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Competency Maturing grounded theory

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Maturing Competency: A Grounded Theory of Senior IS Undergraduates' Learning Process

Completed Research Paper

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Abstract

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, acquiring a diverse set of IS/IT/ICT competencies, and being competent is a problematic task globally, which requires building competencies comprising knowledge, skills, abilities, and values. This study employs Classic Grounded Theory Methodology to identify the main concern of senior IS undergraduates during their learning process, and how they resolve the concern. The students' main concern emerged as a perceived lack of IS Competency. Maturing competency is a substantive theory which explains how these students attempt to resolve their concern. Three phases of the basic social process of Maturing Competency are student engagement, self-awareness of competency, and self-development. The findings suggest that creating an organic learning environment can be a useful approach to developing more competent IS graduates.

Keywords: Maturing Competency, student engagement, self-awareness of competency, self-development, Senior IS undergraduates

Introduction

University academic programmes are expected to graduate students who are competent, prepared and well able to take up employment immediately after graduating (Miller & Dettori, 2008; Mulder, Gulikers, Biemans & Wesselink, 2009). Initially, programmes had a focus on producing graduates with generic skills, but this has given way to approaches that emphasise understanding, metacognition, personal attributes, and practical skills (Griesel & Parker, 2009). Similarly, Computing educators (including Information Systems, Information Technology, Computer Engineering, Computer Science, and Software Engineering) focus on graduating competent students prepared for future careers in industry or for further advanced study (Miller & Dettori, 2008; Radermacher & Walia, 2013). Information Systems (IS) competencies are essential for driving business growth and innovation in a globalised knowledge-driven economy

(Gjermundrod, Dionysiou, Baumberger & Pattinson, 2016). 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).

This paper reports the findings of an inductive study that followed Classic (or Glaserian) Grounded Theory Methodology (CGTM) (Glaser & Strauss, 1967) but within a single case. In line with CGTM (Adolph et al., 2012), the study began with a broad overarching goal of unearthing the main concern of senior IS undergraduates studying at a leading South African university, and how they attempted to resolve the concern. The main concern was identified as a *perceived lack of IS competency* amongst the students, which they resolved through a process of *Maturing Competency*. The research question ultimately addressed was "*How do senior IS undergraduates mature competency during their learning process?*" This paper describes the core concepts that emerged and provides insight into the most closely related concepts that are contained in the emergent Maturing Competency grounded theory.

After this introductory section is the literature review, where we present the issues relevant to the senior IS undergraduates' concern, the subject of competency, and IS curriculum development. The section is followed by the research methodology, details on our study, then the *perceived lack of IS competency*, and *Maturing Competency* grounded theory sections, respectively. The final section concludes the paper.

Literature Review

In accordance with Holton's (2017) suggestion on the presentation of a CGTM study, the contextual literature review was done ex-post (after the empirical data was obtained) but presented ex-ante (before presenting the actual research study) to help the reader understand the paper. A hermeneutic process was used to identify and interpret relevant concepts related to the emergent phenomenon which involved finding relevant texts, and then interpreting them to develop a broader understanding of the relevant literature (Boell & Cecez-Kecmanovic, 2014). Significant literature on issues of competencies in IS education and curricula was published after the completion of empirical data collection and analysis. This literature affirmed and was in keeping with the significance of the emergent theory pertaining to maturing competency and is weaved into the overall discussion below.

Issues Pertinent to Senior IS Undergraduates

Many IS departments at South African universities offer students the option of enrolling in a fourth year IS undergraduate programme, i.e., three years to achieve a Bachelors in IS undergraduate degree followed by an additional one-year qualification. This fourth year is referred to as an Honours programme in countries such as South Africa, the United Kingdom and Australia. Several other names such as final year, high-level, upper level (Woods, 2020), fourth year (Liu & Murphy, 2017), senior-level, or senior year (Karsten & Roth, 2015) have been used to refer to this level. In this study, we refer to students in this fourth-year programme as senior IS undergraduates. Research that specifically focuses on the senior IS undergraduates' competencies, curriculum, and issues is rare. Feng and Salmela (2020) note that the research community covering IS curricula is largely United States-based (Feng & Salmela, 2020; Kevor, Boateng, Kolog, Owusu & Afful-Dadzie, 2020). They raise the question: "*Why are contributions from Europe/Africa and Asia/Pacific so limited?*" This paper, although based on empirical data collected prior to 2020, addresses and responds to their call by providing an account from South Africa of senior IS undergraduates' main concern and how they resolve it.

Competency Perspectives

Competency and Competence: General Literature

Competency (plural competencies) and competence (plural competences) are common words, used almost as synonyms (Nieminen, 2015) but rarely defined. When defined, the definition is ambiguous, with only a few empirical studies addressing the phenomenon (Shet et al., 2017; Wu, Lee & Tzeng, 2005; Yang et al., 2017). Several studies (Arifin et al., 2017; Khongmalai et al., 2016; Shet et al., 2017; Yang et al., 2017) point to McClelland (1973) as proposing the notion of competency. This concept was aimed at challenging the traditional way of evaluating higher education systems (Shet et al., 2017). The concept 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). Westerhuis (2011, p. 80) notes "*[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]. Competence is conceptualised (Guthrie, 2009) and used from different perspectives (Jones & Moore, 1993). 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). The French competence model is conceptualised in terms of the capacity to build up – a dynamic process carried out by 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. The model 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 is attached to the existing tasks of the workplace (Brockmann et al., 2008).

Some studies (Arifin et al., 2017; Yang et al., 2017) have categorised competency into implicit (self-concepts, motives, traits) and explicit (skills, knowledge, abilities/attributes) elements. 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 to IS graduates in this constantly changing world. Hence, with a focus on the explicit elements of competency from the context of general education, we define competency as the skills, knowledge, abilities, and values needed to do today's task as well as tomorrow's task successfully.

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*". The MSIS2016 global competency model for the IS programmes at the graduate level is relevant to senior IS undergraduates where competency is defined as a graduate's ability to apply knowledge, skills, and dispositions/attitudes to complete IS tasks effectively (Leidig et al., 2020). 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).

Given the understanding of competency derived from the education literature and IS contexts, we define IS competency as 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's and tomorrow's Information Systems' tasks successfully and effectively.

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 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 the history of the IS discipline over 40 years, and divided its developmental stages into four somewhat overlapping eras; The First Era (the mid-1960s to mid-1970s), the Second Era (the mid-1970s to mid-1980s), the Third Era (the mid-1980s to mid/late 1990s); and the Fourth Era (the late 1990s to mid/late 2010). 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. The debate regarding what the core of IS discipline is or should be persists throughout the four eras.

The current era (from late 2010 to the present) is the digital era or fourth industrial revolution era (Benbya, Nan, Tanriverdi & Yoo, 2020; Matthee & Turpin, 2019; Skilton & Hovsepian, 2017). This era is changing the landscape of education (Shahroom & Hussin, 2018). The 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. These changes have provided 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). The field of IS has become ingrained in everyday personal, business and professional life and is now more society-centric than organisation-centric (Belanger, Van Slyke & Crossler, 2019; Leidig et al., 2020). Daily experiences of interacting with digital tools is a dynamic emergence of complex sociotechnical systems. These systems present 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 that recommended a joint process that led to a comprehensive revision of the IS2010 curriculum (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.

The MSIS2016 curriculum, established as a global competency model for Master's IS programmes, builds upon preceding graduate-level curricula (Topi, Karsten, Brown, Alvaro, Donnellan, Shen, et al., 2017). This model defines four levels of competency for IS graduates: awareness, novice, support, and independent, with the expert level being beyond the scope of a graduate curriculum due to its reliance on practical application within organisational structures (Kevor et al., 2020). The MSIS2016 competency model development followed a top-down approach, and serves as a guide for translating these competencies into an actionable curriculum for Master's degree programmes in IS (Topi et al., 2017). These competencies are

aligned with specific domains of practice such as business, education, healthcare, law, government, NGOs, and other non-profits.

Building on the competency thinking in the IS2010 and MSIS2016, the latest iteration of the IS undergraduate curriculum is the IS2020 curriculum 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 senior IS undergraduates. 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 outcomes) 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 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.

This review reveals that a competency-based approach has been a key focus in recent IS Education research and development, which coincides with what emerged as the core concern of the Senior IS undergraduates in this study (*perceived lack of IS competency)* and how they resolve it (*Maturing Competency)*. The referenced literature pertaining to IS education and competencies was published after completion of our study. That our findings around maturing competency are in alignment with this curriculum work is serendipitous.

Research Methodology

CGTM (Classic Grounded Theory Methodology) was chosen as the most appropriate approach to conduct the investigation given the desire to identify the main concern of the senior IS undergraduates and how they resolve their concern. 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). Given our interest in examining the dynamics within a specific senior IS undergraduate programme in South Africa, the data collection was limited to a single case.

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 provides the theoretical grasp of the problems and the processes of developing the theory from data obtained in a substantive area (Glaser, 1978). It 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).

The basic principles governing the use of CGTM were applied, i.e. no preconceived problem; conceptualisation; constant comparative analysis; theoretical sampling; coding; and memoing:

- **No preconceived problem**: The CGTM study began with an area of interest rather than a preconceived professional problem (Glaser, 1998). This was to allow for openness and theoretical sensitivity and not to anticipate or preconceive what constitutes the substantive area (Glaser, 1978).

In support of no preconceived problem, the research questions were open-ended (broad) (Gibson & Hartman, 2014).

- **Conceptualisation**: The focus was on the identification, discussion, and integration of emerging concepts from the substantive area to develop the substantive theory, rather than providing a detailed description of happenings in the substantive area (Glaser & Strauss, 1967).
- **Constant comparative analysis**: The process of constant comparative analysis entailed: (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).
- **Theoretical sampling**: Theoretical sampling, otherwise referred to as theory-directed sampling (Birks & Mills, 2011), was driven by the emerging theory. The initial selection was not based on a predetermined theoretical framework (Glaser & Strauss, 1967; Glaser, 1978); the emerging theory controlled the data collection process, and dictated "*what data to collect next and where to find them*" (Glaser & Strauss, 1967, p. 45). Given the focus on a single case, however, the sampling was restricted to one case. The initial theoretical sampling decision was, however, based on the prominent places where the relevant data could be obtained, and the data collection ceased when codes were saturated, elaborated and incorporated into the emerging theory, through the constant comparative analysis (Glaser & Strauss, 1967; Glaser, 1978; Goulding, 2002).
- **Coding**: Coding in CGTM can be categorized into substantive coding (open coding and selective coding), and theoretical coding (Holton & Glaser, 2012; Holton & Walsh, 2017). Substantive coding began with initial open coding of the empirical data until the emergence of a core category, followed by selective coding, where the data collection and analysis were delimited to the core category and its related categories (Holton & Glaser, 2012, p. 277-278). Theoretical coding involved establishing and refining the relationships between categories (Adolph et sl., 2012).
- **Memoing**: Theoretical memoing involved breaking off during coding to write up ideas about the data obtained (Glaser, 1978; Urquhart, 2013). While coding captured what was going on in the substantive area, memoing involved writing up ideas about the codes and how they were related (Gibson & Hartman, 2014). Memoing allowed the principal researcher to be creative and meaningfully think differently about the data (Urquhart, 2013).

Our study

Case Description

The case chosen was an IS Department at a leading South African university. The IS Department followed the AIS curriculum closely and used IS97, IS2002, then IS2010 as guides for curricula. The senior IS undergraduates' programme prepares students for a research-based postgraduate programme, and consolidates and deepens the students' expertise in the IS discipline. The senior IS undergraduate programme is a one-year programme, which usually runs from February to November. The programme is typically 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 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 course development and delivery process.

Empirical Data

We followed the CGTM theoretical sampling principle in selecting the students who participated in the study and 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 Higher Education Institution in South Africa. 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. We collected data from April 2015 - June 2016 (for fourteen months) until we reached saturation. We adopted three different data collection strategies: direct observation, informal discussion, and formal (face-to-face) interviews. After identifying the students' main concern, other sources of data we used for memoing were telephonic interviews, field notes, lecture videos, documentation (course evaluation, and senior IS undergraduates course outline), online surveys, and seminar reflection. We 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 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 our study and our consciousness, provided support for the core category and its process.

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, we conducted 25 face-to-face and telephonic interviews and two face-to-face group discussions, 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.

The Perceived Lack of IS Competency

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*. 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). This perception is in contrast to the acquired competency garnered through prior study and reflected a desire to grow further. 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 refer 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. We found 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*".

Maturing Competency Grounded Theory

After about seven months in the field, collecting, coding, and analysing data line-by-line and conducting a constant comparative analysis, we noticed the frequent occurrence of the words engage, engaging, and

engagement, and 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 we began to question whether *engaging* fulfilled the conditions of being the core category. We theoretically obtained further data and discovered the pattern through which the students continuously resolved their main concern (*perceived lack of IS competency*); we initially named the pattern "*building competency"*. As soon as the pattern of the core category emerged, we 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. As we began to compare codes, memos, instances, and concepts, we discovered that 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 (*Maturing Competency*).

The main concern was hence noted as resolved through Maturing Competency. 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*. As presented in Figure 1, the grounded theory process found that a substantive theory of *Maturing Competency* 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*. *Maturing Competency* process has three phases that are supported by *learning by doing* and *spontaneous learning*. Within an *organic learning environment*, *Maturing Competency* 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*.

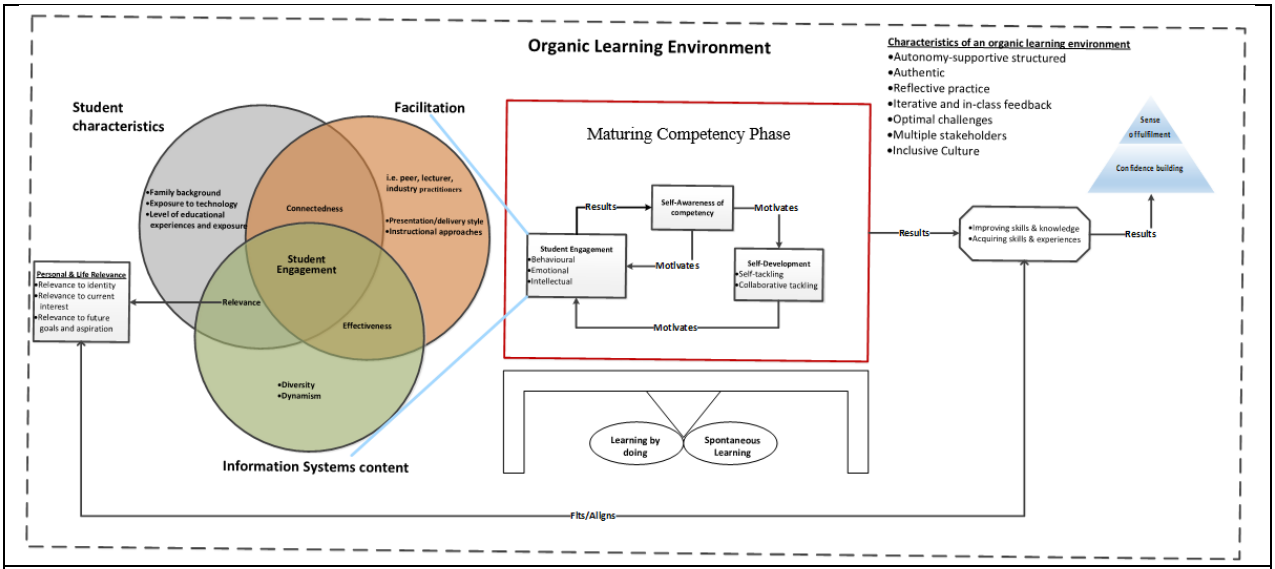

Figure 1. Maturing Competency Grounded Theory

An Organic Learning Environment

The senior IS undergraduates resolve their *perceived lack of IS competency* within 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 broken lines in the consolidated diagram of a substantive theory of *Maturing Competency* (Figure 1) 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* makes it possible for the students 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*".

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 *Maturing Competency* are the *autonomy-supportive structure*, *authenticity*, *reflective practice*, *iterative and in-class feedback*, *optimal challenges*, *multiple stakeholders*, and *inclusive culture*.

Maturing Competency Phases

The BSP (Basic Social Process) of *Maturing Competency* 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 1, the three cyclic process of *Maturing Competency* 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: Maturing Competency process/phases).

Student Engagement Phase:

Student engagement is a multi-faceted meta-construct, which we 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*". 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.

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. *Behavioural engagement* is motivated by the *IS contents'* perceived relevance to a *student's identity*, *sense of connectedness*, and *facilitation effectiveness*.

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 *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 to bring to bear the *personal relevance* and the *life relevance* of the theoretical knowledge they have acquired. The *personal relevance* and the *life relevance* of the *IS contents*, shared within the senior IS undergraduates' learning environment, influence the *students' current interest*.

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"*).

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*". 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"*.

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*".

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"*. Maddock-2016-1 explained how important self-development is in Maturing Competency; 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*".

Related to the concept of self-development is self-managed learning, self-directed learning, and self-regulated learning. Self-managed learning explains "*the notions of learners working together in small groups, or action sets, on real-life problems with the practice of learners setting their own learning agendas and assuming responsibility for their own learning*" (Ellinger, 2004, p. 160). Self-directed learning is "*a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes*" (Knowles, 1985, p. 18). Self-regulated learning is a "*process through which learners transform mental abilities into task-related academic skills*" (Cassidy, 2011, p. 990). Self-regulated learning emphases the active role of a student in the learning process and assumes that social and environmental factors influence a student self-regulated learning (Mega et al., 2014; Won, Wolters & Mueller, 2018). "*A self-regulated student is characterised as a student who is aware not only of task requirements but also of his own needs with regard to optimal learning experiences*" (Mega et al., 2014, p. 122).

Learning by Doing and Spontaneous Learning

Maturing Competency phases rely on the senior IS undergraduates' ability to engage in *learning by doing* and *spontaneous learning* within an *organic learning environment*.

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). 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). 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*".

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, Cuervo-Cazurra & Un, 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 et al., 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).

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).

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".*

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 Resultant Effects of Going Through the Maturing Competency Process

As presented in Table 1, the resultant effects of the students going through the Maturing Competency 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*.

Resultant effects	**Explanation/Example**
Improving skills and knowledge	For example, 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	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	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".*
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, 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".*

Table 1. The Effects of the Students Going Through the Maturing Competency Process

Evaluation of Maturing Competency Theory With Classic Grounded Theory

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). Here we present how the substantive theory of Maturing Competency fulfilled the criteria of CGT (Glaser, 1992; 1978; Glaser & Strauss, 1967; Holton & Walsh, 2017):

- **Fit**: we 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. We adhered to the entire grounded theory procedures, from data collection to writing up. Through the constant comparative analysis, we developed a substantive theory of Maturing Competency from empirical data, which fits, works and is relevant.
- **Workability**: we produced a core category, Maturing Competency, that continuously resolves the students' main concern of perceived lack of IS competency. A substantive theory of Maturing Competency accounts for most of the variations around the students' main concern and the action in their learning environment.
- **Relevance**: a substantive theory of Maturing Competency is relevant to the students' 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 Maturing Competency in data affirms its relevance, credibility, and confirmability.
- **Modifiability**: a substantive theory of Maturing Competency could be modified to include new concepts, properties or dimensions to fit new data. A substantive theory of Maturing Competency, 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 Maturing Competency 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 Maturing Competency 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.

Conclusion

Our study's primary contribution is the Maturing Competency grounded theory, which explains how senior IS undergraduates continuously resolve their perceived lack of IS competency. Our contributions centre on the role of an organic learning environment in achieving individual and collective students' engagement and students' Maturing Competency. Maturing Competency grounded theory explains the three phases of the Maturing Competency process, and the characteristics of an organic learning environment where knowledge is improved, and skills are acquired. Our study shows that improved skills and knowledge and acquired skills and experiences result in confidence-building and a sense of fulfilment. The Maturing Competency 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. The study explains the three different but interrelated student engagement levels (behavioural, emotional and intellectual engagement). Through the systematic analysis of the empirical data we present an in-depth exploration of students' comments about teaching and learning practice in a mainstream classroom, and how these relate to student engagement. Our findings elucidate the importance of student engagement in Maturing Competency and contributes to the field of student engagement. Part of the findings of this study is that students can Mature Competency in an organic learning environment where learning by doing and spontaneous learning co-exist. IS educational practitioners are better informed to tailor their practice towards building an organic learning environment to ensure maximal student engagement and Maturing Competency. The findings of the study suggest that creating an organic learning environment can be a useful approach to developing more competent IS graduates.

Practical implications of the study are that senior IS undergraduates need educational content that can offer academically relevant work experience. IS content should be created in close collaboration with industry and be relevant to the students. 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 which increases student engagement and results in deep learning and self-awareness of competency.

The fact that the study was carried out over fourteen months, within a Department of IS in one of the South African HEIs should not be considered unduly limiting to the generalizability of the substantive theory of Maturing Competency. Just as with any grounded theory, any additional data collected could result in refinement and modification of the grounded theory. However, the substantive theory that emerged through the rigorous research process followed represents a relevant and useful contribution 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. We 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 Maturing Competency grounded theory. Further research could explore the likely applicability of the Maturing Competency theory and extend the Maturing Competency framework we developed 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 Maturing Competency 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.

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