratch our minds and acquire many skills… The course brings value in a sense that it prepares us well for the working environment. Even though the course is very challenging and demanding, it provides us with all the necessary skills and knowledge that a graduate should have… The course taught me a lot of things I never thought I would be capable of"* (CE-2016-3).

The "*theories of motivation stress the importance of optimal challenges—challenges that are approximately equal to the capacities of the participant*" (Abuhamdeh, Csikszentmihalyi & Jalal, 2015, p. 2). Generally, to remain engaged, students require educational content that challenges them intellectually (Bolkan, 2015; Busse, 2013; Deci & Porac, 2015). However, the academic challenge must be accompanied by academic support (Karras, 2013; Kurtzman, 2015; Schussler, 2009), as explained in 6.2.1 (*autonomy-supportive structure*).

6.2.6. Multiple stakeholders

A stakeholder is an individual or group of individuals involved in the production of the *IS contents* shared within the senior IS undergraduate programme. Three principal stakeholders were identified here, namely: the academics, the senior IS undergraduates, and the industry practitioners, and all the stakeholders *were co-producers of educational resources*. Having *multiple stakeholders* who contribute intellectually to the senior IS undergraduates' *IS contents*, increases the shared knowledge and makes the senior IS undergraduates' learning environment "knowledge-dense". For example,

> In the course evaluation, a senior IS undergraduate indicated that, *"we had access to great amount of learning. The mixture of presentation and writing is ideal. Learning diverse skills is great. Continuous building of knowledge and engagement through forums is perfect. I really enjoyed hearing about the different topics and expanding my thoughts. Guest lecturer [industry practitioners] is a massive bonus. Great opportunity to learn new things at each seminar"* (CE-2015-1).

The academics create a learning environment for the senior IS undergraduates to take ownership of their learning and engage with the academics, peers, industry practitioners, and the *IS contents* shared within the learning environment. Of importance are the values they derive from engaging with their peers and the industry practitioners. Some of these benefits include motivation for self-development, confidence building, valuable experience, and understanding the practical application of IS concepts. Engaging with peers also assists them in being aware of their weaknesses. For example,

> Lila-2015-1 spoke about self-development motivation when she said, "*My SD (System Development) group motivated me a lot to overcome the challenges I encountered*". Dominic-2015-2 commented on how *engaging* in peer review motivated him to self-develop, he said, "*I was able to see what it's like to review other work, which helped me put more effort into my own work and produce greater quality*". Bryce-2015-2 added that "*the best way I found for improvement was through reviews as they showed my shortcomings and helped me improve on them*".

> The valuable experiences and the understanding of the practical application that the senior IS undergraduates derive from engaging with their peers are further supported by student comments in the course evaluation, e.g. "*continuous involvement with the course and with my classmates gave lots of real-world information… a constructive experience through the presentations and interactions of students with each other"* (CE-2016-3). Silas-2015-1 spoke about how peer presentations challenged them and built their confidence when he said, "*peer presentations challenged all of us to produce content not only in a manner to impart knowledge onto our fellow peers but to present in a manner that can be meaningful to everyone*". Noel-2015-2 added that his engagement with peers "*helped improve confidence and general presentation skills. I also notice what others do wrong, which helped me to self-improve*". In addition, the students comment that from their engagement with peers, they gained valuable experiences and the understanding of the practical application. For example, Gabriel-2015-2 said, *"Systems Development project is most probably the best part about the entire Honours project because it gives us the opportunity to engage with one another"*. Hailey-2016-1 added that "*engaging with peers helped me understand how topics relate to real life situations*".

The Honours programme exposed the senior IS undergraduates to practitioners from different IS/IT industries, who came to present during the weekly seminars and brought to bear the relevance of the Honours' *IS contents* and its practical application. Some industry practitioners also provided mentorship for them on their research topics and made the students aware of the skills industries require, contributing to preparing the students for employment. For example,

> Seth-2016-1 said "*engaging with industry practitioners gives you the confidence to approach businesses and industry with the knowledge and skills you have"*. Another student commented in the course evaluation that "*this course addresses how theory learnt is applied in real-life… Grounded with practical examples used in the real world"* (CE-2016-4).

Engaging with industry practitioners provides senior IS undergraduates with career insight, awareness of the current industry trends, and the skill sets relevant to their future goals and

aspiration, which encourages the students to focus attention on developing specific skills relevant to them. They gained a better understanding of the practical application of the theoretical knowledge they have learned, strengthening the relevance of the *IS contents* shared within the learning environment. This helped to build confidence for the students. For example,

> Andrew-2015-2 commented on the practical value of engaging with industry practitioners that "*having someone from the industry helped me connect the dots between academic theory and industry facts"*. Hailey-2016-1 said, engaging with industry practitioners "*helped me understand how topics relate to real-life situations"*. Another student added in the course evaluation that
>
> *"Understanding a theory is easy, but understanding the reality of the field is what I enjoyed from the guest lecturers [industry practitioners]. I appreciated all of them and enjoyed most of them. I find it to be helpful to not only understanding the theoretical work and the practicality, but also potential fields of jobs I can pursue. Learning about these from industry specialists is insightful*" (CE-2015-1).

6.2.7. Inclusive culture

An *inclusive culture* is a learning and teaching culture that enables all students, irrespective of their background or situation and nationality, to develop academically, professionally, and personally fulfil their potentials (Lawrie et al., 2017; Wray, 2013). This definition moves from focusing on subgroups of students, towards structure, processes and practices within the learning environment that eliminate barriers to the equal learning experiences. An inclusive learning environment embraces the *"culture that brings everyone to speed as soon as they enrol in a course or program"* (Memo – Inclusive culture). For example,

> In the case of the senior IS undergraduate programme, the learning and teaching culture (*inclusive culture*) should take into consideration the international students, students crossing from local universities, and those from previously or historically disadvantaged universities. For instance, Natalie-2015-2 said, "*most of us from another University or other department, initially we didn't know what it means to do iteration"*.

To an extent, their programme is inclusive, as Pr.Kyle-2015/2016-1 said, "*the whole class is interconnected...No one is left isolated*".

Some of the international students, however, as well as students crossing from local universities, feel the communication, the learning environment, as well as the entire senior IS undergraduate programme could be more inclusive, to adequately and sufficiently nurture the potential of all the students enrolled in the programme. For instance, Tyler-2015-2 said,

"the [Honours] program needs to be transformed to be more inclusive. I think 12 or 13 of us are from another university and were new to the system… I feel the communication structure is culturally insensitive… Communication structure needs to be changed to become accessible to all".

An inclusive learning environment "*strives towards proactively making higher education accessible, relevant and engaging to all students*" (Thomas & May, 2010, p. 5). An inclusive higher education speaks of how *"pedagogy, curricula and assessment are designed to engage students in learning that is meaningful, relevant, and accessible to all*" (Lawrie et al., 2017, p. 2).

In conclusion, as explained above (in subsections 6.2.1 – 6.2.7), an *organic learning environment* is characterised by an *autonomy-supportive structure*, *authenticity*, *reflective practice*, *iterative and in-class feedback*, *optimal challenges*, *multiple stakeholders*, and *inclusive culture*. The next section is dedicated to explaining the three phases of a substantive theory of *Competency Maturing*.

6.3. Competency Maturing Phases

As represented in Figure 21, a BSP (Basic Social Process) of *Competency Maturing* begins with the *student engagement* phase, then moves to the *self-awareness of competency* phase, to the *self-development* phase, and back to *student engagement*. As can also be seen in Figure 18, the three cyclic process of *Competency Maturing* occur when students "*individually and*

collaboratively engage with the IS contents shared within an organic learning environment, and put their theoretical knowledge into practical application, and become aware of their strengths and weaknesses (self-awareness of competency), which motivates self-development and more student engagement" (Memo: Competency Maturing process/phases).

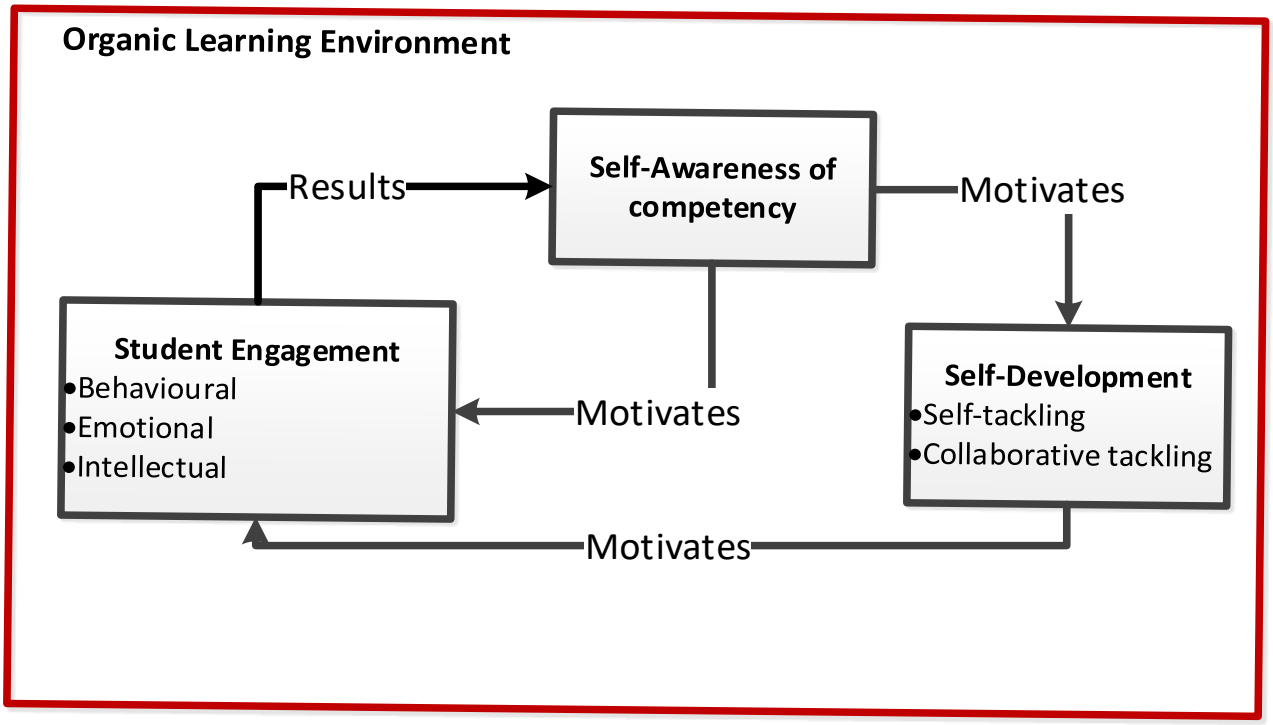


Figure 21: Competency Maturing Phases.

Figure 21 indicates that the three phases of a *Competency Maturing* occur within an *organic learning environment*. These phases are further explained in subsections 6.3.1 – 6.3.3 and organised as follows:

- Subsection 6.3.1 elaborates on the *student engagement* phase.
- Subsection 6.3.2 presents *self-awareness of competency* phase.
- Subsection 6.3.3 presents the *self-development* phase.

6.3.1. Student Engagement Phase

Student engagement is a multi-faceted meta-construct, which the GT research found to comprise *student characteristics*, *facilitation*, *IS contents*, *organic learning environment*, and their *relationships*. For example,

> Noel-2015-1 spoke about the multi-faceted meta-construct of *student engagement* when he said, "*student engagement depends on how the facilitator captivates you, if what they are saying interests you, then you are going to engage in the content, if the content of what they are saying isn't actually interesting, then you drift"*.

The diagrammatical representation of the concepts which are relevant to the multi-faceted meta-construct of *student engagement* and their properties are presented in Figure 22. I elaborate on these concepts in subsections 6.3.1.1 – 6.3.1.4, organised as follows:

- Subsection 6.3.1.1 presents the concept of *student characteristics*.
- Subsection 6.3.1.2 covers the concept of *facilitation*.
- Subsection 6.3.1.3 presents the characteristics of *IS content*.
- Subsection 6.3.1.4 discusses the levels of *student engagement.*

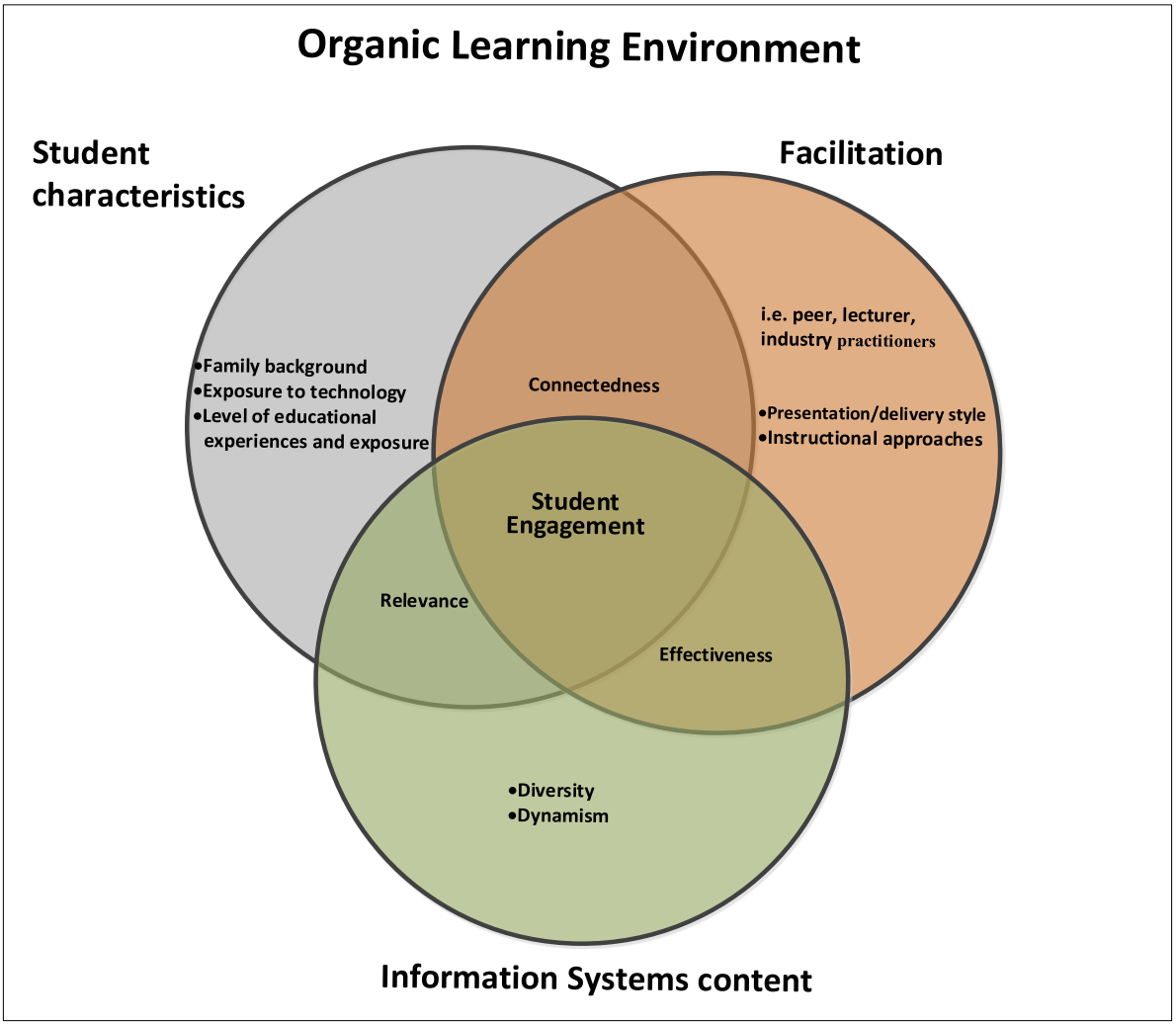


Figure 22: A developmental diagram of Student Engagement Model.

6.3.1.1. Student characteristics

Student characteristics represent the values, passion, traits, skills, goals, interests, and fears that come with the senior IS undergraduates into an *organic learning environment*. *Student characteristics* exist before the students enrol in this programme, thus exist before *student engagement*, and influence the students' learning process and their decision to enrol and engage in the IS Honours programme. For example,

> Mason-2015-1 said "*the reason I registered for Honours in Information Systems is I have always had a passion for Engineering and IT, my key interest was in Engineering and Technology before I discovered that Electrical Engineering is not what I value"*

(Mason-2015-1). Natalie-2015-2 said, "*I just have to have that thing that will set me apart. I wanted the qualification that would add value to me".* Yale-2015-1 added that IS Honours program "*is a good match for my passion…so I think IS is just perfect for my passion. IS makes you holistic".*

Figure 23 depicts that the *student characteristics*, is influenced by the senior IS undergraduates' *family background* (i.e. socio-economy status, culture, relations' level of education), *exposure to technology*, and prior *educational experiences and exposure*. For instance,

Giselle-2015-3 said, "*I am the first to graduate in my family… I practically lived with my friend's family... and I got encouragement, support from their parents because they also have degrees*" (socio-economic status). Gabriel-2015-1 is of the opinion that socio-economic status influences students' *exposure to technology*, he said "*because some people are from high class, middle class and may be able to invest in technology… what about low class, why should they be excluded from learning?"*. Giselle-2015-2, who is from a relatively closed culture; a family culture that does not encourage *exposure to technology*, said: *"I am never into technology because of my background... we are traditionally enclosed"*. Yale-2015-1 added, "*my sister did IS, even though I don't like following her footsteps but I was aware of what I could be in IS before I joined IS because my sister who is ten years older than me, had started working before I chose IS"* (Relations' level of education).

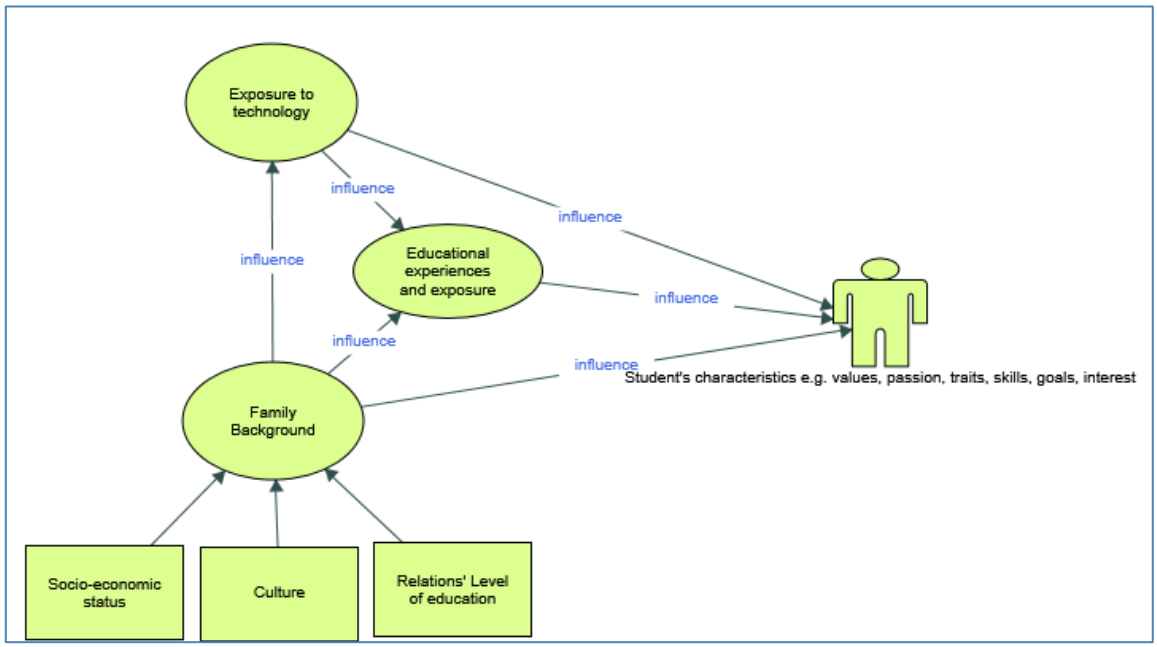


Figure 23: Students' characteristics.

Further, the *family background* and *exposure to technology* influence students' level of *educational experiences and exposure*, as supported below:

> Connor-2016-1 said, "*before I applied for the Honours programme, sometimes I went to the IS website to check the Honours programme and also ask some lecturers that were teaching us, and I realised that the curriculum for IS Honours the way it is structured it will equip me much more"* (*Educational experiences and exposure*). Drake-2016-1 added that *"I was sure of the skills I would get from IS Honours, I did my research, I spoke with people doing IS Honours and Computer Science Honours, I spoke with lecturers, course convenor to know what I would get from both before making my decision... both Honours can get you a kind of the same position… But one has more options in IS"* (*Educational experiences and exposure*). The students' prior level of *educational experiences and exposure* refers to "*the knowledge, skills or ability that students bring to the learning process*" (Jonassen & Grabowski, 2012, p. 417).

The decision to enrol in the IS Honours programme is a result of the students' *perceived value* of the Honours' programme. *Perceived value* refers to the worth of something from one's point of view (Duncan, 2018), and includes the benefits obtained and the sacrifices expended (Liu et

al., 2015). "*Generally speaking, perceived value is defined as the consumer's subjective evaluation of the trade-off between benefits obtained from a product or service and sacrifices made for it*" (Liu, Zhao, Chau & Tang, 2015, p. 474). For instance,

> Before enrolment and subsequent *student engagement*, the senior IS undergraduates perceived that the Honours curriculum had some important values (*perceived value*) which motivated them to enrol in the program, and to engage in the *IS contents*. For example,
>
> Sophia-2016-1 commented on the *perceived value* of the IS Honours programme when she said, "*it looks like we are going to learn a lot from the programme"*. Connor-2016-1 voiced his opinion that "*I know the way the curriculum for Honours is structured, it will equip me much better*". Owen-2016-1 felt that "*IS Honours has more to offer*".

The *perceived value* of the senior IS undergraduate programme varies and is largely dependent on the student's prior *educational experiences and exposure*. And the *educational experiences and exposure* is a function of their *family background*, *personal development*, *industry awareness*, and *industry experience*. Figure 24 presents how these concepts are related, indicating that the higher the *educational experiences and exposure*, the higher the *perceived value* of the *IS contents* shared within an *organic learning environment*.

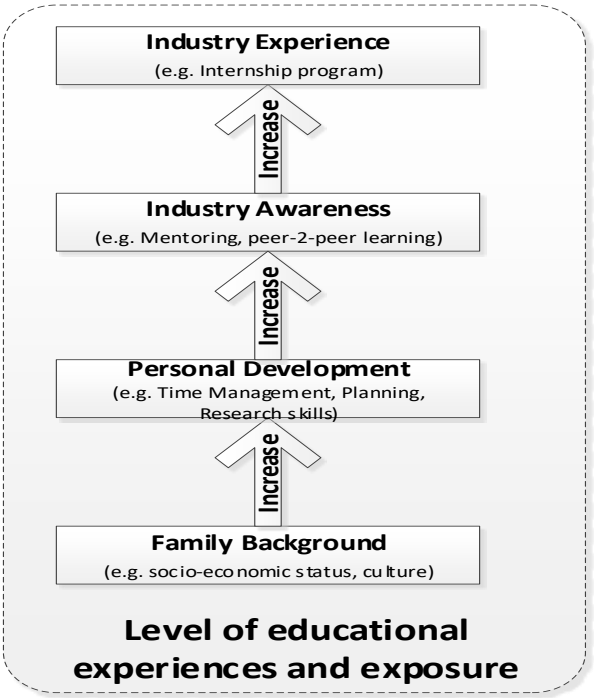


Figure 24: Level of educational experiences and exposure.

For instance, Owen-2016-1 spoke about how his *industry experience* influenced his *perceived value* of the senior IS undergraduates' program when he said, *"before going for the internship, I was still interested in Honours in Computer Science, but during the internship, I discovered that you would code, but there is more to coding. I was working part-time internship last year… that is where I understand the usefulness of IS"*. Roy-2015-1 also spoke about how his *industry experience* had influenced his *perceived value*, when he said, *"especially this year, I have come to appreciate technology more because I can see from the developer's view. If I see an App, I know what effort has gone into it, and I become more interested in it. I have always had the front-end view, but now if I see an App, as a developer, I know better"*.

Drake-2016-1's comment on his *industry awareness* revealing that mentoring influenced his level of *educational experiences and exposure*, he said,

"Firstly, I wanted to do Computer Science at Honours level; I had that in mind without talking to anyone. You know you just have that perception that this is what I want to do,

> *but in reality, you don't know what you really want to do. I guess the experience influenced because I get to know people because some of the people I was working with they also did IS Honours, so they gave me the insight, like what it's all about… All these things they influence how you think".*
>
> In addition, a statement such as "*with IS Honours programme, I was aware of where I could work"* from Yale-2015-1 indicates his level of *educational experiences and exposure*. Mason-2015-2 and Maddock-2016-1 each commented on how their *personal development* contributed to their level of *educational experiences and exposure*, that *"some of the skills were developed by learning on my own"* (Mason-2015-2), and *"I had to grow my own competencies to ensure I am successful during the Honours year* (Maddock-2016-1).

In conclusion, these findings agree with the suggestion that the HEIs "*should consider learner profiles in the development of teaching and learning in order to optimise the fit between the individual learner and the [learning] environment so that student success is supported*" (Botha & Coetzee, 2016, p. 247). The findings on student characteristics support the presage variable in Biggs' (1993) widely cited 3P model (presage–process–product model) of learning. According to Biggs' 3P model, *"the ways students go about a learning task (process variable) depend on characteristics of the individual students and of the learning environment (presage variables). Their approach to learning, in turn, affects the learning outcome (product variable)*" (Yuen-Yee & Watkins, 1994, p. 233). Also, Corso, Bundick, Quaglia and Haywood (2013, p. 54) indicate that "*[d]emographic and other external factors are associated with student engagement and may have some impact on classroom engagement*".

6.3.1.2. Facilitation

"*Facilitation is both a role (facilitator) and a process*" (Berta, Cranley, Dearing, Dogherty, Squires & Estabrooks, 2015, p. 1). A facilitator's characteristics such as personality, presentation/delivery style, and instructional approach contribute to whether the senior IS undergraduates will engage or not. The facilitator is key to ensuring success of classroom discussions (Ding, Kim & Orey, 2017). As a facilitator, an academic acts as a mentor,

assessment-giver, guide, and resource-provider (Moller, Prestera, Harvey, Downs-Keller & McCausland, 2002). However, facilitators are not limited to academics. Peers also act as assessment-giver and resource-provider (the senior IS undergraduates are co-producers of educational resources), while industry practitioners also play the role of resource-provider. Academics, senior IS undergraduates, and the industry practitioners act as co-producers of educational resources and are thus the stakeholders (further detail on stakeholders was provided in subsection 6.2.6). For example,

> Giselle-2015-3 commented that when she could not get support from staff, "*I had to depend on peer-to-peer tutoring. I also learnt much more from external presenters [industry practitioners]".* Also, in the course evaluation, the senior IS undergraduates indicate that "*some of the guest lecturers [industry practitioners] open up your mind to what is out there, what to expect and how to proceed further... Guest lecturers gave the most insight into graduates getting into the working world... really practical and put our coursework into a real-world perspective"* (CE-2015-2).

Facilitation effectiveness is an important factor that determines *student engagement* which talks about the degree to which the delivery style or presentation style or the instructional approach used in delivering the educational content achieves the intended outcome **(**Barrett, Chawla-Duggan, Lowe, Nikel & Ukpo, 2006; Mulder, Messmann & König, 2015). *Facilitation effectiveness* influences learning (Berta et al., 2015) and *student engagement*, as supported by the senior IS undergraduates' comments that,

> "*students will engage with a facilitator who is passionate, and adopts a good teaching technique"* (CE-2015-1).

> *"It all depends on the presenter. Everyone has their style of presentation, and people have different views on how presentations should be given. When engaging, it helps to understand many different subjects. Poor presentations from peers and industry practitioners, just like poor presentations from lecturers do not inspire me to learn"* (Seth-2016-1).

In support of the importance of *facilitation effectiveness*, O'Flaherty and Phillips (2015, p. 85) noted that "*[i]nstitutions of higher education are facing increased scrutiny to improve student learning and demonstrate programme effectiveness*". Effective facilitation demands an effective delivery or teaching method which requires "*a clear understanding of the value of presented material and associated activities, enhanced by constructive alignment with explicit learning outcomes*" (Jackson, 2013, p. 272). "*The literature tells us that one of the primary components of effective teaching is student engagement and that engagement is critical for learning*" (O'Flaherty & Phillips, 2015, p. 85).

In addition, the senior IS undergraduates' *sense of connectedness*, which is their perception of belonging and closeness with peers, facilitator, and the learning environment (Allen, Vella-Brodrick & Waters, 2017; Benjamin & Kuusisto, 2015; Dey, Lindsay & Thomson, 2017; Misra, Cheng, Genevie & Yuan, 2016; Ouyang & Scharber, 2017), is an important concept in achieving individual and collective *student engagement*. The *sense of connectedness* enhances *student engagement*; as supported by these comments from the students:

> "*this course seems to be more interactive as we are always involved in discussions, forums, etc."* (CE-2016-3), and *"all of us chat in a group, the interaction is nice, and it brings us together"* (Zelda-2015-1).

The introduction of mobile technology further enhances the senior IS undergraduates' *sense of connectedness* which corroborates the findings of Park and Kim (2014) that mobile technology provides users with a more positive feeling of connectedness. However, mobile technology has both benefits and disadvantages (Kenny, 2016); can lead to social inclusion (a positive consequence) and technology dependency (a negative consequence), as supported below:

> Pr.Kyle-2015/2016-1 commented on mobile technology's social inclusion when he said, "*the positive consequences of mobile technology in the class is that the whole class is connected. Students text each other in class to share ideas. No one is left isolated"*. Dylan-2015-1 commented on mobile technology leading to social inclusion, when he said, "*mobile technology helps to get everyone on board to know what's more important"*.

The usage of mobile technology in their programme also led to technology dependency, for example,

Gabriel-2015-3 said, "*I believe without mobile technology, people will struggle to get through the day*". Andrew-2015-2 commented on his dependency on technology when he said, "*If I don't have my phone, it will feel like missing out on life*". Giselle-2015-1 added that "*a lot of people are socially attached to their phones,… some people even stop going out, but sit and chat".*

Zelda-2015-1 explicitly said that they are all dependent on technology:

"with my mobile technology, I can basically do everything… I'm used to it every day. Technology is my life; it has become a part of me… I think they have taught us a lot that if you are an IS student; technology is the deal, we are even required to bring all these devices into our lectures, so that is while I say technology is our second nature".

6.3.1.3. Characteristics of Information Systems Contents

Information Systems contents (*IS contents*) refer to the educational activities and resources (Brahim, Khribi & Jemni, 2017; Piotrowski, 2017) shared within the senior IS undergraduates' learning environment. A key motivating factor for *student engagement* is content *relevance*. *IS contents* shared within their programme need to be perceived as relevant by the senior IS undergraduates. *IS contents relevance* is essential because,

as soon as they enrol in the IS Honours programme, the first question they try to answer is "*what is in this Honours programme for me?"* (Memo: IS content). They are interested in knowing the *relevance* of the IS Honours programme to them, and when they perceive the *IS contents' relevance*, they tend to engage immediately.

Drake-2016-1 spoke about the *relevance* of the Honours *IS contents* when he said, *"in IS Honours, you get exposure to a lot of people from the industry when they come to lecture… You get to know what is really happening"*. Owen-2016-1 also commented that the practical *relevance* of the Honours *IS contents* is his driving force. He said, "*my*

> *driving force is graduating knowing that what I am learning is practical outside. Knowing that when I step out, a lot of what I have learnt in class will become useful".*

When the senior IS undergraduates indicate that some educational activities such as Global Citizenship, and Student Development office, contribute the least to their IS competencies, they imply that *"the skills required for these activities are not suitable for the competencies I want to acquire for my life* (Maddock-2016-1). Caleb-2016-1 added that "*I felt these activities were not as related to what I am studying as others"*.

The following memo further explains the *relevance* of the Honours' *IS contents* to the senior IS undergraduates:

> *"The Honours programme has something that each senior Information Systems undergraduate values, something of interest, and the senior Information Systems undergraduates have the opportunity to build on whatever they acquire. The senior Information Systems undergraduates do not all develop the same skill at the same level. But each majored in what is relevant to them"* (Memo – Relevance of IS content).

This finding further supports that today's educational content must meet students' needs (Soule & Warrick, 2015). Cardullo, Wilson, and Zygouris-Coe (2017) also indicate that the 21st century's education must be active, engaging, and customised to fit the individual student's needs. Thus, relevance is:

> "*important for fostering student engagement and motivation… Relevance is important for both maintaining and increasing student motivation and learning as it increases the individual student's intrinsic interest which, in turn, motivates the individual towards more meaningful learning*" (Dulfer et al., 2017, p. 5).

Further details on *IS contents* *relevance* and its additional characteristics are presented in subsections 6.3.1.3.1 - 6.3.1.3.3 and are organised as follows:

- Subsection 6.3.1.3.1 presents the two categories of relevance; *personal relevance* and *life relevance*.

- Subsection 6.3.1.3.2 highlights three forms of *personal* and *life relevance* of *IS contents*.
- Subsection 6.3.1.3.3 presents *diversity* and *dynamism* as crucial characteristics of *IS contents*.

6.3.1.3.1. Relevance and additional characteristics of Information Systems content

Generally, *relevance* can be categorised into *personal relevance* and *life relevance* (Dobrow, Miller, Frank & Brown, 2017).

Personal relevance refers to learning experiences that are directly applicable to the students (Anderson, 2016; Chen, 2014). The senior IS undergraduates are interested in *IS contents* that have *personal relevance*; content that is directly applicable to them. For example,

> Tyler-2015-2 spoke about his goal and that content must have *personal relevance*, he said, *"I also feel that your job is your life, it requires you to do something that has internal meaning to you […] so that you can find happiness in the job"*. Another student added that the positive aspect of the IS Honours programme is "*meeting guest lecturers [industry practitioners] and having time to exchange contact details and hear more about the work they do in relation to our course and fields which we would like to work in"* (CE-2015-1).

Jung (2017, p. 304) defined *personal relevance* as "*a mental process stimulated by external sources in which people evaluate how much the source is self-related or how much it allows them to fulfil their needs, goals, and values*". Jung (2017) further indicated that *personal relevance* has two sources, namely situational and intrinsic sources. Situational source is based on the physical and sociological environments, and intrinsic source is based on personal experience and knowledge (Jung, 2017).

Life relevance refers to learning experiences that are connected in some ways to the real world**.** The IS Honours programme provided the senior IS undergraduates with *life relevant IS contents*. For instance,

> One commented in the course evaluation that "*this course really encourages you to engage and learn about the real-world applications of the various topics that we cover. It is great that it is not just theory based"* (CE-2016-3). They also believe that "*this course has allowed me to learn beyond the educational aspect. I have acquired knowledge that will equip me with life experience as well as skills that will allow me to grow when I enter the working industry"* (CE-2015-2).

The idea of *life relevance* learning is that knowledge and skills are learnt in contexts that reflect how they will be useful in real life. *Life relevance* is the connection between the students' learning experiences and real-world issues, problems, and contexts (Dobrow et al., 2017). Neumann, Hood and Neumann (2013, p. 65) found *life relevance* to be "*consistent with the notion that research experiences should be authentic and grounded in context*". Thus, senior IS undergraduates' learning activities should match as nearly as possible the IS professionals' tasks in the real world (Herrington, Reeves & Oliver, 2014).

6.3.1.3.2. Forms of personal and life relevance of Information Systems content

Figure 25 shows three different forms of *personal* and *life relevance* of *IS contents*, namely, *relevance to identity*, *relevance to current interests*, and *relevance to future goals and aspirations*, as explained respectively below.

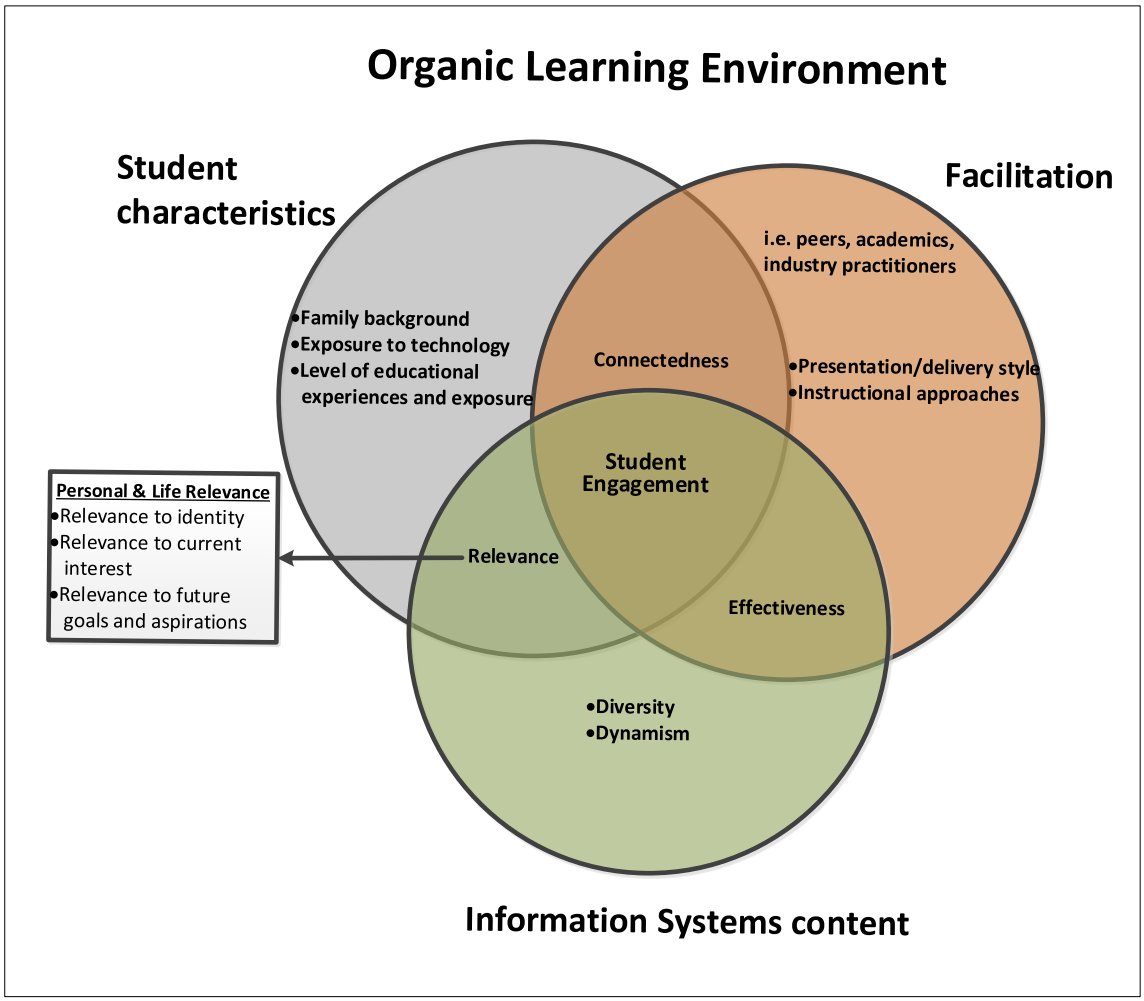


Figure 25: A Student Relevance Engagement Model.

- ***Relevance to identity***

Relevance to identity refers to the students' sense of self. *Relevance to identity* talks about the degree to which the senior IS undergraduates feel the *IS contents* relate to who they are, such as the *IS contents' relevance* to the students as graduates, their race, or prior *educational experiences and exposure*. *Relevance to identity* incorporates how students perceive the content to reflect some aspect of their self-concept (Bundick et al., 2014). For instance,

Yale-2015-1 perceived the IS Honours programme as *relevant* to his *identity*: when he said, "*when I did my research, I discovered that the Honours programme is very broad and it is a good match for my passion"*. A senior IS undergraduate commented in the course evaluation that the course provided "*useful information about how to transition from varsity to working world"* (CE-2016-4). Students also added that the Industry practitioners *"gave insight on graduate prospects"* (CE-2015-1), *"which made it very relevant and easy for us to relate with"* (Giselle-2015-3).

- **Relevance to current interests**

Relevance to current interests refers to how the *IS contents* relate to the current events; it refers to the contents' applicability to the students' everyday lives (Harlen, 2017). For example,

> Andrew-2015-2 said, "*We spent a great time here exchanging thoughts and gaining insights ... so it is very transferable and relatable"*. I noted that the senior IS undergraduates engage when they discover that the *IS contents* are *relevant to their current interests*, as supported by the following quote:
>
> *"Overall, I found the guest lecturers [industry practitioners] very interesting and useful. I specifically enjoyed it if guest lecturers shared their story of how they entered the IS industry and how they coped with their jobs after university"* (CE-2016-3). *"I got the chance to ask them if I can use their organisation for my empirical research"* (CE-2016-3).

Although *current interests* are situational, transitory and unstable (Hidi & Renninger, 2006), the educational content linked to the experiences and ideas which students could relate to, promote greater *student engagement* (Corso et al., 2013; Shernoff, Csikszentmihalyi, Schneider & Shernoff, 2014). Situational interest refers to a short-term interest that is linked or triggered in a particular moment or situation by the environmental factor(s), which may or may not last over time (Hidi & Renninger, 2006; Palmer, Dixon & Archer, 2016). *Current interests*, which are situational, can evolve into individual interests if it aligns with developing self-identity (Bundick et al., 2014). Individual interests are specific to individuals (Renninger, Hidi, Krapp & Renninger, 2014) and refer to "*a person's relatively enduring predisposition to re-engage*

particular content over time as well as to the immediate psychological state when this predisposition has been activated" (Hidi & Renninger, 2006, p. 113).

- **Relevance to future goals and aspirations**

Relevance to future goals and aspirations refers to the connection between the *IS contents* and the student's *future goals and aspirations*. This form of *relevance* is based on the notion that even when the *IS contents* are not currently interesting to the senior IS undergraduates, they can still engage because of the perceived future value.

> In the course evaluation, they indicated their interest in the *IS contents*, which are *relevant to their future goals and aspirations* as follows:
>
> *"Guest Lecturer on security and innovation, I found them insightful and I learnt a lot. The two were interesting to me because I want to work with the two topics in the future, and during the lectures, I got to ask and find out more on the subjects"* (CE-2015-1).
>
> *"The opportunity to meet with Guest Lecturers provided me with the chance to find out more about certain industries in terms of how academic and actual work is done, which opened my mind more to the possibilities or what awaits me"* (CE-2016-4). *"[The course gave] an insightful view of the world we are about to embark on"* (CE-2016-4).
>
> In addition, Connor-2016-1 commented:
>
> *"… I am trying to understand the impact this course will bring to what I am planning to do in the future […]. My main achievement, which I think, if I can understand how what I am doing now, will contribute to the success of what I want to do. […] being able to reflect on what I did […], how it will drive some of the things I want to achieve in life, that is, how IS will fit into my future aspirations".*

An important concept that enhances the *relevance* of the *IS contents* is *practicalisation of theoretical knowledge*. Real life application is especially important for students who are *inexperienced* or lack *relevant experience* or have *limited experience* or *limited educational*

exposure (Neumann et al., 2013). The relevance of the *IS contents* is enhanced when students can practicalise their theoretical knowledge. For example,

> The senior IS undergraduates commented in the course evaluation that when the practical application was missing, they were not motivated to engage. One student said, "*The worst guest lecturers talk too much about their industry and not about what is generally applicable"* (CE-2016-3). Another student added that *"some of the guest lecturers did not provide information that we can relate to. Their presentation outline should entail information that can help us through the transitioning to the working world* (CE-2015-2).

This finding indicates that when the practical application is missing, *student engagement* would be affected, and senior IS undergraduates may perceive the *IS contents* to be irrelevant. For instance,

> one student gave her evaluation of who the best industry practitioner was based on the practical application of the educational content that was presented, and said, "*the best lecturer was the […] who presented in our last lecture. She was really practical and put our coursework into a real-world perspective*" (CE-2015-2).
>
> They are more interested in engaging with the *IS contents* presented by the industry practitioners working in their potential fields. For example,
>
> Bryce-2015-1 said, "*the best thing I got out of guest lectures was that from a person in the field I would like to be to show what it really takes to be a Developer. It best focuses my efforts on the skills I need most"*.

These three forms of *IS contents relevance:* (*relevance to identity*, *relevance to current interests*, and *relevance to future goals and aspirations*) align with Corso et al.'s (2013) three types of Class content relevance, Bundick et al.'s (2014) Student-Content relevance and Barrett et al.'s (2006) Instructional Core model. According to Barrett et al. (2006, p.4), relevance "*includes relevance to context, relevance to the present and future needs of learners and relevance to humanity*". These three forms of *IS contents relevance* support the expectancy-value theory proposed by Eccles et al. (1983), which says that students' achievement is

determined by their expectancies for success and subjective task values. The subjective task values have four domains: interest value, attainment value, utility value, and cost (Dever, 2016).

> "*Interest value is defined as the student's level of intrinsic interest or liking of the task. Attainment value is the importance that the student places on the academic task or domain personally and is tied to personal identity. Utility value includes the student's perceptions of how useful what he or she learns in school is to one's personal goals or future plans outside of school. Finally, cost assesses the extent to which the student believes he or she needs to sacrifice or endure anxiety, social consequences, and so on to do well academically*" (Dever, 2016, p. 419).

In summary, the senior IS undergraduates became effectively engaged when they perceived that the *IS contents* shared within the *organic learning environment* are relevant to their *identity*, *current interests*, or their *future goals and aspirations*. This finding agrees with Bundick et al. (2014) that addressing *student engagement* at the institution level will only provide a surface-level perspective; still, the real *student engagement* is at the classroom level. I will recommend that academics ask authentic questions to know the students' educational experiences and exposure, values, passion, traits, skills, goals, interests, and fears. This knowledge can assist in contextualising educational content and instructional style that would motivate *student engagement*.

6.3.1.3.3. Characteristics of IS contents: diversity and dynamism

Diversity and *dynamism* are crucial in engaging students in the *IS contents*, as explained below:

Diversity: The senior IS undergraduates comment largely on the *diversity* of the *IS contents* because the IS Honours programme provides them with a wide variety of educational resources and experiences as can be seen in the following quotes.

> Owen-2016-1 said, *"I really enjoy it, it is so diverse, it is not just going to class, come for a test like my undergrad was…more like six different things that open your mind in different ways"*.

This was further emphasised in the course evaluation:

"*vast exposure to different concepts and technologies. This course really broadens your mind in the field of Information Technology* (CE-2016-3). In addition, "*the course provided insight on different aspects rather than focusing solely on the course content, we also learnt other topics from our Community Involvement Programme experience and GC [Global Citizenship]"* (CE-2016-3).

"more and more I see the senior Information Systems undergraduates commenting on the educational content of the IS Honours' program that it is bringing out the best in them. I think the Honours' curriculum is holistic; it is so diverse, it has something that each student value, something of interest, and the students have the opportunity to expand on it" (Memo – IS content diversity).

Dynamism: The senior IS undergraduates' (*IS contents*) is dynamic, as supported below:

"The course content changes every year to allow for meeting up with the advancement in technology and industry requirements" (Memo – IS content dynamism). For example, one of the senior IS undergraduates commented on the topics of discussion during the seminars that,

"*the topics were relevant to industry concerns, which was interesting, and many focal topics are reflected in that of real-time industry shifts"* (CE-2016-4). Also, Pr.Kyle-2015/2016-3 indicated that the students were given different topics each year. When Pr.Kyle-2015/2016-3 was asked to explain what informs the yearly changes in the topics, he said, "*it is based on a combination of what academics say are top IS management and technology concerns, AND what industry such as Gartner, IBM and Accenture say are top issues"*.

6.3.1.4. Levels of Student engagement

Three different but interrelated levels of *student engagement* emerged: *behavioural engagement*, *emotional engagement*, and *intellectual engagement*, with *behavioural engagement* being the lowest level and *intellectual engagement*, the highest. Different names

such as behavioural/social/participatory, emotional/affective, and cognitive/intellectual engagement, etc. have been used to represent *student engagement* in the extant literature (Bundick et al., 2014; Fredricks, Filsecker & Lawson, 2016; Fredricks & McColskey, 2012), the most prevalent being *behavioural*, *emotional* and cognitive engagement (Fredricks et al., 2016; Fredricks & McColskey, 2012). *Intellectual engagement* is used in this thesis instead of cognitive engagement because none of the senior IS undergraduates specifically mentioned cognitive engagement, and *intellectual engagement* emerged from the in vivo coding. The three levels of *student engagement* are elaborated on in subsections 6.3.1.4.1 – 6.3.1.4.3 as follows:

6.3.1.4.1. Behavioural Engagement

Behavioural engagement is characterised by the willingness to be punctual to the learning environment, and "*has been defined in terms of participation, effort, attention, persistence, positive conduct, and the absence of disruptive behaviour*" (Fredricks et al., 2016, p. 2). A student who behaviourally engages will willingly embrace the culture and adhere to the learning environment's norms. For example,

> Natalie-2015-2 said, "*you have to learn the culture; you have to know how to talk to people around you"*. The students were eager to learn the culture of the learning environment and be early and punctual to the IS Honours seminar, as supported by the following memo on Behavioural engagement:
>
> *"Though it is required that the senior Information Systems undergraduates attend seminars, I can see that the students engaged behaviourally, as almost all the students arrived in the seminar room before the commencement of the seminar… I can remember they said the nature of the Information Systems Honours programme required them to engage"* (Memo: Behavioural engagement).

Behavioural engagement is motivated by the *IS contents'* perceived relevance to a *student's identity*, *sense of connectedness*, and *facilitation effectiveness*. Figure 26 is a diagrammatical representation of how these concepts that motivate *behavioural engagement* are related, illustrated as Proposition 1a as follows:

Proposition 1a: The senior Information Systems undergraduates behaviourally engage when there is facilitation effectiveness, a sense of connectedness, and students perceive that the educational content shared within the organic learning environment is relevant to their identity.

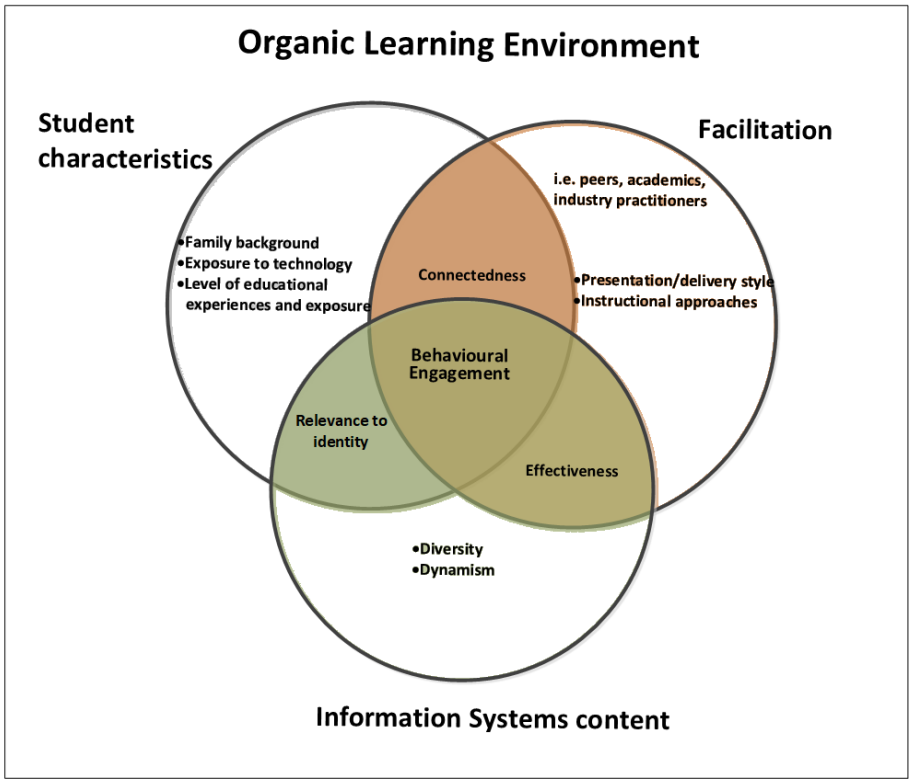


Figure 26: Behavioural Engagement.

This view of the educational content's perceived relevance to a *student identity* supports the theory of self-concordance proposed by Sheldon and Elliot (1999), which is influenced by the earlier work on self-determination theory proposed by Deci and Ryan (1985). The self-concordance theory is the degree to which a task expresses an individual's interests and values (Yaacob, Sarkam & Othman, 2017). Self-determination theory is a "*theoretical approach to understanding an individual's motivation, personality development and behavioural self-regulation through the way in which new information is internalised or integrated into an individual's sense of self*" (Dulfer et al., 2017, p. 4). According to self-determination theory, one major factor that could explain why students are often poorly motivated and poorly

engaged is when they do not feel the educational activities/content support their need for autonomy (Assor, 2012).

The *behavioural engagement* diagram (presented in Figure 26) also aligns with the theory of integrated regulation proposed by Ryan and Deci (2009), which suggests that, "*when students' goal commitments reflect their sense of self and core values, they are more likely to behaviourally engage in these goals"* (Bundick et al., 2014, p. 16).

6.3.1.4.2. Emotional Engagement

A student who emotionally engages will show personal interest and exhibit a sense of belonging (*sense of connectedness*). "*Emotional engagement focuses on the extent of positive (and negative) reactions to teachers, classmates, academic, or school; individuals' sense of belonging; and identification with school or subject domains*" (Fredricks et al., 2016, p. 2). When there is *emotional engagement*, students care about their image. For instance,

> the senior IS undergraduates go a long way in preparing themselves (*self-development*) before the commencement of the seminar session they are required to facilitate because they know that peers are watching. Tyler-2015-2 comments that "*you know that the peers are watching, so you want to give your all, your very best…because it was very competitive, I know that we gave our all"*.
>
> The more the *IS contents* shared within the senior IS undergraduates' learning environment fit into the *students' current interest*, the more the students emotionally engage in the content. For example,
>
> Giselle-2015-2 said, *"I met my IS lecturer, who was superb. He engaged me in his personal project, he showed me his blueprint, he literally opened the world of IS to me, He exposed me to his real project - then I fell in love with IS"*.

For *emotional engagement* to occur, the senior IS undergraduates need to be given the opportunity to practice the theoretical knowledge they have acquired, to provide some insight into the real working world and bring to bear the *personal relevance* and the *life relevance* of the theoretical knowledge they have acquired, thus Proposition 1b:

Proposition 1b: The senior Information Systems undergraduates *emotionally engage* in an environment that gives them the opportunity to practice the theoretical knowledge they have acquired (an authentic learning environment).

Further, the *personal relevance* and the *life relevance* of the *IS contents*, shared within the senior IS undergraduates' learning environment, influence the *students' current interest*, which is interpreted as Proposition 1c as follows:

Proposition 1c: The senior Information Systems undergraduates emotionally engage when there is facilitation effectiveness, a sense of connectedness, and students perceive that the educational content shared within the organic learning environment is relevant to their current interests.

Figure 27 is a diagrammatical representation of how these concepts that motivate *emotional engagement* are related.

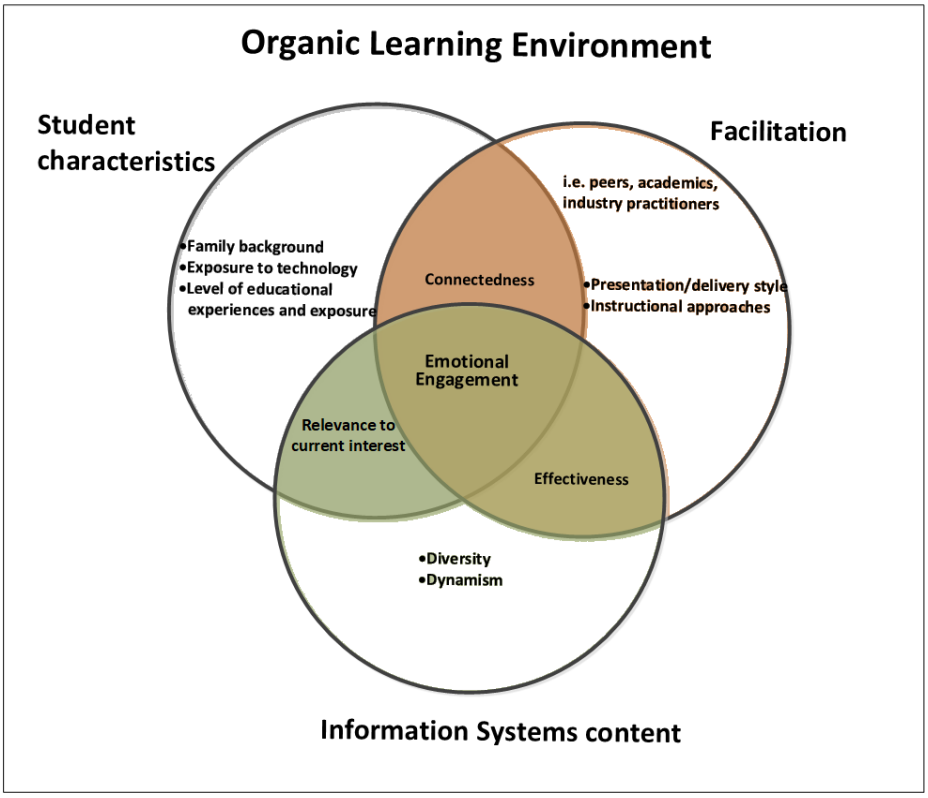


Figure 27: Emotional Engagement.

6.3.1.4.3. Intellectual Engagement

Intellectual engagement is the level where students engage in deep learning; where the senior IS undergraduates are involved in *intellectual power-sharing* and *intellectual power-tapping*. *Intellectual engagement* (or cognitive engagement) has been *"defined in terms of self-regulated learning, using deep learning strategies, and exerting the necessary effort for comprehension of complex ideas*" (Fredricks et al., 2016, p. 2). For example,

> The senior IS undergraduates worked in teams of three or four to facilitate weekly seminar sessions and worked individually to motivate discussion in the online platform, and thus intellectually engage.
>
> The more the *IS contents* shared within the learning environment fit into the senior IS undergraduates' *future goals and aspirations*, the more they intellectually engaged in the *IS content*. For example, one of the students commented in the course evaluation that, "*this particular course is the reason I know l have matured intellectually"* (CE-2015-1).
>
> The students *engage* in *intellectual power-sharing*, (for example, Zelda-2015-2 said "*the benefit of seminar discussion is learning from others"*) and *intellectual power tapping* (for example, Connor-2016-1 said, "*so we tap knowledge from one another"*). Gabriel-2015-3 also commented that the IS Honours programme is a "*good way to engage and think with your classmates".*

Figure 28 is a diagrammatical representation of how these concepts that motivate *intellectual engagement* are related, interpreted as Proposition 1d as follows:

> **Proposition 1d**: The senior Information Systems undergraduates intellectually engage when there is facilitation effectiveness, a sense of connectedness, and students perceive that the educational content shared within the organic learning environment is relevant to their future goals and aspirations.

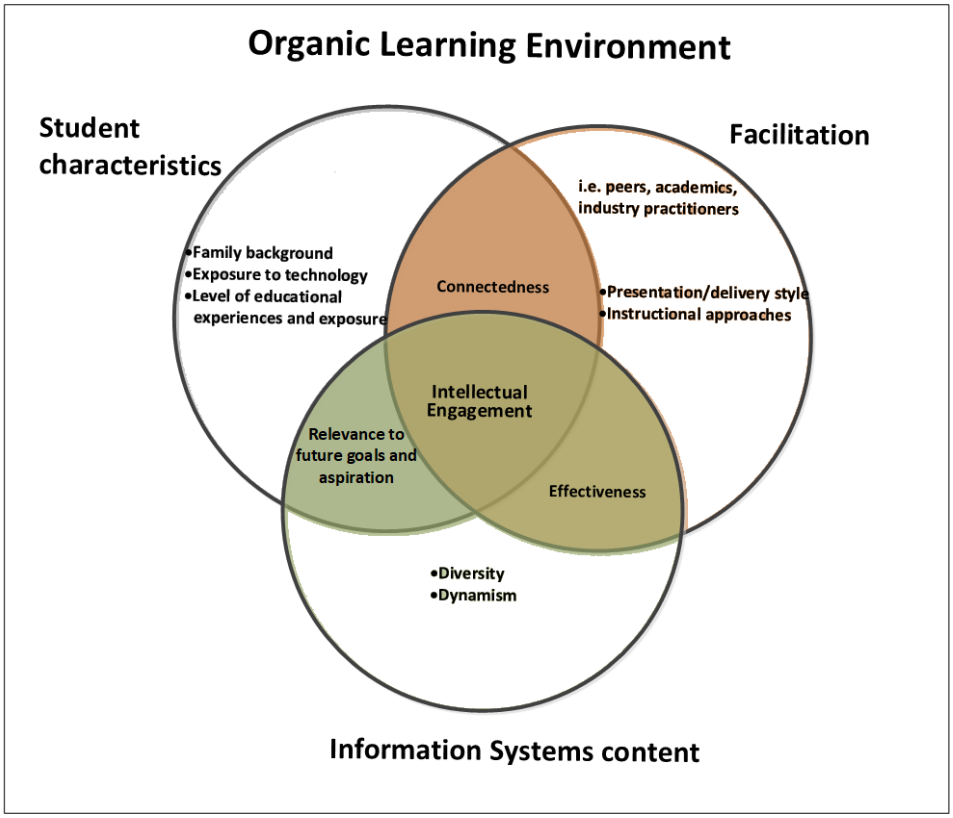


Figure 28: Intellectual Engagement.

6.3.2. Self-awareness of competency Phase

Self-awareness of competency is a process where senior IS undergraduates, through engaging with peers, academics and industry practitioners (*student engagement*), *reflective practice*, and using their theoretical knowledge, acknowledge their weaknesses and abilities (strengths). The *self-awareness of competency* phase is a phase where the senior IS undergraduates engage and reflect on their learning process, evaluate and compare their skills with the industry's expected skills, and thus experience *self-awareness of competency*.

> Their learning process results in *self-awareness of competency* and makes them aware of the skills needed in industry beyond the university walls, and motivates them to acquire them. For example,
>
> Andrew-2015-2 said I learnt "*a lot about myself and my strengths and weaknesses*". Zelda-2015-3 added that "*this course pushed me beyond my limits, and I was able to*

> *learn a lot about myself* ". Nell-2016-1 said, "*It is important to understand one's capabilities and establish common ground on what needs to be improved and how to achieve that improvement. Information Systems Honours program provides one with the excellent opportunity to experience this"*. Naomi-2015-1 said, "*we were able to practice the skills we have acquired; it gives us the ability to know where we stand. You get to discover how much you know"*.

Scholars have indicated that awareness is the first stage of reflection (Tannenbaum, Beard, McNall & Salas, 2010). It has been noted that "*a well-developed self-awareness is crucial to enable graduates to reach their full potential*" (O'Riordan & Morrison, 2017, p. 39). "*A student's self-awareness of his or her current level of information is key in that student becoming a self-regulated learner*" (Keyser, 2016, p. 76). Self-awareness involves one's ability to recognise one's strengths, weaknesses, likes and dislikes (Johnson, 2017), and is "*broadly defined as the extent to which people are consciously aware of their internal states and their interactions or relationships with others*" (Sutton, 2016, p. 646). Based on the work of Law and Watts (1977), O'Riordan and Morrison (2017, p. 45) defined self-awareness as "*the ability of learners to develop their own sense of understanding about themselves; their interests, personal characteristics, desires and needs, personality, strengths and abilities, weaknesses and limitations*".

The *self-awareness of competency* findings led to Proposition 2 as follows:

> **Proposition 2**: In an organic learning environment, the more senior Information Systems undergraduates engage with peers, academics and industry practitioners, the more they will experience self-awareness of competency (become aware of their strengths and weaknesses).

6.3.3. Self-development Phase

The Self-development phase involves activities that senior IS undergraduates personally engage with to improve their potential and facilitate their employability, which contribute to the achievement of their *current interests* and *future goals and aspiration*. As soon as they identify their strengths and weaknesses (*self-awareness of competency*), they focus their efforts on

developing (*self-development*) their area of weaknesses relevant to their *current interests*, and *future goals and aspirations*. For example,

> Silas-2015-1 said "*this course showed me areas where I lacked or needed to take time to develop on my own... I feel if I am to make an impact in the corporate world, such knowledge areas need to be improved"*.
>
> Hailey-2016-1 commented "*personal development plan has shown me the areas I can improve on and the areas that are my strong point. It has therefore helped me to improve on areas that are not my strongest*".
>
> Maddock-2016-1 explained how important self-development is in Competency Maturing; he said "*personal development has contributed the most to my IS competencies as I have realised that the only way to grow competencies is through personal development. All my skills have improved through personal development*".

This finding is therefore illustrated as Proposition 3a as follows:

> **Proposition 3a**: In an organic learning environment, self-awareness of competency would motivate students to engage more and self-develop.

The senior IS undergraduates develop their needed skills (develop their areas of weakness) through *self-tackling* or *collaborative tackling*:

Self-tackling is a practice whereby a self-motivated, self-determined senior IS undergraduate personally engages in improving on self-aware skill(s) deficiency and solving a contextually meaningful problem that matters to him/her. For example,

> Lila-2015-1 advised senior IS undergraduates who would like to *Mature Competency* "*not to be afraid to tackle the problem themselves"*. Owen-2016-1 added that we "*are not taught like the undergrad, we are told to look up for ourselves*". Bryce-2015-1 added that "*as an Information Systems student, we are being forced to do things for ourselves. We are told to go to YouTube to get the assignment done*".

Collaborative tackling is conceptualised as a practice whereby two or more students collaborate and tap intellectual power from each other (*intellectual power tapping*) to solve a contextually meaningful problem. For example,

> Tyler-2015-2 said, "*we were able to collaborate as a class*". Lila-2015-1 further advised, "*anyone who is interested in building competencies to find another person who is equally interested in the same skill and they work together*".

Collaborative tackling could be done face-2-face or enhanced by an online collaboration tool such as Google doc and could be motivated by a student (self-motivated) or driven by a facilitator. For instance,

> Dylan-2015-1 said, "*we often share our ideas on google drive, google talk, like ten people at the same time editing one document and coming up with one consolidated document*".

The fact that the senior IS undergraduates are *co-producers of educational resources* serves as a motivation for their *self-development*. For example,

> one of the students commented in the course evaluation that "*IS Honours programme challenged me and as a result made me grow as an individual"* (CE-2015-1). Tyler-2015-2 said, "*we were encouraged to research on our own, we were not spoon fed*". Keira-2015-1 explained how her participation in the forum contributed to her competencies when she said "*I set aside time each week to participate in the forum. Participating in the forum required me to understand, to criticise the discussion, and do research on the discussed subjects. This contributed to my competencies*". Mason-2015-1 commented on how he acquired additional skills; he said, "*some of the skills were developed by learning on my own. We are told to learn on our own*". Naomi-2015-1 added that "*I pushed myself in a way that no one thought I could*". One student commented on how engaging in "*the course [IS Honours programme] helped me grow as an individual by not only forcing me to do IT-related activities but also non-IT related ones"* (CE-2016-4).

These findings corroborate with Kumar (2012, p. 1) that says:

> *"[s]elf-awareness is a dynamic learning journey as Self develops, values, aspirations and circumstances change... for each student the journey will also have deviations, revised and re-visited learning outcomes*".

The findings led to Proposition 3b as follows:

> **Proposition 3b**: In an organic learning environment, student engagement with peers, academics and industry practitioners would lead to self-awareness of competency, then motivate self-development and more engagement.

The next subsection is focused on explaining *learning by doing* and *spontaneous learning*.

6.4. Learning by doing and spontaneous learning

Competency Maturing phases rely on the senior IS undergraduates' ability to engage in *learning by doing* and *spontaneous learning* within an *organic learning environment*. Subsections 6.4.1 and 6.4.2 provide further explanation on *learning by doing* and *spontaneous learning* respectively.

6.4.1. Learning by doing

Learning by doing is simply "*learning from doing, learning from experience*" (Luo, Ding & Wu, 2015, p. 148), a process whereby performance increases with *experience* (Dosi, Grazzi & Mathew, 2017). For example,

> In an attempt to solve a real-life problem, the senior IS undergraduates learn and acquire knowledge through several IS educational activities. The students engage in educational activities such as:
>
> - Conducting Empirical Research (ER).
> - Presenting and discussing current issues in seminars.
> - Designing a solution to a real-life problem.
> - Providing peer-review formative feedback on deliverables.
> - Engaging in a community outreach project.

- Being active in online class forums.
- Submitting reflection pieces.
- Engaging with industry practitioners (through seminar, SD, *Community Involvement Programme* and ER), peers, academic, and junior IS undergraduates (through tutoring).

The IS Honours programme follows a process of *learning by doing*; a learning curve for the students (Dean-2016-1, Michael-2015-1, Vanessa-2016-1). For example,

> In the course evaluation, one student indicated that "*it was a learning curve experience while participating in the course. In terms of experiencing growth required personally and gaining insight as to what is expected in the industry, this course has been extremely beneficial to me"* (CE-2015-1). Another student added that "*[a]s much as I hated it at the time, doing the Literature Review and presentation really taught me a lot. It was also very interesting to see how everyone else did and learned as we all went along"* (CE-2016-3). Scott-Seminar reflection-2 commented, "*I did substantial research on the seminar topic in order to present the seminar to the class"*. Silas-2015-1 also spoke about what was learnt through tutoring junior IS undergraduates that, *"tutoring gave us the opportunity to engage with content in a manner that differs to what we have done previously…because when you're advising a student, he/she will ask all kinds of questions*". Maddock-2016-1 added that "*by reviewing my peers' deliverables, it improved my IS competencies as I could reflect on errors my peers made and ensure I don't make such mistakes"*.

The idea of *learning by doing* has been used in various studies to explain emerging market and capability upgrading (Rui et al., 2016), firm behaviour (Tsang, 2002), and production efficiency (Ohno, 1998). *Learning by doing* was expounded by Dewey (1938) who claims education is life, growth, reconstruction of experiences, and human interaction with its environment (Luo et al., 2015). "*The more experience[d] individuals ..., the more it is assumed they have learned*" (Rui et al., 2016, p. 688). Central to *learning by doing* is the value of the action while learning, and that learning should be practical and relevant (Dewey, 1938; Lai, Yang, Chen, Ho & Chan, 2007). *Learning by doing* focuses on the cumulative experience of

doing, or engaging in the same educational activities and the subsequent performance (Rui, Cuervo-Cazurra & Un, 2016). *Learning by doing* emphasises the importance of practice in knowledge acquisition and has been considered "*the most effective way to learn*" (Lombardi, 2007, p. 2), and supports the principles of Instructional Core that says, *"[w]hat predicts performance is what students are actually doing"* (City, Elmore, Fiarman & Teitel, 2009, p. 30) and that,

> *"We learn to do the work by doing the work, not by telling other people to do the work, not by having done the work at some time in the past, and not by hiring experts who can act as proxies for our knowledge about how to do the work"* (City et al., 2009, p. 33).

6.4.2. Spontaneous learning

Spontaneous learning is the gradual or sudden process of discovering, developing or acquiring skills or knowledge or experience through normal, natural, or "*everyday experiences generally without prior planning*" (Cua, Stein & Perez-Pido, 2014, p. 343). *Spontaneous learning* is grounded in everyday activities and could occur when students interact with themselves, their learning environment or community (Cua et al., 2014; Steffe & Thompson, 2000).

> The senior IS undergraduates work in teams of three or four to facilitate weekly seminar sessions and individually to motivate discussion in the online platform and generally the feeling is "*this particular course is the reason I know l have matured intellectually"* (CE-2015-1) and that "*the benefit of seminar discussion is learning from others"* (Zelda-2015-2). Keira-2015-3 said "*reviewing my peers' work helped me gain new knowledge from their work"*. Connor-2016-1 said "*the online learning management system is useful… If someone finds something online which is interesting, people will just post and we discuss"*.
>
> When the senior IS undergraduates have the opportunity to function as co-producers of educational resources, they were motivated to engage more in *IS contents*, take ownership of, feel more committed and responsible for their learning. For example, Tyler-2015-2 spoke about how the challenges they encountered in his Systems

Development group made him change roles and assisted him to Mature Competency, he said,

> *"I was at the beginning the "lead developer", my role changed to "lead developer with interfacing with the organisation" when the person responsible for the role of "lead developer with interfacing with the organisation" dropped out from the program, and I finally became the "team lead" when our "team lead" had an accident".*

Zelda-2015-3 also commented on what she learnt through her engagement in Community Involvement Programme, she said, "*I learnt responsibility through engaging in the Community Programme ... I was responsible for someone else, so it taught me to love, care and be patient… I learnt leadership through tutoring, and I learnt to lead and be responsible for other people".*

The organic "*learning environments are the starting points for thinking about students' spontaneous activity*" (Cua et al., 2014, p. 348). One of the many forms of spontaneous activity is students playing the role of facilitators (Wang & Chen, 2010), where students act as co-producer of educational resources.

The findings of *learning by doing* and *spontaneous learning* led to Proposition 4.

> **Proposition 4**: In an organic learning environment, learning by doing and spontaneous learning will support the competency maturing process (student engagement, self-awareness of competency, and self-development).

The next subsection looks at the resultant effects of the senior IS undergraduates going through the *Competency Maturing* process.

6.5. The resultant effects of going through the Competency Maturing process

All the participants (senior IS undergraduates) commented on the positive benefits or values of engaging in the Honours programme. The resultant effects of them going through the Competency Maturing process include *improving skills and knowledge* and *acquiring skills and experiences* that have *personal* and *life relevance*, which leads to *confidence building* and a *sense of fulfilment*. These resultant effects are illustrated below:

- **Improving skills and knowledge:**

One of the resultant effects of the senior IS undergraduates going through the *Competency Maturing* process is *improving skills and knowledge*. For example, one of them said, "*I had a high-level understanding of the technologies covered in the course, but after each seminar, my understanding deepened, and I can now say that I understand the topics much better"* (CE-2015-1). Noel-2015-2 added that "*the [Honours] programme pushes you as a student and tests your ability. If taken seriously, there is a lot of room to grow as an individual, as you can continuously test and improve your personal capacities*".

Bryce-2015-4 mentioned *improving skills and knowledge* as the value of the programme, when he said, *"the value of the Honours programme is that it gives you a more realistic view of how things should be. [Honours' programme] adds to your ability to take things in and critically evaluate your situation and come up with more logical, critical solutions to it*". Dominic-2015-2 said the programme *"helps you work under pressure and develops many of your skills which undergraduate courses do not do… it helps you to be a better employer or business owner in the real world*".

- **Acquiring skills and experiences:**

The Competency Maturing process also results in the senior IS undergraduates *acquiring skills and experiences*. For example, Andrew-2015-2 said that their programme *"gives students an opportunity to merge their academic theory and the industry experience"*. One student also

commented in the course evaluation that, "*students gain a lot of knowledge regarding IT, and managing IT and business in the industry"* (CE-2016-4).

- **Confidence building:**

The senior IS undergraduate programme also assists the students to *build confidence*. For example, Silas-2015-1 said *"peer presentations gave me a taste as to what it means to present a topic in a manner that is supposed to be meaningful for the class. Personally, I usually avoid such situations, but when put in a position where I had no choice it really gave me a boost in confidence"*.

Tyler-2015-2 commented on the benefits of the programme when he said, "*because of the knowledge I have acquired, the programme is definitely confidence building. You understand the level where you are. It has made me more competent"*. He also said the Honours programme *"is a program, which teaches one to be environmentally aware, builds confidence* (Tyler-2015-4). One student commented in their course evaluation that *"the course taught me many things I never thought I would be capable of* (CE-2016-3).

- **Sense of fulfilment:**

In addition to *improving skills and knowledge*, *acquiring skills and experiences* and *confidence building*, the *Competency Maturing* process results in the *sense of fulfilment*.

> "*I can see that the senior Information Systems undergraduates have this sense of fulfilment and satisfaction"* (Memo – a sense of fulfilment). For example, Jessica-2015-1 indicated that "*most of the skills that I have gained through IS honours has helped me develop into an awesome young professional*". Maddock-2016-1 added that "*this course has been the most fulfilling in gaining IS competencies as what I've learned from the professional presentations supersede what I've ever learnt*". Naomi-2015-1 also commented on her engagement in the programme resulting in the *sense of fulfilment* when she said, "*I have gotten much more than what I expected… IS has given me more than the skill I was expecting, I have learnt additional life lesson; I have*

acquired more knowledge than my goal". Yale-2015-1 said, "*I don't see how I would have survived in the working world if I didn't pass through the Honours programme"*.

Thus, the resultant effects of the senior IS undergraduates going through the *Competency Maturing* process is interpreted as Proposition 5 as follows:

> **Proposition 5**: In an organic learning environment, where the educational content is relevant to student's identity, current interest or future goals and aspiration, students will mature their competency, improve their skills and knowledge, acquire knowledge and experiences, and experience confidence-building and a sense of fulfilment.

The next section is the theoretical integration and elaboration of a substantive theory of *Competency Maturing*.

6.6. Evaluation of a substantive theory of Competency Maturing

This thesis resulted in the development of a substantive grounded theory of Competency Maturing. In this section, I highlight the criteria for evaluating the quality of CGT. This section has two subsections: Subsection 6.6.1 presents how the substantive theory of Competency Maturing fulfilled the criteria of CGT. The final subsection, 6.6.2 presents the evaluation of a substantive theory of Competency Maturing with the exemplary quality criteria.

6.6.1. Evaluation of a substantive theory of Competency Maturing with classic grounded theory criteria

The essence of grounded theory is the conceptual idea and not the elaborate or voluminous descriptions or clever verification of findings. A grounded theory "*requires only enough evidence to establish a suggestion, to propose a theory*" (Holton, 2006, p. 225). This section presents the evaluation of a substantive theory of Competency Maturing based on the criteria for evaluating CGT I highlighted in section 3.3.

- **Fit**: this thesis rigorously followed the procedures of CGT by ensuring that all the conceptual codes and categories emerged from the empirical data rather than a preconceived idea or existing literature. The thesis adhered to the entire grounded

theory procedures, from data collection to writing up. Through the constant comparative analysis, this thesis developed a substantive theory of Competency Maturing from empirical data, which fits, works and is relevant.

- **Workability**: this thesis produced a core category, Competency Maturing, that continuously resolves the senior IS undergraduates' main concern of perceived lack of IS competency. A substantive theory of Competency Maturing accounts for most of the variations around the senior IS undergraduates' main concern and the action in their learning environment.

- **Relevance**: a substantive theory of Competency Maturing is relevant to the senior IS undergraduates' main concern, and it is grounded in empirical data. Holton and Walsh (2017) highlighted that the relevance of CGT comes not from existing literature but data, and "*[the] evaluation of grounded theory, therefore, is not based on the verification of individual hypotheses*" (Holton, 2006, p. 225). The empirical grounding of the theory of Competency Maturing in data affirms its relevance, credibility, and confirmability.

- **Modifiability**: this thesis presents a substantive theory of Competency Maturing, which could be modified to include new concepts, properties or dimensions to fit new data. A substantive theory of Competency Maturing, as it is, went through several stages of modification. Through constant comparison, as new incidents came, the incident was compared with incidents which applied to each category and the theory was modified. Thus, a substantive theory of Competency Maturing would remain relevant because, "*[n]ew concepts or properties do not render the study's theory irrelevant or obsolete; rather, the current theory is simply modified to fit the new data*" (Holton, 2006, p. 227).

In addition, a substantive theory of Competency Maturing is logical, well organised and communicated using several diagrams, and sufficiently taps into the domain of student engagement and learning environment, and is presented as a set of integrated propositions unified into a coherent theory.

6.6.2. Evaluating a substantive theory of Competency Maturing with exemplary quality criteria

This subsection presents the evaluation of a substantive theory of Competency Maturing based on the seven theory evaluation quality criteria proposed by Mueller and Urbach (2013, p. 13) as follows:

Logical consistency: "*Constructs, propositions, scope conditions, and assumptions are coherent*", and internally consistent (Mueller & Urbach, 2013, p. 13).

Based on the empirical data, this thesis offers a set of propositions, provides a precise explanation of the individual constructs that make up a substantive theory of Competency Maturing, and indicates the scope of the theory. All the constructs are internally consistent, as the data was not forced, but all the constructs earn their way into a substantive theory of Competency Maturing.

Explanatory power: "*How much does a given theory explain*", and "*specify the what, how, and why*"? (Mueller & Urbach, 2013, p. 13).

This thesis presents what was happening in the senior IS undergraduates' learning environment, and identifies the main concern of the students during their learning process as perceived lack of IS competency. A substantive theory of Competency Maturing sufficiently explains how and why the students continuously resolved their perceived lack of IS competency.

Falsifiability: "*Theory must be potentially disprovable*" and allow for empirical testing (Mueller & Urbach, 2013, p. 13).

This thesis provides a set of propositions that could be used for empirical testing of a substantive theory of Competency Maturing. Of course, a substantive theory of Competency Maturing would undoubtedly evolve as more data are added. Any grounded theory could be extended or enhanced through the theoretical sampling of additional data, which could be useful for generating other concepts, properties or dimensions that could broaden the scope of the theory.

Parsimony: "*Examines how much of a phenomenon is explained with how few variables*", and "*only include relevant information*" (Mueller & Urbach, 2013, p. 13).

Only the relevant constructs are integrated into a substantive theory of Competency Maturing. The few constructs that explain how the senior IS undergraduates resolved their perceived lack of IS competency are an organic learning environment, student engagement, self-awareness of competency, and self-development.

Nomological validity: "*Construct makes sense in the context of others relating to it*", and "*describes what we are actually interested in*" (Mueller & Urbach, 2013, p. 13).

All the constructs (organic learning environment, student engagement, self-awareness of competency, and self-development) that make up a substantive theory of Competency Maturing make sense and explain how the senior IS undergraduates resolved their perceived lack of IS competency.

Generalizability: "*Conclusions can be drawn with respect to another set of observations*", and "*only conclusions that are logically supported are drawn from the sample*" (Mueller & Urbach, 2013, p. 13).

A substantive theory of Competency Maturing emerged from logically supported data. One of the benefits of this thesis is that it combines multiple empirical data with theoretical abstraction. This single case exploratory CGTM thesis benefits from multiple data collection methods, which include direct observation, informal discussion, formal interview (face-to-face and telephonic interviews), field notes, lecture video, documentation (course evaluation, Honours Programme outline, and seminar reflection), online surveys, and when the theory was sufficiently grounded, scholarly literature was used. However, the generalizability of a substantive theory of Competency Maturing can be enhanced by obtaining further data from a different computing-related discipline and comparing findings from different institutions and countries.

Utility: "*Relevant to practitioners*", and "*unique findings*" (Mueller & Urbach, 2013, p. 13).

A substantive theory of Competency Maturing is unique and relevant to senior IS undergraduates and IS academics. The thesis makes theoretical, methodological and practical contributions as highlighted in section 8.1, contributions of the thesis to knowledge, and offers, in section 8.2, implications of the findings for senior IS undergraduates and teaching.

A substantive theory of Competency Maturing was generated from empirical data through the process of constant comparative analysis. This thesis provides a parsimonious integrated framework that depicts the relationships between the concepts that comprise the theory of Competency Maturing, which account for much of the variation in the data.

Thus, a substantive theory of Competency Maturing fulfils the criteria for evaluating CGT (fit, workability, relevance, modifiability) (Glaser, 1992; 1978; Glaser & Strauss, 1967; Holton & Walsh, 2017) and the seven theory evaluation quality criteria proposed by Mueller and Urbach (2013). A comment such as "*the models suggest an interesting theory*" by Holton (2018) further suggest the quality of a substantive theory of Competency Maturing. A substantive theory of Competency Maturing fits with what Weick (1989, p. 517) referred to as a good theory;

> "*a good theory is a plausible theory, and a theory is judged to be more plausible and of higher quality, if it is interesting rather than obvious, irrelevant or absurd, obvious in novel ways, a source of unexpected connections, high in narrative rationality, aesthetically pleasing, or correspondent with presumed realities*".

6.7. Summary

This chapter presented the thesis findings in reverse order to how the grounded theory process was applied. An overview of a substantive theory of Competency Maturing, with characteristics of an organic learning environment which supports the Competency Maturing process were presented. The chapter also explained the three phases of a substantive theory of Competency Maturing, learning by doing and spontanous learning and the resultant effect of senior IS undergraduates going through a Competency Maturing process. I share the same view with Yale-2015-2 who commented that:

> *"The knowledge in coming out of the Honours programme; it was a big jump from undergrad to Honours. I definitely think the programme should be a priority in an IS degree. This programme would give the biggest stepping stone that would make a student ready to face the working world"* (Yale-2015-2).

The propositions presented in the chapter are summarised as follows:

Proposition 1a: The senior Information Systems undergraduates behaviourally engage when there is facilitation effectiveness, a sense of connectedness, and students perceive that the educational content shared within the organic learning environment is relevant to their identity.

Proposition 1b: The senior Information Systems undergraduates emotionally engage in an environment that gives them the opportunity to practise the theoretical knowledge they have acquired (an authentic learning environment).

Proposition 1c: The senior Information Systems undergraduates emotionally engage when there is facilitation effectiveness, a sense of connectedness, and students perceive that the educational content shared within the organic learning environment is relevant to their current interests.

Proposition 1d: The senior Information Systems undergraduates intellectually engage when there is facilitation effectiveness, a sense of connectedness, and students perceive that the educational content shared within the organic learning environment is relevant to their future goals and aspirations.

Proposition 2: In an organic learning environment, the more senior Information Systems undergraduates engage with peers, academics and industry practitioners, the more they will experience self-awareness of competency (become aware of their strengths and weaknesses).

Proposition 3a: In an organic learning environment, self-awareness of competency would motivate students to engage more and self-develop.

Proposition 3b: In an organic learning environment, student engagement with peers, academics and industry practitioners would lead to self-awareness of competency, then motivate self-development and more engagement.

Proposition 4: In an organic learning environment, learning by doing and spontaneous learning will support the competency maturing process (student engagement, self-awareness of competency, and self-development).

Proposition 5: In an organic learning environment, where the educational content is relevant to a student's identity, current interest or future goals and aspirations, students will mature competency, improve their skills and knowledge, acquire knowledge and experiences, and experience confidence-building and a sense of fulfilment.

The next chapter is the theoretical integration which integrates the Competency Maturing theory with other existing theories.

7. Theoretical integration

This chapter focuses on comparing the Competency Maturing theory with other existing theories. The aim is to integrate Competency Maturing theory with other existing theories that could explain how senior IS undergraduates' perceived lack of IS Competency is resolved, and to discuss how Competency Maturing theory confirms, extends or contradicts existing theories. The hermeneutic principle (Boell & Cecez-Kecmanovic, 2014) discussed in chapter 2 was used to search the databases, IS journals, and conference proceedings previously identified in chapter 2 to identify other existing theories related to Competency Maturing theory. The following search string was used:

> **("Competency Maturing" OR Maturity OR Competenc* OR Matur*) AND (Framework OR Model OR Theor*) AND (Education OR Universi* OR Undergrad* OR Graduate* OR Train*).**

Additional competency theories, models, and frameworks relevant to IS/IT were identified through citational tracking of authors, journals, and conference proceedings. The identified theories, models, and frameworks, which are relevant in explaining the senior IS undergraduate phenomenon, are presented as follows:

I first relate the Iceberg Model of Competency to the theory of Competency Maturing. Subsequently, I present Boyatzis' intentional change theory. This is followed by a presentation of other existing theories that relate to certain concepts of the Competency Maturing theory, and the last section summarises the chapter.

7.1. The Iceberg model of Competency (Spencer and Spencer, 1993)

Since McClelland (1973) suggested testing for competence rather than testing for intelligence, and that competency is task and organisational specific, the concept of competency has continued to be a popular topic in various research fields (Luo, Shen, Lou, He & Sun, 2016). Several studies of competency have been built on the basis of the iceberg model (Spencer & Spencer 1993) in fields such as IT (Sharma, 2015), and Nursing (Supamanee, Krairiksh,

Singhakhumfu & Turale, 2011). As shown in Figure 29, the Iceberg Model of Competency by Spencer and Spencer (1993, p. 9) indicates five types of competency characteristics as motives, traits, self-concept, knowledge, and skill, and defines competency as "*an underlying characteristic of an individual that is casually related to criterion-referenced effective and/or superior performance in a job or situation*". An underlying characteristic is a fairly deep, enduring part of a person's personality that can predict behaviour in a wide variety of situations and job tasks (Spencer & Spencer, 1993). According to Spencer and Spencer (1993), motives are the things a person consistently thinks about or wants that cause action; traits are physical characteristics, and consistent responses to situations or information; self-concept represents a person's attitude, values or self-image; knowledge is the information a person has in specific content areas; and skill is the ability to perform a certain physical or mental task.

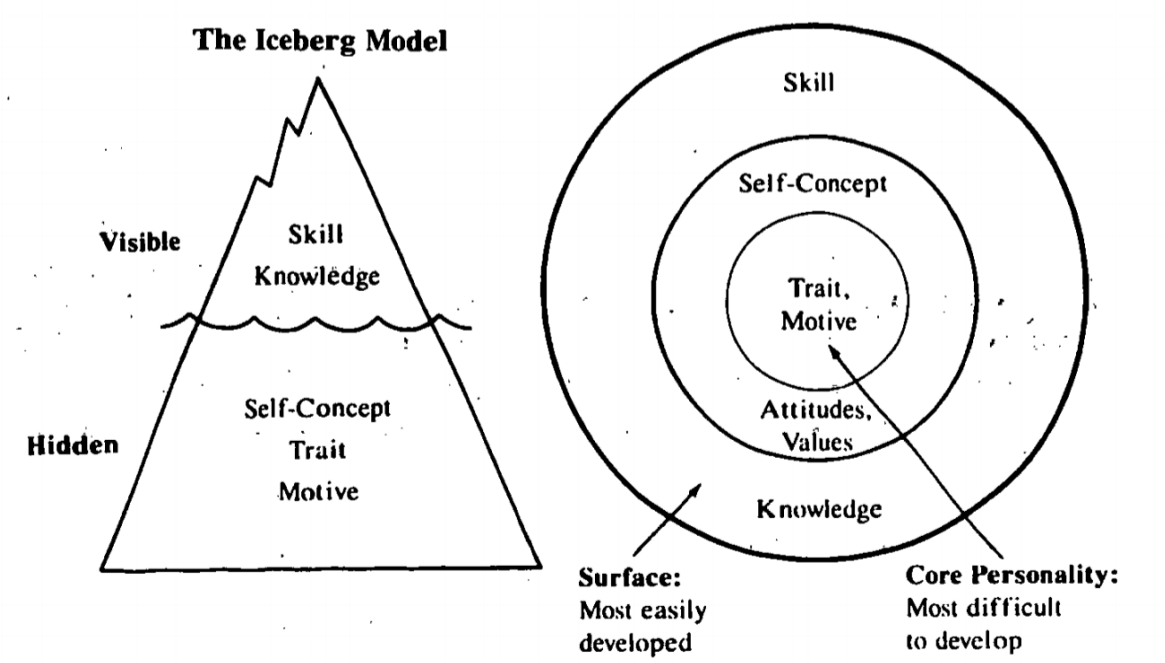


Figure 29: The Iceberg Model, adopted from Spencer and Spencer (1993, p. 11).

While knowledge and skill are visible and relatively surfaced characteristics of an individual, motives and traits are hidden, and at the base of the Iceberg Model of Competency, and self-concept lies in between the surface and the Iceberg Competency Model's base (Maurer, Wrenn,

Pierce, Tross & Collins, 2003; Salman, Ganie & Saleem, 2020; Spencer & Spencer, 1993). Knowledge and skills are easy to observe, measure and evaluate (Liao & Cho, 2019; Yu, Sheng & He, 2016). As McClelland (1973, p. 8) noted, "*[i]t is difficult, if not impossible, to find a human characteristic that cannot be modified by training or experience, whether it be an eye blink or copying Kohs' block designs*". The Iceberg Competency Model's surface characteristics can be strengthened through training and learning (Liao & Cho, 2019; Spencer & Spencer, 1993; Yu, Sheng & He, 2016). However, the hidden characteristics are difficult to develop (Liao & Cho, 2019; Spencer & Spencer, 1993; Yu, Sheng & He, 2016), and "*have a more substantive impact on how effectively an individual performs on the job*" (Vazirani, 2010, p. 122). The Iceberg Competency Model makes it "*clear that it is the values, mission, personal philosophy, knowledge, competencies, stages of life and career, interest and styles that describe the talent of a person*" (Sharma, 2015, p. 2416).

The theory of Competency Maturing supports the five types of competency characteristics of the Iceberg Model of Competency (Spencer & Spencer, 1993). The hidden characteristics of the Iceberg Competency Model relate to the student characteristics of the Competency Maturing theory that represent the values, passion, traits, goals, interests, and fears that come with the senior IS undergraduates into the learning environment. Like motives and traits at the base, self-concept in between, and knowledge and skill at the surface of the Iceberg Model of Competency, student characteristics serve as the base for student engagement, with self-awareness of Competency at the middle linking the student engagement to self-development/Competency Maturing. This eventually leads to improving skills and knowledge, and acquiring skills and experiences, and subsequently leads to further Competency Maturing. The underlying hidden characteristics of the Iceberg Model of Competency (Spencer & Spencer, 1993) also relates to the student characteristics of the Competency Maturing theory that predict whether students will engage behaviourally, emotionally or intellectually.

However, the Iceberg Competency Model does not in itself explain the Competency Maturing process; the Model is limited to highlighting the characteristics of the hidden and surface competencies, similar to the competencies listed in the MSIS2016 Model. The Iceberg Model of Competency does not explain how the hidden competencies (such as student characteristics in the theory of Competency Maturing) lead to visible competencies (improved skills and

knowledge and acquired skills and experiences), the gap which Competency Maturing theory explains. The Iceberg Competency Model does not account for the organic learning environment where knowledge is improved, and skills are acquired, and does not explain the educational content and facilitation characteristics relevant to student engagement and, subsequently, Competency Maturing. The Iceberg Model of Competency, though it has a component of self-concept, and shows that knowledge and skills can grow, does not explain that improved skills and knowledge and acquired skills and experiences result in confidence-building and a sense of fulfilment.

7.2. Intentional change theory

For many years, intentional change theory was referred to as self-directed learning (Boyatzis, 1999; Goleman, Boyatzis & McKee, 2002). Although some behavioural changes are biochemically induced (e.g. hormonal changes), most behavioural changes are self-directed; if our behaviour changes, it is usually because of our decision or choice (Boyatzis, 1999). Thus, most, if not all, sustainable behavioural changes are intentional (Boyatzis, 1999). Intentional change theory describes competency development as a non-linear process that emerges as self-awareness grows (Boyatzis, 2006). According to Boyatzis (2006, p. 609), "*When one is highly self-aware, he/she will experience the change process as more of a set of smooth transitions*".

An intentional change process begins with a person wanting to change. "*Wake-up calls, or moments and events that awaken the person to the need for consideration of a change, may be required to bring the person to the process of desired, intentional change*" (Boyatzis, 2006, p. 610). At the individual level, intentional change theory explains that desirable, sustainable change can occur when five discoveries are experienced, the change which can be in a person's actions, habits, dreams, aspirations or competencies (Boyatzis, 2006).

- (Discovery 1) Ideal Self: Who do I want to be? Ideal Self is a person's passion, purpose and core values; an image of who a person wants to be.
- (Discovery 2) Real Self: Who am I? Ideal Self leads to the awareness of Real Self. Real Self is the awareness of one's strengths and weaknesses. The areas where the Ideal Self

and Real Self are in sync or similar are considered strengths, while the areas where the Ideal Self and Real Self are different are considered gaps.

- (Discovery 3) Development of a learning agenda: Real Self leads to the third discovery, a process of building on strengths while reducing gaps.
- (Discovery 4) Experimenting and practising: experimenting with new behaviour, thoughts and feelings, and creating and building new neural pathways through practising to mastery.
- (Discovery 5) Trusting or resonant relationships: Developing supportive and trusting relationships that make change possible. Trusting or resonant relationships help, support, enable and encourage each step in the discovery process (Boyatzis, 2006; Boyatzis, Smith, Van Oosten & Woolford, 2013; Taylor, 2006; Van Oosten, 2006).

The Competency Maturing theory supports intentional change theory that the competency development process is a non-linear process that emerges as self-awareness of competency grows. In the Competency Maturing theory, self-awareness of competency is a personal acknowledgement of one's weaknesses and abilities (strengths) within an organic learning environment, leading to self-development that fosters student engagement and Competency Maturing. The intentional change theory and Competency Maturing theory can be combined to explain the three phases of Competency Maturing as thus:

> When students engage (student engagement), the discoveries of Ideal Self and Real Self (in the intentional change theory) results in the self-awareness of competency (in the Competency Maturing theory) which motivates further engagement (student engagement) and self-development (referred to as the Development of a learning agenda in the intentional change theory).

Experimenting and practising in the intentional change theory relate to the concepts of spontaneous learning and learning by doing, which supports the three phases of Competency Maturing (in the Competency Maturing theory). Again, learning by doing is "*learning from doing, learning from experience*" (Luo et al., 2015, p. 148), a process whereby performance increases with experience (Dosi et al., 2017). Furthermore, spontaneous learning has been defined as the gradual or sudden process of discovering, developing or acquiring skills or

knowledge or experience through normal, natural, or "*everyday experiences generally without prior planning*" (Cua et al., 2014, p. 343).

Trusting or resonant relationships in the intentional change theory relate to the sense of connectedness experienced, and the support (the autonomy-supportive structure) provided within an organic learning environment. The sense of connectedness (i.e. the student's perception of belonging and closeness with peers, facilitator, and the learning environment) and the autonomy-supportive structure (i.e. a learning environment where academics provide students with clear and relevant information and ways of achieving students' goals that identify, nurture and build the students' inner motivational resources) encourage each step in the Competency Maturing process.

The following statement from Boyatzis (1999, p. 17) supports the concept of IS content relevance in the Competency Maturing theory:

> "*People learn what they want to learn. Other things, even if acquired temporarily (e.g., for a test), are soon forgotten. Students, children, patients, clients, and subordinates may act as if they care about learning something, go through the motions, but they proceed to disregard it or forget it – unless it is something they want to learn and change*" (Boyatzis, 1999, p. 17).

Like the Iceberg Model of Competency, the Intentional Change Theory does not significantly explain the characteristics of an organic learning environment where knowledge is improved, and skills are acquired. The Intentional Change Theory does not account for the characteristics of the IS educational content and facilitation effectiveness relevant for student engagement and Competency Maturing. Thus, the Competency Maturing theory provides a better explanation for how senior IS undergraduates resolve their main concern of perceived lack of IS competency; how senior IS undergraduates mature competency during their learning process.

7.3. Other theories related to the Competency Maturing theory

Other existing theories that explain certain concepts in the Competency Maturing theory are briefly highlighted as follows:

7.3.1. Activity theory

Activity theory is rooted in the philosophy that learning occurs from or during activity (Fire & Casstevens, 2013) and is concerned with the changes that occur in individual consciousness, based on a strong notion of intentionality, history, mediation, collaboration and development (Nardi, 1996). The concepts of learning by doing and an authentic learning environment in the substantive theory of Competency Maturing supports activity theory. The Competency Maturing theory is aligned with the aspect of activity theory that "*deep learning occurs when students are encouraged to engage in productive learning activities*" (Stull & Mayer, 2007, p. 810). Activity theory suggests that students learn more deeply when fully engaged (Price & Harkins, 2011).

7.3.2. Deliberate practice theory

Deliberate practice theory refers to goal-directed activities that do not lead to immediate personal, social or financial rewards, but require cognitive or physical effort, which is explicitly done to improve performance (Baker & Young, 2014; Ericsson et al., 1993; Hyllegard & Bories, 2009; Ullen, Hambrick & Mosing, 2016). The concept of the relevance of the IS educational content to a student's future goals and aspirations in the Competency Maturing theory ties in with the notion of deliberate practice (Ericsson et al., 1993) that even when the educational content is not attractive to the students, they can still engage because of the perceived future value to them.

7.3.3. Expectancy-value theory

This thesis proposes that in an organic learning environment, where the educational content is relevant to a student's identity, current interests or future goals and aspirations, students will mature their competency, improve their skills and knowledge, acquire knowledge and experiences, and experience confidence-building and a sense of fulfilment. The thesis also proposes that the senior Information Systems undergraduates behaviourally engage when there is facilitation effectiveness, a sense of connectedness, and students perceive that the educational content shared within the organic learning environment is relevant to their identity. These propositions support the notions of attainment value, interest value, and utility value in

the expectancy-value theory (Eccles et al., 1983). The notion of attainment value refers to the relevance of the IS educational content to one's identity (Magidson, Roberts, Collado-Rodriguez & Lejuez, 2014). Interest value relates to intrinsic reasons for engaging in a task because of its perceived relevance to one's current interest (Galla, Amemiya & Wang, 2018). Utility value captures more extrinsic reasons for engaging in activity because of its perceived relevance to one's future goals and aspirations (Fan, 2011; Magidson et al., 2014).

7.3.4. Situated learning theory

A substantive theory of Competency Maturing emphasises the process of developing existing skills and acquiring additional skills, knowledge, and experiences (professional skills) by engaging with multiple stakeholders (academics, peers and industry practitioners) within an organic learning environment. This view supports the situated learning theory, which is based upon communities of practice. Situated learning theory focuses on the way an individual acquires professional skills through real-world problem-solving. According to situated learning theory, learning is grounded in everyday situations and focuses on the relationship between learning and the social context in which learning occurs (Barab & Duffy, 2000; Buysse, Sparkman & Wesley, 2003; Gulikers et al., 2005).

7.3.5. Social learning theory

A substantive theory of Competency Maturing is a basic social process of learning through student engagement in an organic learning environment. The substantive theory of Competency Maturing supports Bandura's social learning theory, which suggests that learning is a cognitive process that takes place in a social context (Bandura & Walters, 1977; Crawford, 2016; Prati, 2012; Law, Chung, Leung & Wong, 2017). According to social learning theory, social experiences predict the process of learning (Prati, 2012). Social learning theory integrates behavioural and cognitive theories of learning and has been expanded as the social cognitive theory (Bandura, 1986; Prati, 2012), which "*focuses on the ways in which cognitive operations on social experiences are thought to influence behaviour*" (Prati, 2012, p. 415).

7.4. Summary

The chapter reviewed the extant literature to identify theories that can explain how senior IS undergraduates' perceived lack of IS Competency is resolved. It compared the Iceberg Model of Competency and Boyatzis' Intentional Change Theory to the Competency Maturing theory, then mentioned other theories that relate to certain concepts in the Competency Maturing theory.

The next chapter is the final chapter that highlights the thesis's contributions to theory, method and practice, and the limitations of the thesis and recommendations for future research.

8. Conclusion

The overall aim of this thesis, as presented in chapter 1, was to explain how senior IS undergraduates mature competency during their learning process. The thesis followed a CGTM approach to identify and explore the senior IS undergraduates' main concern during their learning process, and to develop a theory explaining how students continuously resolve their main concern. Data were obtained over fourteen months from two sets of senior IS undergraduates who enrolled in an IS Honours programme at a South African HEI. The single case exploratory CGTM thesis found the main concern of the senior IS undergraduates to be perceived lack of IS competency. This concern was explored, and then a substantive theory of Competency Maturing, which explains how the senior IS undergraduates continuously resolve their perceived lack of IS competency, was developed.

This final chapter has three main sections. The first presents the contributions of the thesis to knowledge, the second section covers implications of the findings for students and teaching, and the third highlights limitations of the thesis and presents recommendations for future research. The last section summarises the chapter.

8.1. Contributions of the thesis to knowledge

This section first presents the contributions of the thesis to theory, followed by its contributions to the method, to practice, and then to the IS discipline.

8.1.1. Contributions to theory

This thesis's primary contribution is a Competency Maturing theory, which explains how senior IS undergraduates continuously resolve their perceived lack of IS competency. One of the secondary contributions of the thesis is a proposed Framework for a South African senior IS undergraduate programme. The thesis offers a set of conceptual propositions developed from empirical data and a Student Relevance Engagement Model, which could be useful for future research and in designing an engaging learning environment. The thesis explains how the senior IS undergraduates Mature Competency within an organic learning environment, working closely with IS industry practitioners. The thesis's contributions centre on the role of

an organic learning environment in achieving individual and collective students' engagement and students' Maturing Competency. These contributions have been achieved by identifying and exploring the main concern of senior IS undergraduates during their learning process, and the systematic analysis of the empirical data.

The Competency Maturing theory explains the three phases of the Competency Maturing process, and the characteristics of an organic learning environment where knowledge is improved, and skills are acquired. It shows that improved skills and knowledge and acquired skills and experiences result in confidence-building and a sense of fulfilment. The Competency Maturing process begins with the student engagement phase, moves to the self-awareness of competency phase, then to the self-development phase, and back to student engagement. Furthermore, the substantive theory of Competency Maturing accounts for the educational content and facilitation characteristics relevant to student engagement and subsequently, Competency Maturing. The thesis explains the three different but interrelated student engagement levels (behavioural, emotional and intellectual engagement).

The Competency Maturing theory supports the five types of competency characteristics of the Iceberg Model of Competency, namely, motives, traits, self-concept, knowledge, and skills (Spencer & Spencer, 1993). The Competency Maturing theory is in line with the intentional change theory that at the individual level, desirable, and sustainable change can occur over five discoveries: Ideal Self, Real Self, Development of a learning agenda, Experimenting and practicing, and Trusting or resonant relationships (Boyatzis, 2006; Boyatzis, Smith, Van Oosten & Woolford, 2013; Taylor, 2006).

The substantive theory of Competency Maturing extends self-awareness theory beyond its traditional focus on self to acknowledging ones' competencies (self-awareness of competency). This thesis also broadens the concept of an organic knowledge-building model (Moller et al., 2002) beyond how students naturally learn to how students Mature Competency within an organic learning environment. The finding also extends student engagement theory beyond the issue of students dropping out of the academic programme or being disengaged (Shernoff et al., 2016; Dulfer et al., 2017) to student Maturing Competency. The thesis's finding alludes to the notion that student engagement is relevant for all students (Christenson et al., 2012). The

concept of student's characteristics that emerged in this thesis supports the presage variable in Biggs' (1993) 3P model of learning. The three different forms of educational content relevance (relevance to identity, relevance to current interest, and relevance to future goals and aspirations) found in this thesis align with Bundick et al.'s (2014) Student-Content relevance and Barrett et al.'s (2006) Instructional Core model.

While the Instructional Core model and Student Engagement Core model guide us toward the elements of the classroom framework and student engagement, these models failed to account for the students' interaction with each other and with industry practitioners, and the support students receive from peers (Bundick et al., 2014; City et al., 2009). The Student Relevance Engagement Model developed in this thesis fills these gaps by explaining that the positive dynamic interaction of a student, facilitators (students, academics, and industry practitioners), relevant educational content, and the learning environment enhances student engagement and Competency Maturing.

The theoretical contributions of a substantive theory of Competency Maturing to the extant literature also relate to Activity theory (Price & Harkins, 2011; Stull & Mayer, 2007), Deliberate practice theory (Baker & Young, 2014; Ericsson et al., 1993; Hyllegard & Bories, 2009; Ullen, Hambrick & Mosing, 2016), Expectancy-value theory (Eccles et al., 1983), Situated learning theory (Barab & Duffy, 2000; Buysse, Sparkman & Wesley, 2003; Gulikers et al., 2005), and Social learning theory (Bandura & Walters, 1977; Crawford, 2016; Prati, 2012; Law, Chung, Leung & Wong, 2017).

8.1.2. Contributions to method

This thesis has shown that CGTM is useful for generating a substantive theory of Competency Maturing that explains how senior IS undergraduates mature competency during their learning process. The thesis made a methodological contribution by offering a step-by-step grounding process model (Figure 4), which could be useful for conducting future grounded theory studies.

8.1.3. Contributions to practice

This thesis leads to some practical contributions. It presents an in-depth exploration of students' comments about teaching and learning practice in a mainstream classroom, and how these

relate to student engagement. The findings of this thesis influenced the inclusion of Portfolio of Evidence (POE), as part of the 2017 IS Honours' deliverables in the HEI of this study, and critical reflection was added to the curriculum in 2018. Notably, this thesis elucidates the importance of student engagement in Competency Maturing and contributes to the field of student engagement. Part of the findings of this thesis is that students can Mature Competency in an organic learning environment where learning by doing and spontaneous learning co-exist, and where academics, industry practitioners and students are co-producers of educational resources.

This thesis offers a substantive theory of Competency Maturing for IS educators who wish "*to break away from traditional, teacher-centred approaches in higher education, and are willing to create learning environments where students are motivated to learn in rich, relevant and real-world contexts*" (Herrington & Herrington, 2006, p. 1). The thesis contributes to IS educational practitioners who seek to understand how the learning environment and educational content can influence and support student engagement and Competency Maturing and informs them of the role they can play in promoting individual and collective student engagement and Competency Maturing. IS educational practitioners are better informed to tailor their practice towards building an organic learning environment to ensure maximal student engagement and Competency Maturing. This thesis explains how IS educational practitioners can engage senior IS undergraduates more effectively in the IS content and the learning process to Mature their Competency, build their confidence and experience a sense of fulfilment.

In addition, this thesis provides IS academics with the understanding of the IS content and the delivery style that can provide senior IS undergraduates with both strong theoretical and practical foundations. The findings of the thesis suggest that creating an organic learning environment can be a useful approach to developing more competent IS graduates.

8.1.4. Contributions to IS Discipline

This thesis contributes to the field of IS in various ways. The participants were senior IS undergraduates, and the study was conducted within the IS department. The thesis researched the senior IS undergraduates' main concern during their learning process, and the emergent

grounded theory explains how senior IS undergraduates mature competency during their learning process. The proposed framework for the South African senior IS undergraduate programme can be used to strengthen the curriculum for those students, and bridge the academic-industry IS skills/competencies gap. The step-by-step grounding process model (Figure 4) developed will be useful for conducting future IS grounded theory studies.

8.2. Implications of the findings for students and teaching

It has been suggested that "*[w]hen we publish studies involving student subjects, we might include a section on 'implications for students and teaching' in addition to the obligatory 'implications for practice'. Such reflections would help researchers to articulate the relevance of the research study to students, as well as inform colleagues about the possible useful insights*." (Davidson, 2011, p. 135).

The findings of this thesis provide some support for a previous study suggesting that the solution to the issue of the skills gap "*require not only training and education but also experience which is hard to come by*" (Roodt & Paterson, 2009, p. 198). However, training is essential but inadequate to alleviate the skills gap (Rasool & Botha, 2011). Senior IS undergraduates need educational content that can offer academically relevant work experience. The findings imply that IS content should be created in close collaboration with industry and be relevant to the students. Based on this thesis's findings, I would advocate for senior IS undergraduate learning environments and IS contents to be organised around their identity, current interest, and future goals and aspirations. The implication of having personal or life-relevant IS educational content is that there would be a higher level of student engagement, which could, as a result, increase the number of students completing their education. Senior IS undergraduates should be allowed to act as co-producers of educational resources; this could also increase student engagement and result in deep learning and self-awareness of competency.

The implications of IS academics creating an organic learning environment for students are that they could mature their competencies with personal or life relevance. I would recommend

academics to ask students critical reflective questions in addition to subject and personal reflective questions. Pre-learning reflection should be conducted in addition to the reflection done during and after the learning experiences. Besides the theoretical knowledge, creating an organic learning environment will facilitate IS fresh graduates acquiring practical experience, experiencing a sense of fulfilment and having the confidence to face the working world and take up employment immediately after graduation. Consequently, business organisations would have more confidence in the products of the IS department/faculty and the HEIs.

8.3. Limitations of the thesis / Recommendation for further research

The purpose of this study was not to provide clever verification, or a voluminous description of the main concern of senior IS undergraduates. Rather, the purpose was to conceptualise and explain how they continuously resolve their main concern. This thesis offers an integrated framework that depicts the relationships between the concepts that comprise a substantive theory of Competency Maturing. The thesis developed a substantive theory of Competency Maturing from empirical data, which fits, works and is relevant and is easily modifiable. Just as with any grounded theory, there is no doubt that additional data would refine and modify a substantive theory of Competency Maturing.

This thesis also offers a set of conceptual propositions developed from empirical data, but further study should be done to refine and advance this substantive theory of Competency Maturing. As the empirical data used in developing this theory is limited to one homogeneous case of two sets of senior IS undergraduates enrolled in a South African HEI, I would recommend future research to obtain additional empirical data in other classroom settings, and from larger groups of students.

Future research should collect data from students (undergraduates, senior undergraduates, postgraduates, or secondary education) enrolled in computing-related degrees and other research fields, and compare results from different institutions and countries to refine, extend, and formalise the substantive theory of Competency Maturing. Further research could explore the likely applicability of the Competency Maturing theory and extend the Competency

Maturing framework developed in this thesis to the continuing acquisition of competency while on the job. Further empirical research is needed to refine the characteristics of an organic learning environment, and to examine what characteristics lead to an engaging learning environment, and foster Competency Maturing within an IS/IT/ICT organisation. Further study could also focus on the interface between using ICTs in learning and developing the knowledge, skills, and professional identity of IS/IT/ICT workers.

The fact that this thesis was carried out within the Department of IS in one of the South African HEIs should not be considered unduly limiting to the generalizability of a substantive theory of Competency Maturing. The emerged theory, a substantive theory of Competency Maturing, is relevant and useful to any IS/IT/ICT educator and practitioner who is interested in preparing students for the profession or for the working world, or is interested in designing a curriculum and learning environment for better student engagement and competency building or Competency Maturing.

8.4. Summary

This concluding chapter presented the summary of the contributions of the thesis to knowledge, including the contributions to theory, method, practice, and the IS discipline. The chapter also highlighted the implications of the findings for students and for teaching, stated the limitations of the thesis, and made recommendations for future research.

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Appendix A: Glossary of terms

Term	Definition
Authentic	An authentic learning environment is an environment that allows the senior Information Systems undergraduates to explore, discuss, and construct concepts and relationships based on real-life problems and projects that are relevant to them. An authentic learning environment is a learner-centered, realistic and effective environment (Herrington & Herrington, 2007), that "*reflects the way knowledge and skills will be used in real life*" (Gulikers et al., 2005, p. 509).
Autonomy-supportive structure	An autonomy-supportive structured environment is conceptualised as a learning environment where academics provide students with clear and relevant information and ways of achieving students' goals that identify, nurture and build the students' inner motivational resources.
Basic Social Process (BSP)	Basic Social Processes (BSPs) *"are processural or, as we say, they "process out". They have two or more clear emergent stages*" (Glaser & Holton, 2005a, pp 1-2).
Behavioural engagement	Behavioural engagement is *"defined in terms of participation, effort, attention, persistence, positive conduct, and the absence of disruptive behaviour*" (Fredricks et al., 2016, p. 2) and characterised by the willingness to be punctual for, and to embrace the culture and the norms of the learning environment.
Coding	Coding is a process of conceptualising the emerging pattern of a set of empirical data (Gibson & Hartman, 2014).

Collaborative tackling	Collaborative tackling is conceptualised as a practice whereby two or more students collaborate and tap intellectual power to solve a contextually meaningful problem.
Competency	Competency is a graduate's ability to know the core concepts of the IS discipline, how and why to apply the core concepts to complete today and tomorrow's Information Systems' tasks successfully and effectively (Arifin et al., 2017; Leidig et al., 2020; Ulrich & Dulebohn, 2015; Yang et al., 2017).
Competency Maturing	A substantive theory of Competency Maturing is a continuous process by which senior Information Systems undergraduates develop their existing competencies and acquire additional competencies that have personal or life relevance, through engaging with peers, academics, and industry practitioners, and with a wide variety of relevant Information Systems educational content shared within an organic learning environment.
Constant comparative analysis	Constant comparative analysis is a process of comparing different groups either because "*(a) they suggest the same category or (b) because a category that was developed through an analysis of the concerns of one group might be compared to how it is processed in another*" (Gibson & Hartman, 2014, p. 126).
Emotional engagement	"*Emotional engagement focuses on the extent of positive (and negative) reactions to teachers, classmates, academic, or school; individuals' sense of belonging; and identification with school or subject domains*" (Fredricks et al., 2016, p. 2).
Facilitation effectiveness	Facilitation effectiveness is the degree to which the delivery style or presentation style or the instructional approach used in

	delivering the educational content achieves the intended outcome **(**Barrett et al., 2006; Mulder et al., 2015).
Fit	Fit refers to the closeness of the grounded theory to the pattern in the data; reflecting everyday reality (Glaser, 1998; Glaser & Strauss, 1967; Holton & Walsh, 2017).
Iterative and in-class feedback	Iterative and in-class feedback is one of the effective processes of improving the quality of students' subsequent work (Dawson et al., 2018). Iterative feedback is a process of arriving at a desired, or close to the desired, result by repeating the students' deliverable assessment process (Dawson et al., 2018). In-class feedback is the feedback given to students at the same time learning occurs, enabling students to identify and correct their misconceptions (Koile & Singer, 2006).
Inclusive culture	An inclusive culture is a learning and teaching culture that enables all students, irrespective of their background or situation and nationality, to develop academically, professionally, and personally fulfil their potentials (Lawrie et al., 2017; Wray, 2013).
Information Systems content	Information Systems content refers to the educational activities involved with and the educational resources shared within the learning environment (Brahim et al., 2017; Piotrowski, 2017).
Intellectual engagement	Intellectual or cognitive engagement is *"defined in terms of self-regulated learning, using deep learning strategies, and exerting the necessary effort for comprehension of complex ideas*" (Fredricks et al., 2016, p. 2).

Intellectual power-sharing	Intellectual power-sharing is conceptualised as the students' ability to share intellectual ideas with other people, which could be peers, junior IS undergraduates, and academics.
Intellectual power tapping	Intellectual power tapping is conceptualised as the students' ability to learn from peers, academics and industry practitioners.
Learning by doing	Learning by doing is simply "*learning from doing, learning from experience*" (Luo et al., 2015, p. 148), a process whereby performance increases with experience (Dosi et al., 2017).
Life relevance	Life relevance is the connection between the students' learning experiences and real-world issues, problems, and contexts (Dobrow et al., 2017).
Memos	"*Memos are the written records of the researcher's thinking, both conscious or preconscious realizations, as the research and the researcher grow*" (Glaser, 2014, p. 3).
Modifiability	Grounded theory must be modifiable; this indicates the significance of the theory (Glaser, 1998; Holton & Walsh, 2017).
Multiple stakeholders	Three principal stakeholders identified are the academics, the senior Information Systems undergraduates, and the industry practitioners.
Open coding	Open coding implies "*coding the data everywhere possible*", begins with the process of data collection, and is driven by the emerging theory (Glaser, 1978, p. 56).
Optimal challenges	Optimal challenges refer to educational content (i.e. educational activities involved with and the educational resources shared

	within the learning environment), which challenges students intellectually.
Organic learning environment	An organic learning environment is a natural learning space that respects and responds to senior IS undergraduates' individual and collective needs (goals, values and interests), where IS educational resources are sufficiently abundant and well organised, allowing senior IS undergraduates to learn by doing and spontaneously develop and improve their competencies (skills, knowledge and acquire experiences).
Perceived lack of IS competency	Perceived lack of IS competency is the senior Information Systems undergraduates' perception of their lack of skills, knowledge, abilities, and values needed to do a particular IS task successfully (Petrova & Claxton, 2005; Shinnar et al., 2012).
Perceived value	Perceived value refers to the worth of something from one's point of view (Duncan, 2018), and includes the benefits obtained and the sacrifices expended (Liu et al., 2015).
Personal relevance	Personal relevance refers to learning experiences that are directly applicable to the students (Anderson, 2016; Chen, 2014).
Reflective practice	Reflective practice is the process through which students or professionals learn to improve their skills and acquire knowledge by examining, thinking and evaluating their actions and experiences (van Hilten, 2018).
Relevance	Relevance refers to the usefulness or practical value of the theory (Glaser, 1998; Holton & Walsh, 2017).
Relevance to current interest	Relevance to current interest refers to how the educational content relates to the current events; it refers to the applicability of the

	educational content to the students' everyday lives (Harlen, 2017).
Relevance to future goals and aspirations	Relevance to future goals and aspirations is the connection between the educational content and the students' future goals and aspirations, refers to how a task fits into an individual's (future) plans (Mahler et al., 2017).
Relevance to identity	Relevance to identity is the degree to which the students feel the educational content relates to who they are; it incorporates how students perceive the educational content to reflect some aspect of their self-concept (Bundick et al., 2014).
Selective coding	Selective coding is a "*set of categories and their properties which fit, work and relevant for integrating into a theory*" (Glaser, 1978, p. 57).
Self-awareness of competency	Self-awareness of competency is conceptualised as a phase where students, through engaging (with peers, academics and industry practitioners), reflective practice, and practicalisation of theoretical knowledge, acknowledge their weaknesses and abilities (strength).
Self-development	Self-development phase is a phase which involves activities that students personally engage with to improve their potential and facilitate their employability, which contributes to the achievement of their current interests and future goals and aspirations.
Self-tackling	Self-tackling is conceptualised as a practice whereby a self-motivated, self-determined student personally engages in improving on self-aware skill(s) deficiencies, and solving a contextually meaningful problem that matters to him/her.

Senior Information Systems undergraduates	The senior Information Systems undergraduates are students who enrol in an optional fourth-year IS undergraduate program, i.e. three years IS undergraduate program with an additional one-year qualification, which prepares them for a research-based postgraduate program. The fourth-year program otherwise referred to as an Honours program in countries such as South Africa and the United Kingdom typically follows a Bachelors program.
Sense of connectedness	A sense of connectedness is the student's perception of belonging and closeness to peers, facilitator, and the learning environment (Allen et al., 2017; Benjamin & Kuusisto, 2015; Dey et al., 2017; Misra et al., 2016; Ouyang & Scharber, 2017).
Sense of fulfilment	A sense of fulfilment is the *"result of a life dominated by the experience and realisation of personal values*" (Langle, 2003, p. 111).
Spontaneous learning	Spontaneous learning is the gradual or sudden process of discovering, developing or acquiring skills or knowledge or experience through normal, natural, or "*everyday experiences generally without prior planning*" (Cua et al., 2014, p. 343).
Student characteristics	Student characteristics represent the values, passion, traits, skills, goals, interests, fears, etc., that come with the student into the learning environment.
Student engagement	Student engagement is a multi-faceted meta-construct, comprising of student characteristics, facilitation, educational content, and their relationships.

Substantive codes	Substantive codes *"are the categories and properties of the theory that emerges from and conceptually images the substantive area being researched*" (Glaser & Holton, 2005b, p. 13).
Substantive coding	Substantive coding is the process of conceptualizing the empirical substance of the data (Holton & Walsh, 2017).
Substantive theory	A substantive theory is a theory developed from a specific research area (Glaser, 1978; Glaser & Holton, 2005a; Woods et al., 2016).
Theoretical codes	"*Theoretical codes conceptualize how the substantive codes may relate to each other*" (Glaser, 1978, p. 55).
Theoretical coding	Theoretical coding refers to the process of integrating the emerging concepts that explain the relationship between the core category and their major-related concepts or categories into a coherent grounded theory (Gibson & Hartman, 2014; Holton & Walsh, 2017)**.**
Theoretical memos	Theoretical memos are the bedrock of theory generation, the written records of theoretical thinking, conscious and preconscious ideas about the codes and their relationships as they strike the analyst while coding (Glaser, 2014; Glaser, 1978).
Theoretical memoing	Theoretical memoing is the process whereby the researcher breaks off during coding to write up his/her ideas about the data obtained (Glaser, 1978; Urquhart, 2013).
Theoretical sampling	Theoretical sampling is simply the process of collecting data for generating theory where the analyst identifies and pursues clues that arise during data collection, coding and analysis in a

	grounded theory study (Birks & Mills, 2011; Glaser & Strauss, 1967).
Theoretical saturation	Theoretical saturation is the point where additional data yields no further theoretical elaboration or specification (Glaser, 2011; Holton & Walsh, 2017).
Theoretical sorting	Theoretical sorting is the last stage in the grounded theory process where a researcher's ideas are theoretically ordered, fractured data is put back together, and memos are set up in preparation for writing up (Gibson & Hartman, 2014; Glaser, 1978; Glaser, 1998).
Validity	Validity is "*the extent to which data are plausible, credible, and trustworthy, and thus can be defended when challenged*" (Venkatesh et al., 2013, p. 34).
Workability	Workability means that the concepts and their properties relate sufficiently to hypotheses or propositions that account for how the participants' main concern is resolved (Glaser, 1998; Holton & Walsh, 2017).

Appendix B: BCS CITP assessment criteria

Assessment

The competence will be assessed against the criteria listed below:

Autonomy: it is expected that work is often self-initiated.

A1 Works under broad direction.

A2 Is fully responsible for meeting allocated technical and/or project/supervisory objectives.

A3 Establishes milestones and has a significant role in the assignment of tasks and/or responsibilities.

Influence: leadership ability to achieve successful business benefit.

B1 Influences organisation, customers, suppliers, partners and peers on the contribution of their own specialism.

B2 Builds appropriate and effective business relationships.

B3 Makes decisions that impact the success of assigned work, i.e. results, deadlines and budget.

B4 Has significant influence over the allocation and management of resources appropriate to a given assignment.

Complexity: the ability to succeed in roles that are multifaceted.

C1 Performs an extensive range and variety of complex technical and/or professional work activities.

C2 Undertakes work that requires the application of fundamental principles in a wide and often unpredictable range of contexts.

C3 Understands the relationship between their own specialism and the wider customer/organisational requirements.

Business skills: vision and appreciation of the overall context to achieve benefit from exploiting IT.

D1 Advises on the available standards, methods, tools and applications relevant to their own specialism and can make an appropriate choice from alternatives.

D2 Analyses, designs, plans, executes and evaluates work to time, cost and quality targets and takes all requirements into account when making proposals.

D3 Analyses requirements and advises on scope and options for continuous operational improvement.

D4 Assesses and evaluates risk.

D5 Demonstrates creativity, innovation and ethical thinking when applying a solution for the benefit of a customer/stakeholder.

D6 Communicates effectively, both formally and informally.

D7 Demonstrates leadership and facilitates collaboration between stakeholders who have diverse objectives.

D8 Maintains an awareness of developments in the industry; takes initiative to keep their skills up to date and mentors colleagues.

Figure 30: The British Computer Society Chartered IT Professional assessment criteria (BCS, 2021).

Appendix C: Node

Table 19: The list of Nodes Nov15-2015-1.

1 Academic
2 Accessing course information
3 Accessing information
4 Acquired skills or Knowledge
5 Acquiring Knowledge
6 Active participation
7 Active User
8 Advantage of usage
9 Affordance
10 Attention drifting
11 Attention Span
12 Awareness
13 Becoming passionate
14 Benefit Realisation
15 Building competencies
16 Captivating ability
17 Change in perception
18 Characteristics
19 Checking marks
20 Clarification
21 Collaboration
22 Collaborative learning
23 Commitment
24 Communication
25 Community service
26 Competency
27 Concern
28 Confidence
29 Connection
30 Consequences of usage
31 Continued usage
32 Convenience
33 Coping mechanism
34 Costly
35 Critical thinking
36 Deliverables
37 Dependency
38 Determination
39 Dairying
40 Disadvantage of usage
41 Discipline
42 Distraction
43 Diversity
44 Ease of use
45 Easy note taking
46 Emailing
47 Empowerment
48 Engaging
49 Entertainment
50 Environmentally friendly
51 Exclusion
52 Expectation
53 Exposure and experience
54 Facebooking
55 Family demands
56 Family Influence
57 Fear of victimisation
58 Financial Security
59 Fit
60 Focus students attention
61 Focused
62 Focused literature
63 Forced
64 Forum discussion
65 Future goals and aspiration
66 Future Security
67 Goals and aspiration
68 Group formation
69 Group project
70 Handy
71 High class
72 Honours student and mobile technology
73 Immediacy
74 Immediate access
75 Inclusion
76 Individual project
77 Individualistic
78 Industry-based research

79 Information Storage
80 Insight into the industry
81 Instruction for mobile technology usage
82 Intellectual maturity
83 Interactive learning
84 Interconnection
85 Interest and passion
86 Interesting content
87 Internet access
88 Internship
89 Involving
90 IS Discipline
91 Iterative development
92 Knowledge sharing tool
93 Learning
94 Learning by doing
95 Learning mode
96 Learning Pathways
97 Learning through challenges
98 Lecturer involvement
99 Lecturer's engaging ability
100 Lecturing challenges
101 Less advanced technology
102 Level of education and exposure
103 Limitation
104 LMS
105 Low class
106 Mentor
107 Mentoring
108 Middle class
109 Mobile technology
110 Mode of lecturing
111 Modern teaching mode
112 More information
113 Multi-learning pathways
114 Multitasking
115 Negative consequences
116 Noise
117 None pure extensive learning
118 Note taking
119 Online group project
120 Part-time jobs
121 Participation
122 Passion
123 Peer-2-peer learning
124 Perceived value
125 Personal Ambition
126 Personal Development
127 Personal device
128 Personal research
129 Personal skill
130 Personal trait
131 Physical interaction
132 Playing games
133 Positive consequences
134 Practicability of Acquired Knowledge
135 Practical application of theoretical Knowledge
136 Presentation
137 Professional mentoring
138 Professional presentations
139 Program of study
140 Psychological
141 Purpose
142 Quality
143 Real-time collaborative editing
144 Real-time voting
145 Recent articles
146 Recording
147 Reflective practice
148 Relevance to industry
149 Relevant exposure
150 Relevant information
151 Reliance
152 Requirement
153 Researching
154 Rewards
155 Role model
156 Security
157 Sharing Knowledge
158 Slide viewing
159 Socialising
160 Societal and family influence
161 Societal and modernisation conformity
162 Socioeconomic class
163 Structure

164 Student Grouping
165 Student presentations
166 Student-2-students tutoring
167 Students involvement
168 Taking note
169 Teaching and learning
170 Teaching Mode
171 Teaching techniques
172 Teamwork
173 Technology dependency
174 Technology usage
175 Time constraint
176 Topic diversity
177 Traditional teaching mode
178 Tutoring
179 Types
180 Uncontrollable
181 Uncontrollable power
182 Unintended consequences
183 Unrestricted access
184 Up to date
185 Usage
186 Virtual Collaboration
187 Visualising
188 Work exposure
189 Work shadowing
190 Workshopping

Table 20: The list of Revised Nodes Aug16-2015/2016-2.

1 Acquired skills or Knowledge
2 Acquiring additional skills
3 Active participation
4 Authenticity
5 Autonomy
6 Autonomy-supportive structure
7 Awareness of relevant skill set
8 Behavioural engagement
9 Captivating ability
10 Collaboration
11 Collaborative tackling
12 Competencies building
13 Competency maturing
14 Confidence building
15 Connectedness
16 Connection
17 Content dynamism
18 Content Diversity
19 Content Relevancy
20 Course management
21 Course structure
22 Culture
23 Curriculum
24 Curriculum structuring
25 Delivery style
26 Dependency
27 Developing existing skills
28 Developing process
29 Educational experiences and exposure
30 Educational Resources
31 Engage
32 Engagement
33 Engaging
34 Engaging in content
35 Engaging with community
36 Engaging with peers
37 Engaging with professionals
38 Emotional engagement
39 Exclusion
40 Expansion of knowledge

41 Expectation
42 Experience
43 Exposure to industry
44 Exposure to Practitioners
45 Facilitation effectiveness
46 Facilitator
47 Family Background
48 Fit
49 Future goals and aspiration
50 Future Security
51 Immediacy
52 Improve skills
53 Inclusion
54 Inclusive Culture
55 Industry awareness
56 Industry experience
57 Inexperience
58 Intellectual maturity
59 Intellectual engagement
60 Intellectual power-sharing
61 Intellectual power tapping
62 Interactive learning
63 Interconnection
64 Interest and passion
65 Internship
66 Involving
67 Iterative development
68 Knowledge sharing
69 Lack of experience
70 Lack of relevance
71 Learners as co-producers of educational resources
72 Learning by doing
73 Learning Curve
74 Learning diverse skills
75 Learning Environment
76 Learning process
77 Learning through challenges
78 Learning valuable skills
79 Lecturer involvement
80 Lecturer's engaging ability
81 Level of education and exposure
82 Life Relevance
83 LMS
84 Maximum participation
85 Negative consequences
86 Optimal challenges
87 Organic learning environment
88 Parent or Relative education
89 Parental influence
90 Part-time jobs
91 Participation
92 Passion
93 Peer evaluation
94 Peer review
95 Peer-2-peer Learning
96 Perceived value
97 Personal ability and traits
98 Personal Ambition
99 Personal experience
100 Personal Relevance
101 Positive consequences

102 Practicability of Acquired Knowledge
103 Practical application of theoretical Knowledge
104 Practical experience
105 Practical value
106 Practicalisation of theoretical knowledge
107 Present and future technology
108 Producers of educational resources
109 Professional mentoring
110 Professional presentations
111 Purpose of mobile technology usage
112 Real-world perspective
113 Reflective practice
114 Relevance
115 Relevance to Current Interest
116 Relevance to future goals and aspiration
117 Relevance to Identity
118 Relevance to industry
119 Relevancy
120 Relevant exposure
121 Relevant information
122 Relevant professional advice
123 Self-Awareness of competencies
124 Self-development
125 Self-reflection
126 Self-tackling
127 Sense of fulfilment
128 Sharing Knowledge
129 Societal and family influence
130 Socioeconomic class
131 Spontaneous activities
132 Spontaneous learning
133 Students involvement
134 Tackling
135 Teamwork
136 Technology as an enabler for engagement
137 Technology dependency
138 Technology enabled connectedness
139 Unintended consequences
140 Variety of Educational Resources
141 Variety of learning opportunity
142 Work experience
143 Work shadowing

Appendix D: Research instruments

1. What IS competencies would you say you acquired through the IS Honours program?
2. Could you please explain **how each of these activities** has contributed to your IS competencies?

- **Online discussion forum**
- **Personal development**
- **Reviewing for peer**
- **Peer presentations**
- **Seminar discussions**
- **Professional presentations** (Guest lectures)
- **Supervisor**
- **Course convenor**
- **Honours Outreach and Community Involvement Programme including school talk.**
- **Systems Development (SD) Project**
- **Student Development office**
- **Global Citizenship (GC)**
- **Empirical Research (ER)**
- **Tutoring**

3. Which of the **above activities** would you say **contributed the most** to your IS competencies? And why?
4. Which of the **above activities** would you say **contributed the least** to your IS competencies? And why?
5. What **other activities** would you say is contributing to building your IS competencies?
6. What aspect of the IS Honours program would you say is most beneficial to you and why?
7. In your view, what would you say is the value of the IS Honours program and why?

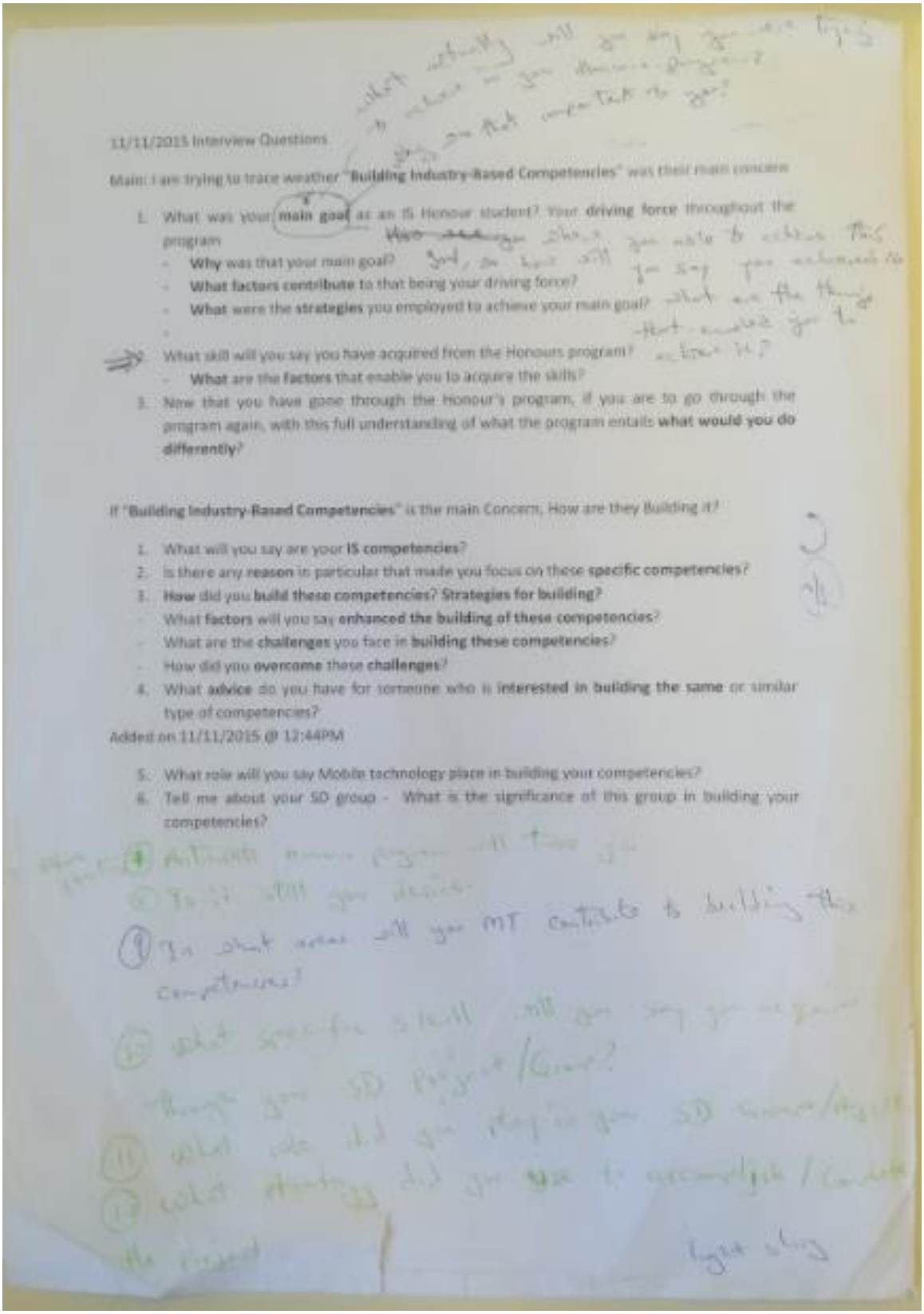
Figure 31: A list of the questions asked.

Diversity in terms of local students - from the department, from another department, from other universities, and international students.

Interview Questions 13/04/2016

- Where did you do your undergraduate programme?
- Can you please tell me why you are pursuing the Honour's program?
- Is there any reason in particular why you are doing the Honour's program at (1) ZZZ (2) Information Systems Department?
- What will you say are your competencies before staring the Honour's program?
- Now that you have started the program, what will you say about the Honour's program so far?
- Do you have any concern about the Honour's program?
- What are your challenges as an Honour's student?
- As an Honour's student, what is your main goal or driving force?
- Can you please explain why you think this is your main goal? What are the factors that contribute to this being your main goal?
- What strategies are you employing to achieve your main goal?
- In what way has the Honour's program contributed to your competencies? What kind of contribution will you say the Honour's program has made to your competencies?
- What will you say is helping you build IS competencies? How will you say you are building IS competencies? What actually will you say is assisting you in building IS competencies?

Figure 32: A sample of interview questions.



11/11/2015 Interview Questions

Main: I are trying to trace weather "**Building Industry-Based Competencies**" was their main concern

1. What was your **main goal** as an IS Honour student? Your **driving force** throughout the program
   - **Why** was that your main goal?
   - **What factors contribute** to that being your driving force?
   - **What** were the **strategies** you employed to achieve your main goal?
2. What skill will you say you have acquired from the Honours program?
   - **What** are the **factors** that enable you to acquire the skills?
3. Now that you have gone through the honour's program, if you are to go through the program again, with this full understanding of what the program entails **what would you do differently**?

If "**Building Industry-Based Competencies**" is the main Concern, How are they Building it?

1. What will you say are your **IS competencies**?
2. Is there any **reason** in particular that made you focus on these **specific competencies**?
3. **How** did you **build these competencies**? **Strategies for building**?
   - What **factors** will you say **enhanced the building of these competencies**?
   - What are the **challenges** you face in **building these competencies**?
   - How did you **overcome** these **challenges**?
4. What **advice** do you have for someone who is **interested in building the same** or similar type of competencies?

Added on 11/11/2015 @ 12:44PM

5. What role will you say Mobile technology place in building your competencies?
6. Tell me about your SD group - What is the significance of this group in building your competencies?

Figure 33: A sample of follow-up interview questions.

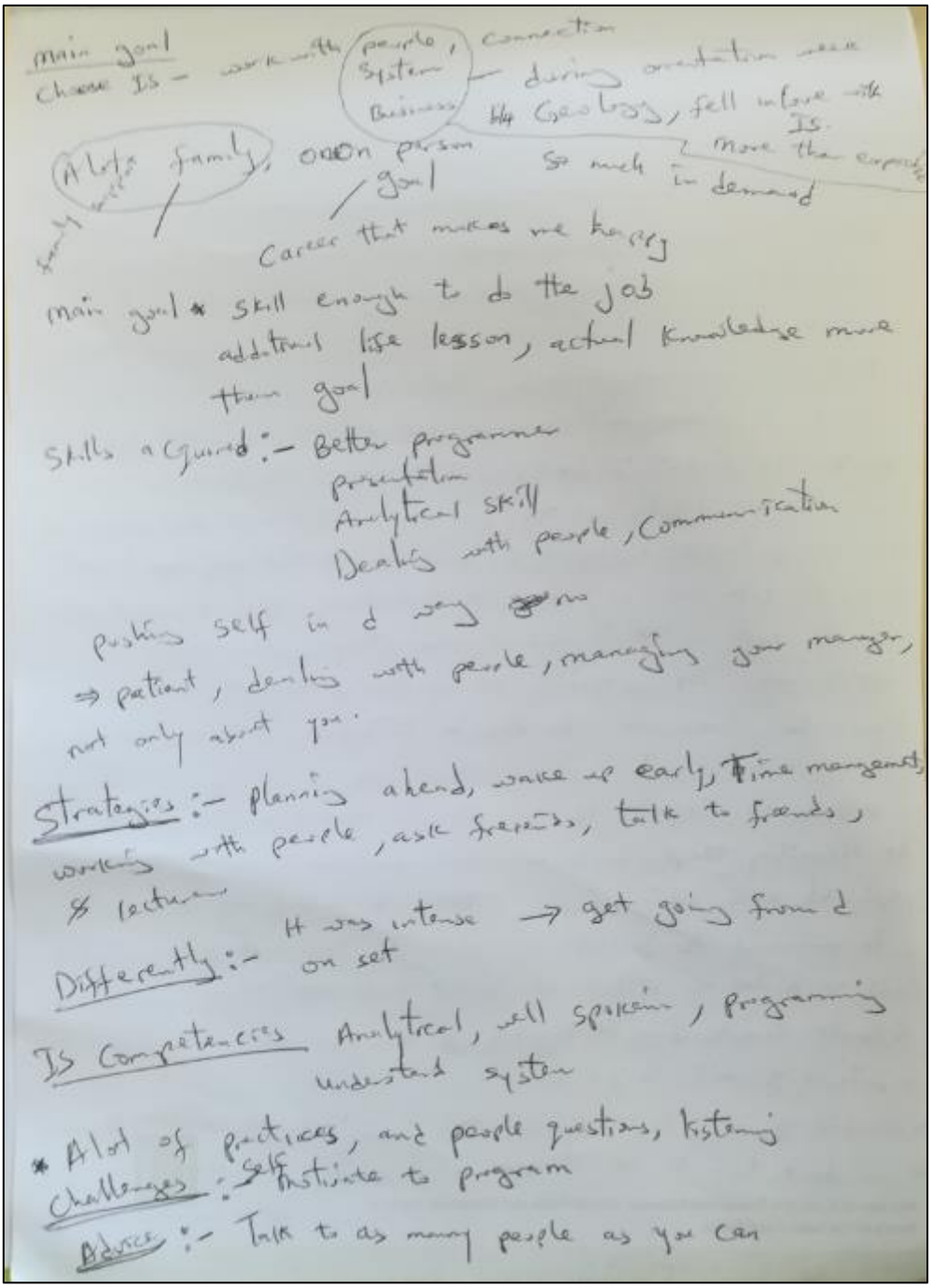


Figure 34: A sample of field note.

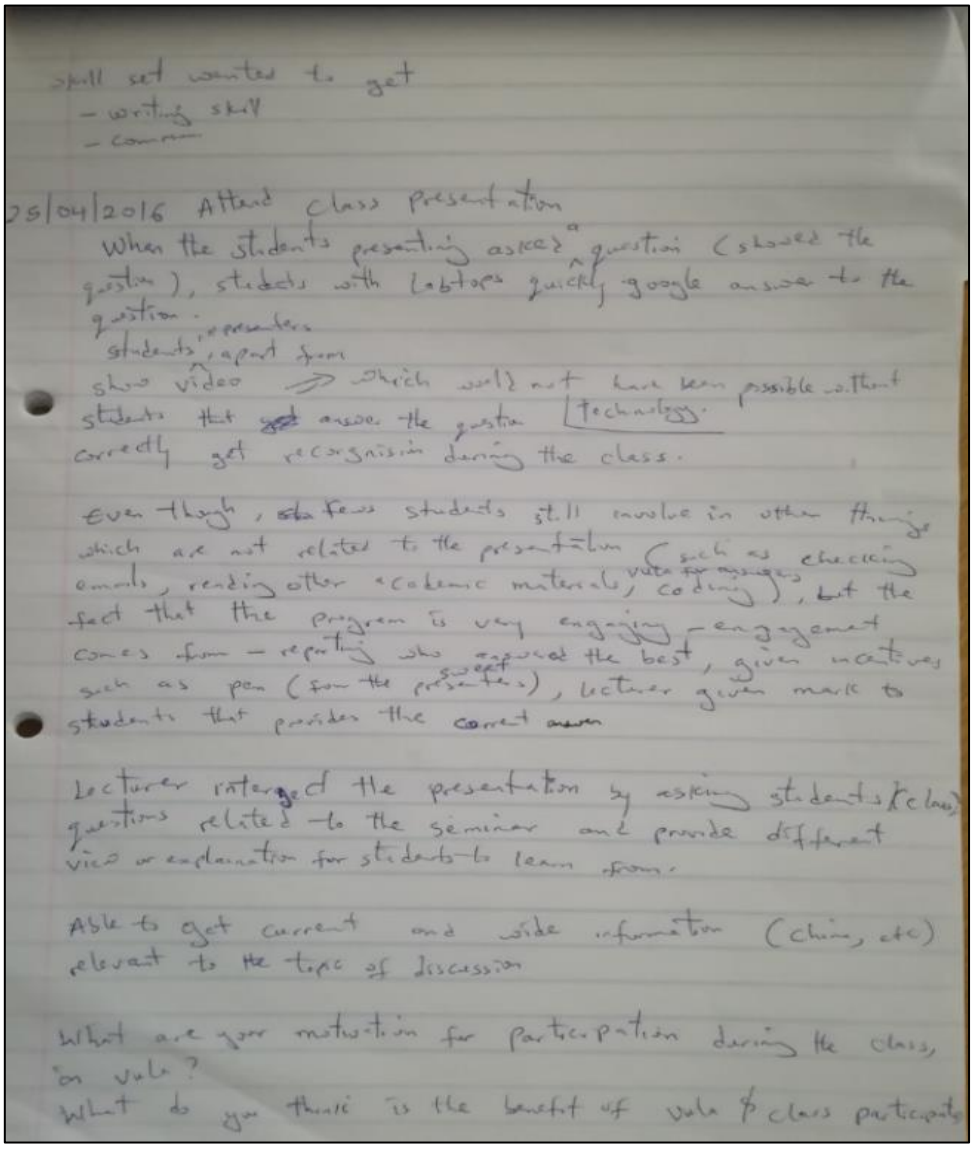
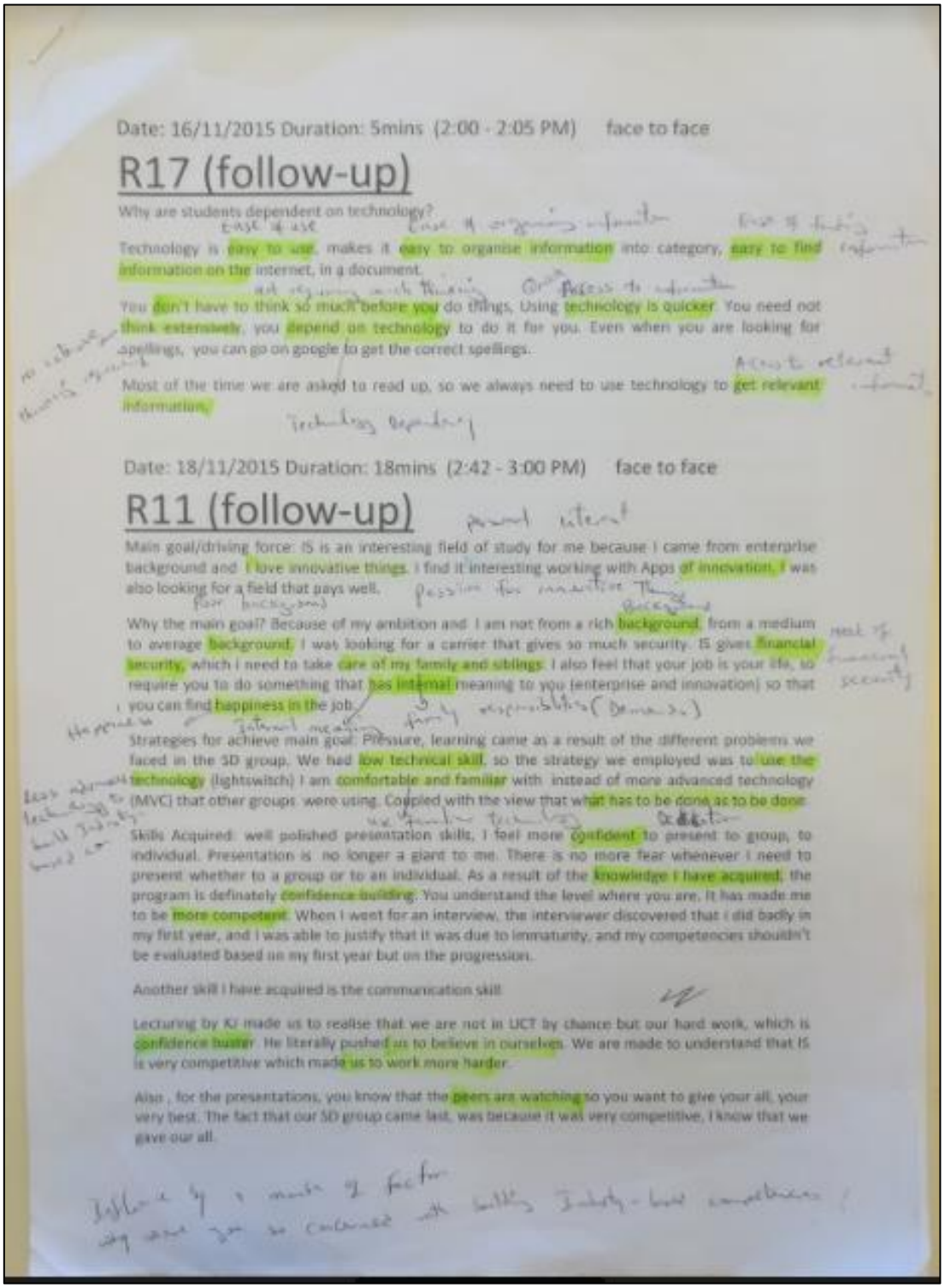


Figure 35: A sample of observation note.



Date: 16/11/2015 Duration: 5mins (2:00 - 2:05 PM) face to face

R17 (follow-up)

Why are students dependent on technology?

Technology is easy to use, makes it easy to organise information into category, easy to find information on the internet, in a document.

You don't have to think so much before you do things. Using technology is quicker. You need not think extensively, you depend on technology to do it for you. Even when you are looking for spellings, you can go on google to get the correct spellings.

Most of the time we are asked to read up, so we always need to use technology to get relevant information.

Date: 18/11/2015 Duration: 18mins (2:42 - 3:00 PM) face to face

R11 (follow-up)

Main goal/driving force: IS is an interesting field of study for me because I came from enterprise background and I love innovative things. I find it interesting working with Apps of innovation. I was also looking for a field that pays well.

Why the main goal? Because of my ambition and I am not from a rich background, from a medium to average background, I was looking for a carrier that gives so much security. IS gives financial security, which I need to take care of my family and siblings. I also feel that your job is your life, so require you to do something that has internal meaning to you (enterprise and innovation) so that you can find happiness in the job.

Strategies for achieve main goal: Pressure, learning came as a result of the different problems we faced in the SD group. We had low technical skill, so the strategy we employed was to use the technology (lightswitch) I am comfortable and familiar with instead of more advanced technology (MVC) that other groups were using. Coupled with the view that what has to be done as to be done.

Skills Acquired: well polished presentation skills, I feel more confident to present to group, to individual. Presentation is no longer a giant to me. There is no more fear whenever I need to present whether to a group or to an individual. As a result of the knowledge I have acquired, the program is definately confidence building. You understand the level where you are. It has made me to be more competent. When I went for an interview, the interviewer discovered that I did badly in my first year, and I was able to justify that it was due to immaturity, and my competencies shouldn't be evaluated based on my first year but on the progression.

Another skill I have acquired is the communication skill.

Lecturing by KJ made us to realise that we are not in UCT by chance but our hard work, which is confidence buster. He literally pushed us to believe in ourselves. We are made to understand that IS is very competitive which made us to work more harder.

Also , for the presentations, you know that the peers are watching so you want to give your all, your very best. The fact that our SD group came last, was because it was very competitive, I know that we gave our all.

Figure 36: A sample of follow up a face-to-face interview.

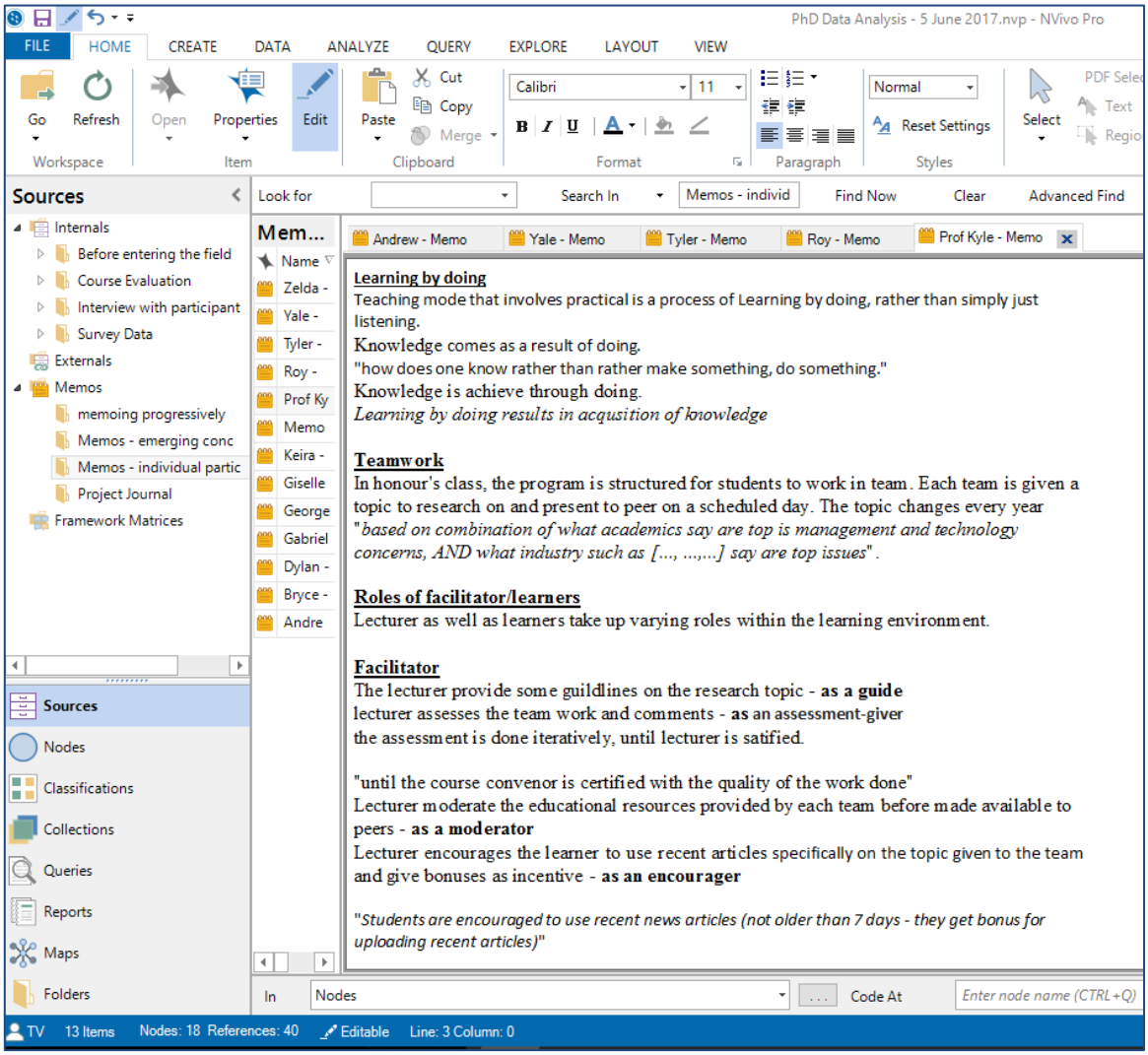


Figure 37: A sample of the conceptual memo.

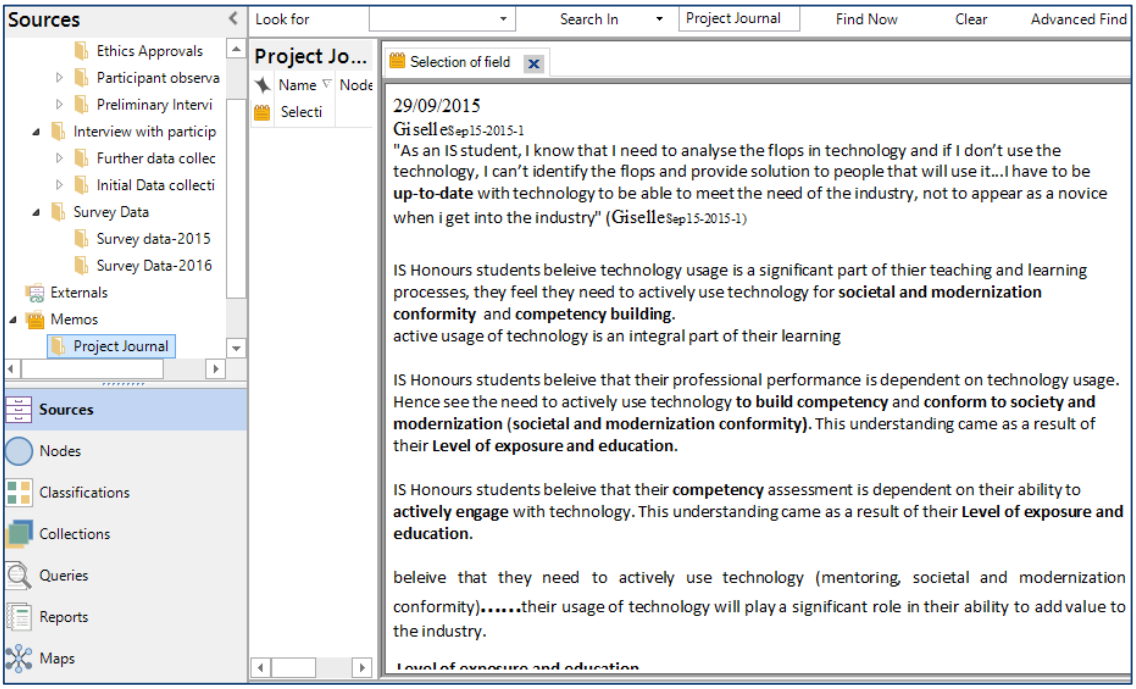


Figure 38: A sample of the project journal.

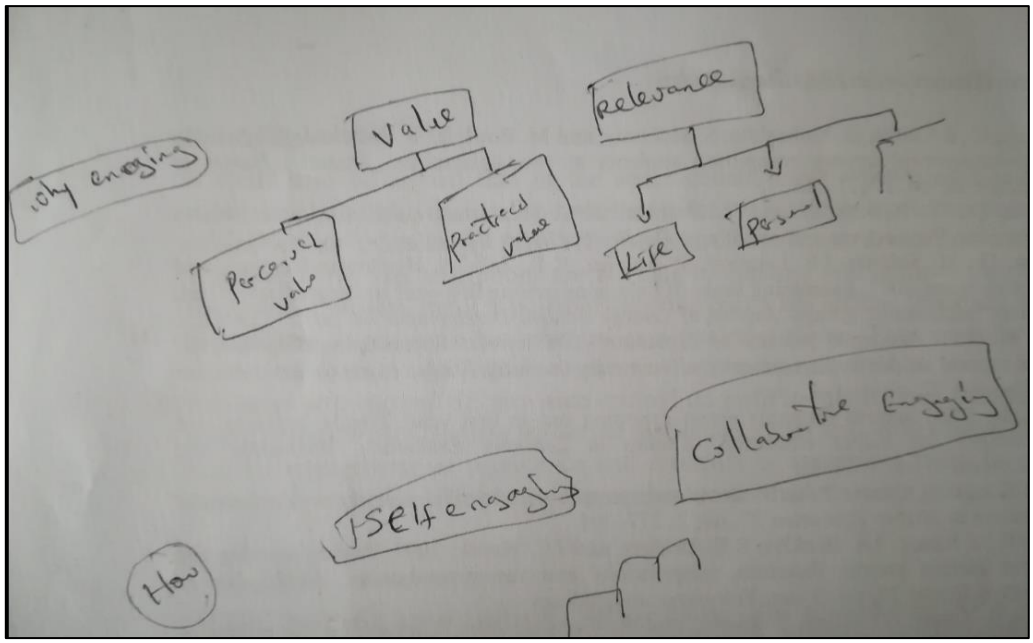


Figure 39: A sample of the conceptual diagram.