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Adopting and contextualising international computing curricula: A South African case

Submitted by

Kenneth Mashingaidze Student No: 1254327
Information Systems Division
School of Economic and Business Sciences
Faculty of Commerce, Law and Management

Submitted in partial fulfilment of an MCOM degree in Information Systems

March 2017

Supervisor: Susan Benvenuti

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Acknowledgements

Archbishop Desmond Tutu once said that when you achieve something significant you do it standing on the shoulders of others and this piece of work is no different. I would like to thank the following whose shoulders I have stood on:

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- My good friend Gwamaka who inspired this topic and encouraged me to persist with it to the end
- Lastly to God who continues to give me strength in everything I do.

Abstract

Purpose – The aim of this research is to examine one case of the adoption and contextualisation of an international computing curriculum at a South African university in order to improve the understanding of this process for literature as well as practice. An international computing curriculum is a curriculum developed by international professional and scientific bodies such as the Association for Information Systems (AIS), Institute for Electrical and Electronics Engineers (IEEE) or the Association for Computing Machinery (ACM).

Design/methodology/approach – The research adopts an interpretivist approach and follows an exploratory research design using qualitative methods to gather data and directed content analysis for data analysis. The research site is a traditional South African university which has used the IS2010 curriculum as a guideline for their undergraduate Information Systems degrees. The site was chosen using convenience sampling. Data was obtained through interviews with staff at the Information Systems department as well as university documentation.

Findings - The research indicates that university objectives, university context and industry skills needs have shaped the way the university has adopted and contextualised the IS2010 curriculum. The research also indicates that there are two types of challenges that were encountered: challenges caused by IS2010 and existing challenges that affected IS2010. The major challenges caused by IS2010 were the absence of important elements related to teaching and learning, particularly pedagogy. The challenges that affected the adoption of IS2010 but were not caused by IS2010 were challenges that the university was already facing. These include the language of instruction, institutional culture, staff shortages and students' cultural and educational background.

Originality and Practical contribution – Most of the research on this area focuses on African countries other than South Africa. Researchers have argued that it is important to conduct this kind of research on an individual country level because of the unique nature of the challenges facing each country. This research is an attempt to conduct such research specifically for South Africa. The research findings have shed light on how a South African university may adopt and contextualise an international computing curriculum and the challenges the university might face in doing so. This will in turn help computing educators in addressing such challenges and provide some guidance on how to go about doing so. The research also puts forward a conceptual framework that can be used to research computing curriculum contextualisation in South Africa.

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CHAPTER 1

1. Introduction

The introduction chapter explains the rationale behind this study and outlines the structure of the rest of the research report. The introduction begins with a brief summary of the research argument in order to orientate the reader as to the direction of the overall study. This is followed by an explanation of the importance of Information and Communication Technology (ICT) to socio-economic development as this is an important aspect of the research argument. The introduction then discusses ICT skills and ICT skills shortages as this has an impact on countries' ability to harness ICT effectively. The research problem is then introduced followed by the research questions, the research justification and the intended contributions of the study. The structure of the research document is then described. Figure 1 below shows the flow of the introduction chapter.

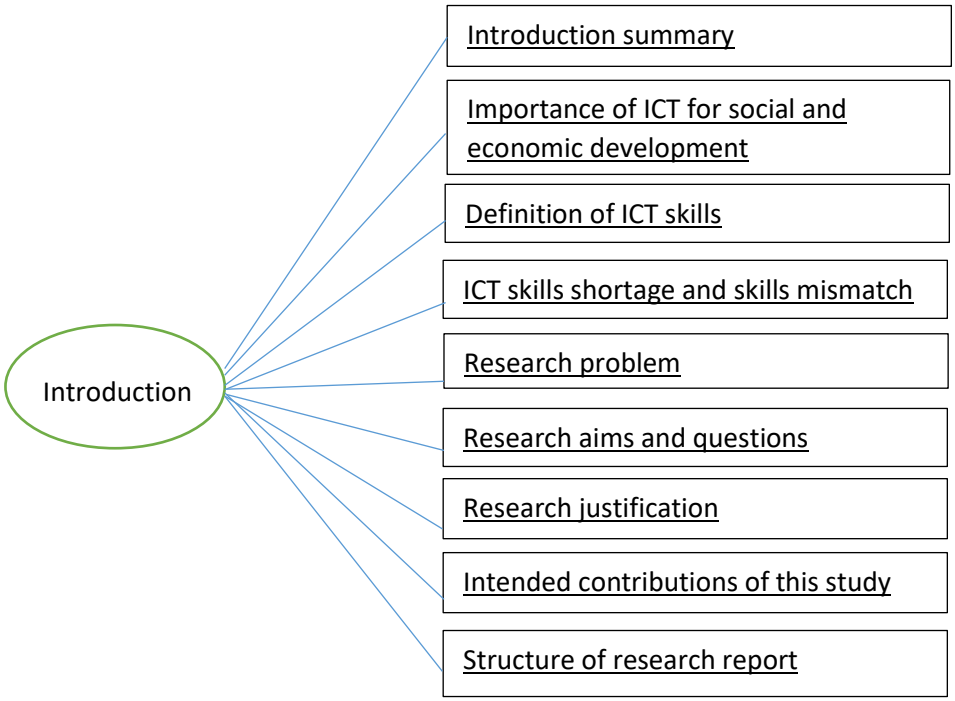


Figure 1: The different sections of the introduction chapter

1.1 Introduction summary

ICT is important to socio-economic development (Dlodlo, 2009; Larsson & Boateng, 2009). A shortage of ICT skills hampers the ability of a country to harness the potential of ICT (Ayalew Renken, Mgaya & Nkgau, 2012). A shortage of ICT skills consists of an insufficient number of ICT professionals and also a mismatch between the skills ICT professionals possess and the ICT skills the economy requires. Universities are one of the places where people acquire ICT skills. The ICT skills taught at universities are encapsulated in the computing curricula they employ. Therefore, the computing curricula used at universities have an impact on the skills mismatch and ultimately the skills shortage.

African countries are considered developing countries which means that their socio-economic needs are greater than those of developed countries. However some universities in Africa use international computing curricula which are more suited for use in developed countries and hence do not cater for the specific socio-economic development needs of African countries (Bass & Heeks, 2011). This further exacerbates the ICT skills mismatch in African countries (Dasuki, Ogedebe, Kanya, Ndume & Makinde 2015). Given that African countries themselves have different needs, the international computing curricula that these African countries adopt must be contextualised to those specific countries (Larsson & Boateng, 2009). There is a lack of research in this regard for the South African context and this study aims to address that gap.

1.2 Importance of ICT for social and economic development

The justification for this research is based on the notion that ICT has an important role to play in socio-economic development (Dlodlo, 2009; Larson & Boateng, 2009). One of the main arguments in support of this notion is that ICT can improve access to information and services thus potentially improving the lives of people in various ways (Albimam & Sulong, 2016). These potential improvements can be illustrated by some examples of how ICT can be applied in various sectors:

Agriculture – ICT can help farmers access information related to crop and livestock diseases, weather, logistics and market prices for their products. This in turn can help raise agricultural production and increase incomes of small-scale farmers who would otherwise not have had access to such information (Kadigi et al., 2013). This is particularly important for Sub-Saharan Africa where agriculture accounts for approximately 33% of Gross Domestic Product (GDP) and 75% of jobs (World Bank, 2011).

An example of an ICT intervention in agriculture is the Esoko virtual marketplace. Esoko is an information service that operates in nine African countries (World Bank, 2011). The functionality includes a facility where farmers who subscribe can receive real time information on market prices as well as accept and receive bids on their produce. As the marketplace is online, farmers are able to access markets they would otherwise not have

been able to access (World Bank, 2011). Another example is the Seeing is Believing West Africa Project (SIBWA). SIBWA is active in four countries: Mali, Burkino-Faso, Ghana and Niger. The purpose of SIBWA is to use satellite imagery to help farmers understand the fertility of their soil with the help of scientists. This in turn helps farmers calculate inputs such as fertilizer more accurately resulting in higher crop yields (World Bank, 2011).

E-government – E-government is the use of ICT to support government service delivery (Mutula & Mostert, 2010). The use of e-government leads to benefits for both governments and their citizens. For governments the benefits include improved efficiency and greater transparency, which leads to cost reductions and greater trust from citizens (Mutula & Mostert, 2010). For citizens, e-government benefits include greater access to government services, cost savings as transport to government offices is not required and time savings as there is no need to travel and queue at government offices (Russo, Ghezzi, Fiamengo & Benedetti, 2014). An example of e-government is the use of electronic tax filing, e-filing, in South Africa. E-filing has been in use in South Africa since 2001. In the first year of e-filing, 51 396 tax returns were submitted using e-filing (Mpinganjira, 2013). By 2016, that number had grown to over 1.4 million (SAnews, 2016).

Healthcare – ICT has growing numbers of applications in the healthcare sector. Disease management systems are used to monitor the geographical spread of diseases and coordinate the necessary resources to counter the spread of disease (Osunyomi & Grobbelaar, 2015). For example during the Ebola outbreak in West Africa in 2014, IBM, in partnership with Sierra Leone's Open Government Initiative, developed an information system which enabled citizens to report issues related to Ebola by SMS or telephone. This provided authorities with up to date information enabling them to make better decisions as to how to respond to the disease outbreak (Linington, 2014).

Mobile devices such as cellular phones and patient monitoring devices are used for remote diagnosis and patient monitoring which helps deliver healthcare to people in remote locations (Al Dahdah, Du Lou & Meadel, 2015; Cripps & Standing, 2011). Health Information Exchange (HIE) systems allow medical practitioners to share data on common patients even if those practitioners have different employers or are in different locations. HIE improves patient safety as practitioners will get accurate patient histories. HIE also improves efficiency as patient information does not have to be re-taken if a patient goes to a different hospital (Politi, Codish, Sagy & Fink, 2014).

Education – In education, ICT can be used as a teaching and learning tool or as an administrative support tool. In terms of teaching and learning ICT can promote collaboration amongst students through web-based technologies such as blogs and online forums (Gikas & Grant, 2013). Teaching can be delivered on-line which improves access to education and reduces cost of education (Perbawaningsih, 2013). ICT can also be used to develop course materials and improve access to knowledge and research through online journals. As an

administrative tool, ICT can help make educational institutions more efficient by enabling online applications and registrations (Talebian, Mohammadi & Rezvanfar, 2014).

In 2015 the United Nations Educational, Scientific and Cultural Organisation (UNESCO) published a report on ICT in Education in Sub-Saharan Africa. In that report, UNESCO highlighted some case studies which serve as practical examples of how ICT has been applied in Education (UNESCO, 2015). One case study described the use of radio to deliver educational programmes to children in the rural communities of Nakaseke, Uganda. Nakaseke is a district 75km from the capital Kampala. The district has 95 primary schools which cater for 13 400 pupils (UNESCO, 2015). The pupil teacher ratio in the district is 75:1. The Nakaseke community radio station was established in 2003 and offers a radio quiz competition, which is aimed at raising literacy and promoting academic achievement. The competition targets all the schools in the district and is credited with raising academic standards, increasing pupil confidence and promoting collaboration amongst teachers (UNESCO, 2015).

In order for a country to take advantage of the opportunities that ICTs have to offer, sufficiently skilled people must be available to both develop and use ICTs (Ayalew, et al., 2012). However, many countries in Africa are facing an ICT skills shortage which is hampering their ability take advantage of ICT. Before progressing further it is necessary to outline what is meant by ICT skills in this research.

1.3 Definition of ICT skills in this research

In this study ICT skills refer to the skills of the five computing disciplines; Information Technology (IT), Software Engineering (SE), Computer Science (CS), Information Systems (IS) and Computer Engineering (CE). One way of categorising ICT skills is to divide them into two broad groups called technical and non-technical skills (Ahmed, Capretz, Bouktif & Campbell, 2012). Technical skills refer to competencies in certain areas such as networking, programming, project management, cyber security and date modelling (Impagliazzo, Sabin, Alrumaih & Viola, 2016). Technical skills tend to overlap and have different levels of emphasis across the different computing disciplines. For example, both the IS and IT disciplines contain subject matter on technology infrastructure within organisations. However, IS is more concerned with the information the technology enables while IT is more concerned with the technology itself (Shackelford et al., 2005). Non-technical skills are also known as “soft skills” and they tend to be applicable across all the computing disciplines. Examples of soft skills are critical thinking, problem solving, leadership and negotiation (Ahmed et al., 2009). In this study, ICT skills are defined as technical and non-technical skills that an ICT professional needs to possess in order to be effective.

1.4 ICT skills shortage and skills mismatch

There is an acknowledged shortage of ICT skills globally which continues to worsen as demand for these skills continues to outgrow supply (Calitz, Evert & Cullen, 2015a). One of the common causes of the shortage in ICT skills globally is the small number of students enrolling in and graduating from ICT programmes at universities (Burns, Gao, Sherman, Vengerov & Klein, 2014; Calitz et al., 2015b; Stefanidis, Fitzgerald & Counsell, 2012). Several reports in various countries have been published in an effort to gauge the extent of this shortage. In 2014, the government of the Republic of Ireland published the 2014-2018 ICT Skills Action Plan. In that plan they estimated that by 2015 there would be a shortage of 864 000 ICT professionals in the European Union and the European Economic Area (Department of Education and Skills, 2014). In Australia the Australian Computer Society (ACS) estimates that demand for ICT professionals will increase from 628 000 in 2015 to 695 000 by 2020 (Australian Computer Society, 2016). This represents an annual increase of approximately 2%. However, ICT graduates contribute only 1% to the ICT workforce each year resulting in a skills shortage (Australian Computer Society, 2016). The roles that are in demand are a mix of technical and business-related roles such as software developers, software engineers, business analysts and business development managers. The ACS report also shows an increasing demand for related non-ICT skills such as relationship management and contract negotiation (Australian Computer Society, 2016).

In South Africa the shortage of ICT skills is widely acknowledged within academia, government and the private sector (Calitz, Cullen & Greyling, 2015b). Despite several reports and research studies being conducted on this shortage there is no agreement on the numbers that make up this shortage (Lotriet, Mathee & Alexander, 2010). In 2014, the Johannesburg Centre for Software Engineering (JSCE) conducted a survey amongst ICT practitioners in South Africa to ascertain the demand for ICT skills in the country. The survey results indicated an estimated 40 000 vacancies in the ICT sector (Joburg Centre for Software Engineering, 2014). Academic literature also highlights certain ICT specialties where the skills shortage is particularly acute. These specialities include software development, database management, mobile development, ERP consultants and business analysis (Breytenbach, de Villiers & Hearn, 2013; Calitz et al., 2015b).

In South Africa the ICT skills shortage is partly attributed to deficiencies in the teaching and learning at primary and secondary school level of subjects such as mathematics and science (Jacobs & Sewry, 2009; Lotriet et al., 2010). Passes in these subjects in the final year of secondary school are prerequisites for entry into many computing degree programs in South Africa (Lotriet et al., 2010). Another reason that discourages South African learners from pursuing computing degrees is the negative perceptions amongst learners of computing subjects at secondary school. Many learners perceive the subject as difficult and choose not to study computing at school, tertiary level or pursue an ICT related career (Calitz, Greyling, Cullen, 2010).

A second cause of the ICT skills shortage is the mismatch between the skills that are being taught at higher learning institutions and the skills required by economies and societies around the world. This mismatch can be partially attributed to the continuous evolution of the ICT field, which has made it difficult for universities to keep pace with the skills demands of the ICT industry and society in general (Kim, Hsu & Stern, 2006; Lotriet et al., 2010; Stefanidis et al., 2012). This has led to complaints from industry that ICT students are graduating without the necessary skills to make them productive in the workplace (Breytenbach et al., 2013; Calitz et al., 2015a). A specific and persistent complaint has been in relation to soft skills. Since the early 2000s, the ICT industry globally has been emphasising the increasing importance of soft skills and requesting that graduates be more proficient in these soft skills (Fang, Lee & Koh, 2005; Lee, Koh, Yen & Tang, 2002). More recently, there has been an increase in demand for mobile related skills and data skills (Kasture & Patil, 2014; Thompson, Mayernik, Palmer, Allard & Tenopir, 2015). The concept of a skills mismatch in the ICT sector is a key component in the argument put forward by this study.

1.5 Research problem

ICT can contribute positively to socio-economic development. However, a shortage of ICT skills can hamper the ability of a country to harness the potential of ICT (Ayalew et al., 2012). An ICT skills shortage is not only caused by an insufficient number of ICT professionals but also by a mismatch between the skills ICT professionals possess and the ICT skills a country needs (Bass & Heeks, 2011; Larsson & Boateng, 2009). University computing degree programmes are one of the avenues through which people acquire ICT skills. The skills taught in these degree programmes are encapsulated in their respective curricula. *University computing curricula can therefore potentially contribute to the skills mismatch and ultimately the skills shortage*. Some universities develop their own curricula while others adopt published international computing curricula.

An international computing curriculum is a curriculum developed by international professional and scientific bodies such as the Association for Information Systems (AIS), Institute for Electrical and Electronics Engineers (IEEE) or the Association for Computing Machinery (ACM) (Ponelis et al., 2012). Examples of international computing curricula include IS2010, IT2008, SE2014 and CSC2013. A brief analysis of these curricula revealed that although international computing curricula are different, they have the following components in common: a description of the underlying principles upon which the curriculum is based, the expected outcomes of graduates, a summary of the body of knowledge of the discipline, an overview of the resources required to implement the curriculum and course outlines for the individual courses in the curriculum (Ardis et al., 2015; Lunt et al., 2008; Sahami et al., 2013; Topi et al., 2010).

Although organisations such as the AIS, IEEE and ACM have global membership, their membership is dominated by western nations. This has led to the argument that these bodies

lack an appreciation of the African context and therefore the curricula these bodies produce are not entirely appropriate for the African context (Bass & Heeks, 2011). Using international computing curricula in an African country can thus potentially exacerbate an ICT skills shortage by equipping students with skills that are irrelevant to their local context. In Tanzania, for example, ICT professionals have to contend with additional challenges such as inadequate electrical and ICT infrastructure that their counterparts in western countries do not have to. Researchers have found that the ACM/IEEE Information Technology (IT) curriculum used by some Tanzanian universities creates highly specialised graduates that are not equipped with the all-round skills required of an IT professional in Tanzania (Tedre, Bangu & Nyagava, 2009).

In order to reduce the gap between a curriculum and the context in which it is adopted the curriculum needs to be contextualised. Curriculum contextualisation is the process of adapting a curriculum to suit specific conditions. These conditions can be grouped into several different categories such as legal, political, social, cultural, geographical and economic (Ayalew et al., 2012; Tedre, Sutinen, Kahkonen & Kommers, 2003; Tedre et al., 2009). Research on contextualisation of computing curricula in Africa has focused on countries such as Botswana (e.g. Ayalew et al., 2012), Ethiopia (e.g. Bass & Heeks, 2011), Nigeria (e.g. Dasuki at al., 2015) and Tanzania (e.g. Tedre, Suitnen, Kahkonen & Kommers, 2003; Tedre et al., 2009; Vesisenaho, Islas, Tedre & Sutinen; 2006a). This research has tended to focus on describing how contextualisation takes place or identifying the challenges associated with contextualisation. Very little research has been conducted on these topics in South Africa. Given that African countries have different contextual realities the findings from other countries may not be applicable to South Africa (Larsson & Boateng, 2009). There is therefore a need to conduct research specifically for the South African context. The aim of this research is to help meet that need.

1.6 Research aims and questions

The aim of this research is to examine one case of the adoption and contextualisation of an international computing curriculum at a South African university in order to improve the understanding of this process for literature as well as practice. This research will focus on Information Systems at the undergraduate level. This research will attempt to answer the following research questions:

1) How has an international computing curriculum been adopted and contextualised by a South African university?

2) What challenges have been encountered by a South African university while adopting and contextualising an international computing curriculum?

To answer these questions the following research objectives must be met:
1) Critically evaluate literature on the adoption and contextualisation of international computing curricula in African countries
2) Derive a research framework to study the adoption and contextualisation of an international computing curriculum at a South African university
3) Explore processes, practices and staff views related to the adoption and contextualisation of an international computing curriculum at a South African university
4) Identify the challenges that can be encountered when adopting and contextualising an international computing curriculum at a South African university

1.7 Research justification

South Africa faces many challenges which ICT may be able to help address such as poverty, unemployment and disease. South Africa's population is only 0.7% of the world's total population but accounts for 17% of the world's HIV and AIDS cases (Knijn & Slabbert, 2012). In 2013 the unemployment rate was 25.2% while more than 60% of people between the ages of 18 to 24 live below the poverty line as of 2010 (Altman, Mokomane & Wright, 2014; Oluwajodu, Blaauw, Greyling & Kleynhans, 2015). Although ICTs alone cannot eliminate socio-economic challenges, they may help to reduce the extent of these challenges. For example, ICTs can enable companies to expand into new markets thereby generating employment and reducing poverty, mobile devices can be used to make healthcare more accessible and online education can be used to improve the quality of distance education making quality education more accessible (Mashile & Pretorius, 2003; Norris, Swartz & Tomlinson, 2013; Sithole et al., 2013).

A shortage of ICT skills is seen by the South African government as an obstacle to meeting developmental goals outlined in several plans South Africa has committed to such as South Africa's National Development Plan and the African Union's New Partnership for Africa's Development (NEPAD) framework (Department of Labour, 2008; Plaatjies & Mitrovic, 2014). The government and the private sector have recognised this problem and implemented several interventions. For example the government has promoted subjects such as computer literacy, mathematics and science in public schools. The government has also included ICT skills as part of the National Skills Development Strategy framework which is a national plan for skills development within the country and included ICT related occupations in the Critical Skills work visa list which will make it easier for foreign ICT professionals to find work in South Africa (Langmia, 2006; Lotriet, Mathee & Alexander, 2010; ISETT Seta, 2011). The private sector has contributed through the creation of ICT internship programs and ICT training academies while higher education institutions have increased enrolment and graduation rates in the fields of science, engineering and technology (ConVista, 2015; Ponelis et al., 2012; UCS technology Services, 2015). Despite such efforts South Africa still faces an ICT skills shortage (Joburg Centre for Software Engineering, 2014).

This research argues that if international computing curricula adopted in South African universities are not properly contextualised the ICT skills shortage in South Africa may be worsened. It is therefore of academic and practitioner interest to conduct research on contextualisation of international university computing curricula in South Africa.

1.8 Intended contributions of study

This research has the following implications for academia and practice:

1) The research addresses the lack of research in South Africa on adopting and contextualising an international computing curriculum.
2) The research sheds light on how a South African university may adopt and contextualise an international computing curriculum and identifies related challenges.
3) The research puts forward a theoretical framework for studying the adoption and contextualisation of an international computing curriculum in South Africa.

1.9 Structure of research report

This research report contains six chapters. This chapter is the introduction which has explained the background to the research and put forward the research argument. Chapter 2 is a literature review which consists of the definition of important concepts, a review of the relevant literature and the research framework. Chapter 3 addresses the methodology employed in this research including the research philosophy and design, data collection and analysis as well as the trustworthiness and credibility of the research. Chapter 4 describes the results of the data analysis according to the research framework. Chapter 5 discusses the interpretation and implications of the research. Chapter 6 concludes the research report and makes recommendations for future research. Appendix A is a table of contextual factors uncovered in the literature review. Appendix B is a set of questions that were used to guide the research interviews. Appendix C is a sample of the coding and analysis of the interview data. Appendices D, E and F are sample letters that were sent to respondents to elicit participation and obtain consent. Appendix G is a comparison of the undergraduate IS degrees offered by the university which was the subject of this study.

CHAPTER 2

2. Literature review

The research problem outlined in the introduction argues that since African countries are considered developing countries their socio-economic needs are greater than those of developed nations. These socio-economic needs can be addressed to a certain extent by ICT however a shortage of ICT skills is hampering the ability of African nations to take advantage of ICT. While this shortage is a global challenge in Africa it is compounded by challenges in ICT education. The concepts and technologies typically focused on in ICT education predominantly reflect developed world views and needs. As a result they are often incompatible with African contexts. This study explores how ICT education can be made more suitable to the African context with a particular focus on international computing curricula in South Africa.

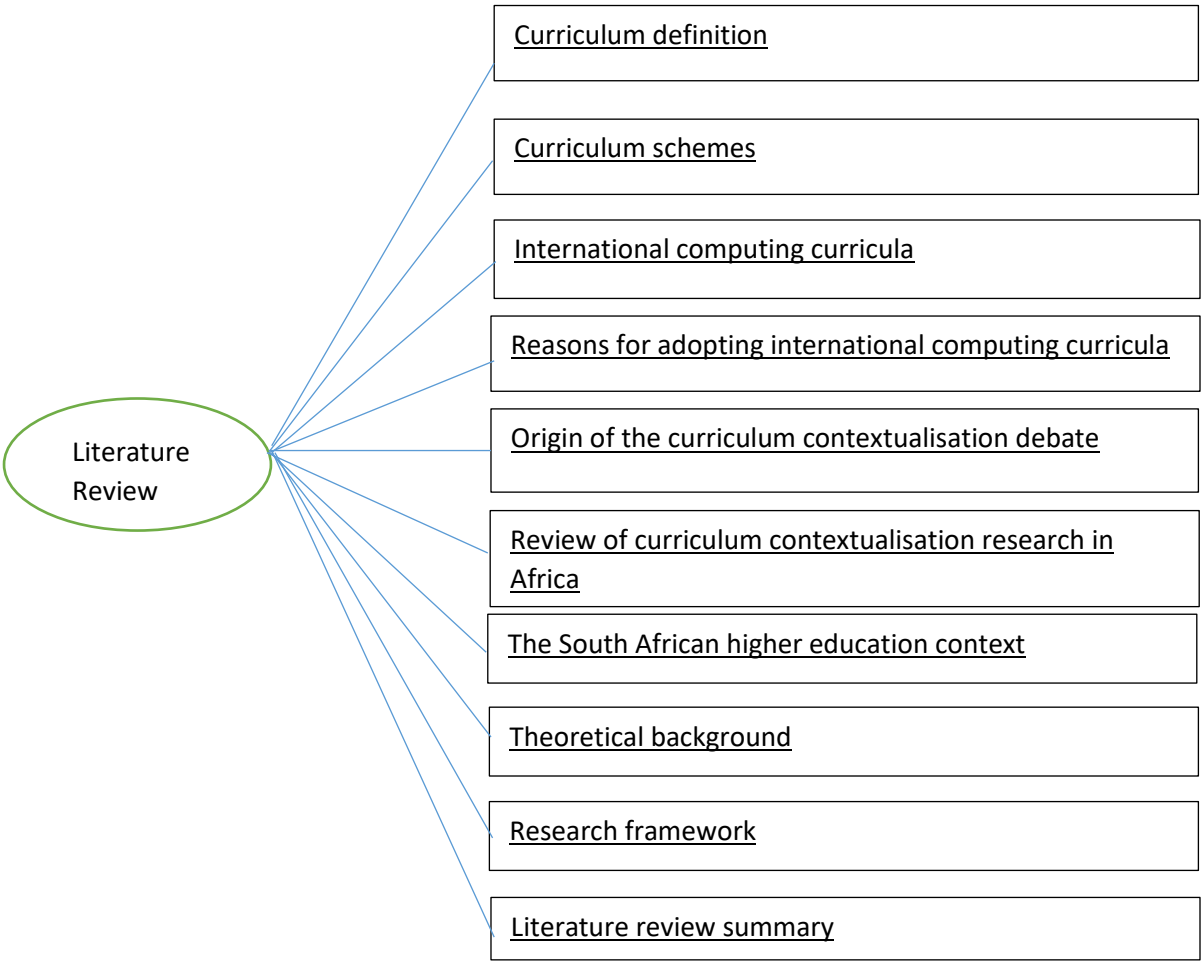


Figure 2: The structure of the literature review

The purpose of this literature review is to address the first and second research objectives which are 1) to critically evaluate literature on the adoption and contextualisation of international computing curricula in African countries and 2) to derive a research framework to study the adoption and contextualisation of an international computing curriculum in South Africa. Figure 2 above shows the structure of this chapter.

Given that this study is centred on international computing curricula this chapter begins by defining the terms 'curriculum' and 'curriculum schemes'. The concept of international computing curricula is then explained along with the reasons why universities, particularly in Africa, make use of them. The origins of the debate surrounding contextualisation of international computing curricula are then explored followed by a review of past research on curriculum contextualisation in Africa. The chapter then describes the South African higher education context as that forms part of the research context. The theoretical background of the research framework is then introduced and the research framework is outlined. The chapter concludes with a summary of the literature review.

2.1 Curriculum definition

There are several definitions of the term "curriculum" in academic literature. Kelley et al. (2008) describe curriculum as a plan that an educator follows in order to teach a student certain knowledge or skills. The education plan consists of four elements: a specification of what must be taught such as a list of courses, guidance on how educators must teach in the classroom, a description of what students will experience and a description of how to assess students (Kelley et al., 2008). Au (2007) describes curriculum as being made up of the knowledge content of a particular subject, the organization and presentation of knowledge content and the way the knowledge content is to be communicated (Au, 2007). According to Tonkaboni, Yousefy and Keshtiaray (2014) a curriculum is a teaching guide that consists of learning outcomes, learning materials and learning activities (Tonkaboni, Yousefy & Keshtiaray, 2014). These definitions suggest that a curriculum consists not only of what students must be taught but how they must be taught and assessed as well (Ahmadi & Lukman, 2015).

A curriculum refers to a program of study aimed at achieving particular educational objectives (Fahey, 2012). A curriculum consists of the knowledge to be taught, the structure of curriculum in terms of which courses are taught when, the teaching methods that can be employed and the assessment methods that can be used.

2.2 Curriculum schemes

A curriculum is specified through a curriculum scheme which is a document which describes what a specific curriculum entails. Van Veen et al. (2004) define three types of curriculum schemes: curriculum guidelines, curriculum frameworks and model curricula (Van Veen et al., 2004). Curriculum guidelines provide advice and suggestions which assists in developing a curriculum. A curriculum framework provides rules that must be followed in the

development of a curriculum (Van Veen et al., 2004). A curriculum framework is more prescriptive than a curriculum guideline. Lastly, they describe a model curriculum which contains significant detail about a curriculum. A model curriculum is designed to be flexible and can be implemented as a degree program (Van Veen et al., 2004).

The research site for this study is a university that uses an international computing curriculum called IS2010. The authors of the IS2010 curriculum scheme describe IS2010 as a model curriculum (Topi et al., 2010). The detail of IS2010 will be described in the results chapter.

2.3 International computing curricula

An international computing curriculum is typically developed by international professional and scientific bodies such as the Association for Information Systems (AIS), Institute for Electrical and Electronics Engineers (IEEE) or the Association for Computing Machinery (ACM) to provide guidance to educators developing computing programs (Cassel, Davies, LeBlanc, Snyder & Topi, 2008; Ponelis et al., 2012). The first international computing curriculum guideline was published in 1968 by the ACM (Bogoiavlenski, 1997). Called Curriculum 68, it was created at a time when the computing field was considered a single field without any sub-specialisations (Cassel et al., 2008). The field of computing has subsequently evolved into 5 different subfields namely computer science (CS), information technology (IT), information systems (IS), software engineering (SE) and computer engineering (CE) (Lunt & Ekstrom, 2008). In the field of IS some of the recent curriculum schemes are IS2002 and IS2010 (Bell, Mills & Fadel, 2013). IS2010, the subject of this study, differs from its predecessor in that it specifies elective courses. This is intended to provide educators with the flexibility to adapt the curriculum to their local needs (Topi et al., 2010).

2.4 Reasons for adopting international computing curricula

Universities in Africa and the rest of the world adopt international curricula for several reasons some of which are linked to globalisation. As the world becomes increasingly interconnected higher education globally is in turn being pressured to provide education that meets global needs and standards (Meyer, Bushney & Ukpere, 2011). From an economic perspective a local workforce with internationally recognised qualifications makes the country more attractive for foreign investment (Meyer et al., 2011). From a student perspective an internationally recognised qualification is attractive as it increases their chances of being able to find work in a different country (Mpinganjira, 2012). There is also a perception in developing countries that international qualifications improve prospects of finding local employment (Garwe, 2015). A possible reason for this is the fact that several companies in countries such as South Africa have an international footprint potentially increasing the demand for students who can operate in an international work environment (Meyer et al., 2011).

Globalisation has also led to an increase in the number of students who study outside of their home country (international students). International students are sought after by many countries because they can make valuable economic contributions. For example in the 2008/2009 academic year it is estimated that foreign students and their dependents contributed US$17.6 billion to the United States economy (Mpinganjira, 2012). For universities, international students are important because they can elevate the global rankings of universities. University rankings such as the Times Higher Education Supplement include the proportion of students who are international as one of their ranking criteria (Marginson, 2007). Rankings in turn have an impact on a university's ability to attract research funds and student talent (Souto-Otero & Enders, 2015). Research has shown that international students tend to favour institutions that offer international qualifications further motivating universities to adopt international curricula (Chimucheka, 2012; Mpinganjira, 2012).

2.5 Origin of the curriculum contextualisation debate

The debate surrounding the contextualisation of international computing curricula in African countries is part of a larger debate involving the development of contextually relevant computing curricula in African countries regardless of whether or not they are derived from international curricula guidelines. The debate around contextualisation of computing curricula is arguably informed by the field of ICT for Development (ICT4D). ICT4D is the use of ICT for socio-economic development (Supriya, Sebastian & Nanath, 2014).

One example of an ICT4D initiative is the implementation of telecentres in rural Peru. Telecentres are public facilities which provide access to ICT. In 2003 telecentres were built in eight rural communities in the Northern Peruvian Andes giving people there internet access for the first time (Andrade & Urquhart, 2010). Another example is an information literacy training programme conducted in 2010 close to Pretoria, South Africa. The aim of the project was to train teachers at the Valley of Hope Primary School on how to use computers that had been donated to their school. The project was implemented by University of Pretoria in conjunction with UNESCO (Fourie & Krauss, 2011).

There are several themes in ICT4D such as defining the concept of "development", evaluating success of ICT4D projects, the concepts of ICT4D failure and success, the importance of context and the relationship between ICT and development (ICTD) (Hatakka & De, 2011). According to Avgerou "*…all ICTD research places emphasis on the socio-economic context of ICT innovation as a source of influence on the shaping of technologies and their consequences*" (Avgerou, p2, 2010). The emphasis on context is a result of lessons learnt from failed ICT4D initiatives. Heeks (2002) mentions several case studies in developing countries of failures of ICT4D initiatives. Although he concedes that there is a lack of strong evidence he argues that these case studies are indicative of high rates of failure of ICT4D initiatives in the 1990s and early 2000s (Heeks, 2002). Heeks (2010) partially attributes these failures to the fact that the

ICT artefacts used were designed in developed countries by people who lacked understanding of the local realities in which the artefacts were implemented.

Some researchers apply this argument to curriculum contextualisation research by considering international computing curricula as ICT artefacts (Bass & Heeks, 2011). As explained in the introduction the bodies responsible for creating such curricula are dominated by western membership (Bass & Heeks, 2011). As a result the curricula are designed by people who lack an understanding of the African context. This results in computing curricula that does not suit the specific needs of African countries (Dasuki et al., 2015).

2.6 Review of curriculum contextualisation research in Africa

Previous sections have explained the importance of international computing curricula in enabling universities to stay competitive while acknowledging the challenge that using such curricula can present for African universities. This section will discuss existing research on the contextualisation of computing curricula in Africa. Even though the focus of this study is on *international* computing curricula it is important to review the literature on computing curricula generally as international computing curricula are part of that discourse. Of particular interest are research frameworks or models and research designs as these provided both guidance for this research project and serve as useful background to the subsequent chapters in this study.

Vesisenaho defines curriculum contextualisation as *"…a way of taking the local environment into account when planning and implementing ICT education. It is a need based approach, to meet the local needs of the society and development"* (Vesisenaho, 2010: 5). In order to contextualise a curriculum one must consider factors that impact a curriculum's ability to meet local needs (Ayalew et al., 2012). In this study such factors are referred to as contextual factors. According to Tedre et al (2009) contextual factors include environmental, cultural and technical factors (such as infrastructure and skills challenges). Ayalew et al believe contextual factors consist of "*previous knowledge of students, relevance of the curricula to geographical, technological, and socio-economic environment where the graduates are going to work and the culture and society in which most of the students are going to work*" (Ayalew et al., 2012, p. 4). Larsson and Boateng describe contextual factors as economic, cultural, social and political conditions (Larsson & Boateng, 2009).

Appendix A is a table that summarises the contextual factors that were identified in various studies. The table shows that different studies emphasise different contextual factors. A possible reason for this is that even though African countries may face similar challenges they still have different socio-economic development needs and priorities hence certain factors will be more important in some countries than others (Larsson & Boateng, 2009). As Tedre, Kemppainen and Ngumbuke say *"…all countries face challenges that are unique to their specific sociocultural, economic, geographic, environmental, political, and technical context*" (Tedre et al., 2011, p1).

Several models and frameworks have been used by previous studies to investigate curriculum contextualisation in Africa. One such model is the CATI model developed by Vesisenaho, Kemppainen, Islas, Tedre and Sutinen (2006a) which is depicted in figure 3 below.

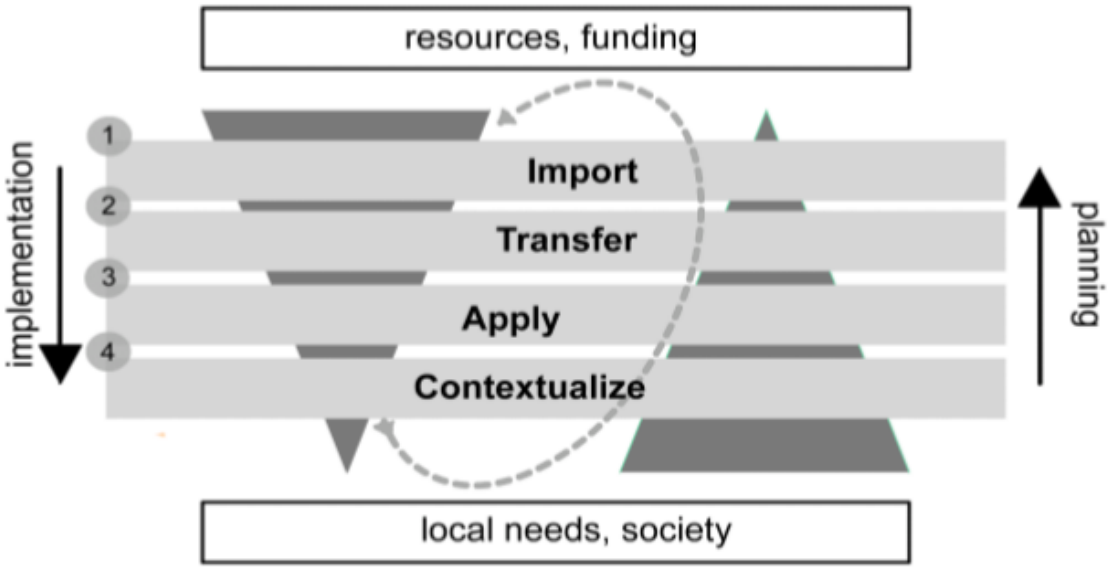


Figure 3: CATI model for planning and implementing sustainable ICT projects within higher education (Vesisenaho et al., 2006a).

CATI was designed for planning and implementing sustainable ICT projects within higher education (Vesisenaho et al., 2006a). CATI is an acronym for Contextualise, Apply, Transfer and Import which represent four stages that the planning and implementation processes go through. Import represents the use of technology from a different context without any local needs analysis. Transfer is when the technology has potential to meet local needs but the needs analysis is weak (Vesisenaho, Duveskog, Laisser & Sutinen., 2006b). Apply is when technology is being utilized in a way that demonstrates the users have embraced the technology and have applied it to address their needs. Contextualise is a deeper and more permanent level than Apply where the technology is now rooted in the local context and serves the needs of other users who were not exposed to the technology originally (Vesisenaho et al., 2006a; Vesisenaho et al., 2006b).

The planning process goes from contextualise to import while the implementation process goes from import to contextualise (Vesisenaho et al., 2006a). This means that in the planning process the first step is to analyse local needs (contextualise), generate ideas to address those needs (apply), specify what each idea requires (transfer) and then create a plan in order to implement the project (import). Once the plan has been created the technology can be obtained (import), then installed (transfer), adopted by the users as they learn the technology (apply) and finally used by users to address local needs (contextualise) (Vesisenaho et al., 2006a).

Vesisenaho et al. (2006b) applied the CATI model to the planning and implementation of a programming course at a Tanzanian university. The model was applied by examining individual elements of the course implementation to determine what level they fall into, what challenges have been encountered and make recommendations to address those challenges. For example one element in the implementation process was teaching arrangements. Initially the teaching was conducted by a teacher of Western origin which meant teaching arrangements fell into the Transfer category. A suggested solution was to use local teachers and offer them online support from the Western teacher (Vesisenaho et al., 2006b).

Larsson and Boateng (2009) developed a framework based on ICT for development (ICT4D) literature for adapting an international IS undergraduate curriculum to a sub-Saharan African (SSA) country. The model is a set of questions which encapsulate the considerations required when adapting an international IS curriculum. The considerations are classified into 4 groups: curriculum content, the local and societal factors that can affect IS education, sustainability issues that must be factored into the curriculum and the current state of the local ICT industry (Larsson & Boateng, 2009). Examples of the questions in the model are:
"*What present local factors can be identified as hindering the development of IS undergraduate education?"*
"What career tracks would be feasible to aim at as target groups for the undergraduate education?" (Larsson & Boateng, 2009:19).

This framework was applied by Ayalew et al. (2012) at the University of Botswana when Ayalew et al. (2012) were developing an IS undergraduate curriculum (Larsson & Boateng, 2009).

Bass and Heeks (2011) created a model based on the design-reality gap model developed by Heeks (2002). The design-reality gap framework is derived from ICT4D literature and is used to analyse the implementation of ICT projects in developing countries. Bass and Heeks (2011) modified the model for use in examining curricula implementation in developing countries. The Bass and Heeks (2011) model is referred to as the OPTIMISM model which is an acronym for the eight dimensions that make up the model: objectives and values, processes, technology, information, management systems and structure, investment resources, staffing and skills and milieu.

Bass and Heeks (2011) used the OPTIMISM model in a multi-site case study conducted at universities in Ethiopia to analyse the adoption of computing curricula developed by the ACM and IEEE. For each dimension they compared the desired outcome with the reality they found. In doing so they highlighted challenges that were encountered and made recommendations as to how to address those challenges. For example under investment resources the Ethiopian government had planned to invest more financial resources in higher education. In reality there was additional money being provided to universities but not for the adoption of the computing curricula (Bass & Heeks, 2011).

Other studies employed their own frameworks which consisted of contextual factors derived from literature on curriculum contextualisation and information regarding local needs in their respective countries (e.g. Fendler & Winschiers-Theophilus, 2010; Ponelis et al., 2012; Tedre et al., 2008; Tedre et al., 2009). With the exception of the CATI model one can observe a common method in the way the frameworks and models are developed. This method involves deriving contextual factors from literature and using those factors as a research lens. The same method is used in this study to derive a research framework.

Research on curriculum contextualisation in Africa has been conducted in Botswana (e.g. Ayalew et al., 2012), Ethiopia (e.g. Bass & Heeks, 2011), Nigeria (e.g. Dasuki at al., 2015), Namibia (e.g. Fendler & Winschiers-Theophilus, 2010) and Tanzania (e.g. Tedre, Suitnen, Kahkonen & Kommers, 2003; Tedre et al., 2009; Vesisenaho, Islas, Tedre & Sutinen, 2006). There is sparse research on curriculum contextualisation in South Africa. One study that addresses curriculum contextualisation in South Africa is Ponelis et al. (2012). Ponelis et al. (2012) conducted a multi-site case study on how contextual realities affect the development of computing curricula at four South African universities. The authors found that although each university was different there were common themes that emerged across the universities. These included the emphasis on soft skills training, the lack of direct participation from industry practitioners and the focus on entrepreneurship due to the high youth unemployment (Ponelis et al., 2012).

The study by Ponelis et al. (2012) has several shortcomings. Firstly in their literature review the Ponelis et al. (2012) identified several contextual factors such as political, socio-cultural, regulatory, student demographics, expectations, access to infrastructure and staff capabilities. However several of these factors were simply stated without justification as to why they were important. Secondly some factors were reflected in some case descriptions but not in others and there was no explanation as to why that was the case. Thirdly there was a lack of in depth analysis as to how each contextual factor impacted the curriculum at each university. The findings were mainly descriptions of how the different universities derived their curricula but with little detail regarding the challenges encountered and possible solutions. In addition the universities profiled by Ponelis et al. used a combination of international computing curricula and locally developed curricula. The disciplines investigated were Information Technology Service Management, Information Technology and Computer Science (Ponelis et al., 2012).

From the literature several observations can be made which influence the choices made in this study:

Observation 1: There are many different contextual factors that impact computing curricula in Africa. Some research frameworks use contextual factors that are important in specific contexts (e.g. Tedre et al., 2008), while other frameworks use contextual factors that are

thought to be applicable across different African contexts (e.g. Bass & Heeks, 2009; Larsson & Boateng, 2009). The CATI model does not identify contextual factors at all but leaves it up to the researcher to decide what factors are important. Given that each country has a unique context there is clearly a need for a framework designed specifically for the South African context. The Ponelis et al. (2012) study does have such a framework but lacks justification as to the choices that inform that framework. Given that other frameworks are not applicable a new framework was therefore derived in this study. The framework was derived using a similar method employed in other studies (e.g. Bass & Heeks, 2011; Ponelis et al., 2012) which is to derive contextual factors from curriculum contextualisation literature along with information regarding the local context.

In deriving the framework many contextual factors were initially uncovered. In order to structure the factors and consolidate them into a more manageable number it was decided to incorporate the Curriculum Responsiveness Framework created by Moll (2004). This framework was created in order to understand the meaning of the term curriculum responsiveness and how it can be investigated in the context of South African higher education. Curriculum responsiveness is the degree to which a curriculum caters to the needs of a particular society or context (Maphosa, Mudzielwana & Netshifhefhe, 2014). Curriculum responsiveness is an appropriate topic to borrow from given that curriculum responsiveness recognises the importance of context to curriculum development and thus aligns with one of the arguments that underpin this study. Moll (2004) derived 4 categories for curriculum responsiveness which are applicable to South Africa namely, economic responsiveness, cultural responsiveness, disciplinary responsiveness and learning responsiveness (Moll, 2004). The categories are the different lenses through which curriculum should be viewed to make it more responsive. Therefore to ensure that a curriculum is responsive to the South African context, one must analyse the curriculum from an economic, cultural, disciplinary and learning perspective (Moll, 2004).

Observation 2: In terms of research designs the popular method seems to be the case study. Some papers conduct multi-site case studies (e.g. Bass & Heeks, 2011; Ponelis et al., 2012) while others employ single-site case studies (e.g. Ayalew et al., 2012; Dasuki et al., 2015; Tedre et al., 2009). The drawback of multi-site case studies is that they sometimes do not obtain the same depth and richness that a single site can obtain. This study will employ a single-site case study in order to obtain more depth and richness than Ponelis et al. (2012).

Observation 3: There is little research on this topic in South Africa with one paper, Ponelis et al. (2012), found. Given that local needs differ from country to country this is a gap that needs addressing as the findings of other studies may not be applicable to South Africa. This study hopes to add to the small body of knowledge on curriculum contextualisation in South Africa.

Ponelis et al. (2012) included both locally developed and international curricula in their study. This study will build on the contribution of Ponelis et al. (2012) by focusing solely on an international curriculum.

The next section explores the South African higher education context as that is the context of this research.

2.7 The South African higher education context

The Department of Higher Education and Training (DHET) is the government department responsible for higher education in South Africa. The department's mission is to develop educated and skilled individuals who have the capacity to compete in the economy and contribute to South Africa's development (Department of Higher Education and Training, n.d). The department is supported by the Council on Higher Education (CHE) which is a statutory body responsible for quality assurance in higher education and advising the minister on matters of higher education (Council on Higher Education, n.d.). The quality assurance function of the CHE is performed by the Higher Education Quality Committee (HEQC) which is also a statutory body that forms part of the CHE (Le Grange, 2009). The HEQC is responsible for activities such as institutional audits and accreditation (Council on Higher Education, n.d.).

Higher education in South Africa consists of both private and public institutions. Currently there are 26 public universities classified as follows: 11 traditional universities, 9 universities of technology and 6 comprehensive universities (Staff Writer, 2015). Traditional universities predominantly offer academic degrees including Bachelors, Honours, Masters and PHDs although they do offer diplomas as well. Universities of Technology primarily offer vocational diplomas and Bachelor of Technology degrees at undergraduate level and a small number of postgraduate degrees. A comprehensive university combines the offerings of traditional universities and universities of technology (Ponelis et al., 2012).

In terms of legislation, education in South Africa is guided by the National Qualifications Framework (NQF). The NQF is a set of guidelines for classifying academic and professional qualifications (Delport, 2009). The NQF consists of 10 levels numbering 1 to 10. Levels 5 to 10 refer to higher education qualifications and represent the Higher Education Qualifications Framework (HEQF). Levels 5 to 7 are undergraduate qualifications while 8 to 10 are postgraduate qualifications (Department of Education, 2007). According to the NQF Act 67 of 2008 the responsibility for implementing the NQF is that of the South African Qualifications Authority (SAQA) (South African Qualifications Authority, 2014). SAQA is a legal entity responsible for the registration of standards and qualifications in South Africa (Delport, 2009).

2.7.1 Purpose of higher education in South Africa

In 1997 the then education department of South Africa published a white paper explaining the purpose of higher education in South Africa which is:

- The development of individuals' intellectual abilities so as to enable them to take advantage of economic opportunities the country has to offer. In doing so higher education will be a vehicle for addressing economic inequality within the country.
- To equip people with the necessary high-level skills and knowledge necessary to develop the economy and society.
- To contribute to the development of citizens who are open-minded, responsible and contribute positively to society.
- To generate and distribute knowledge in all academic disciplines through teaching, research and learning (Department of Education, 1997).

In looking at these goals it is evident that government has adopted three educational philosophies with regards to higher education, namely progressivism (education as a means to develop the individual), social reconstructivism (education as a tool for social change) and instrumentalism (education as a means for skills training) (Goodman & East, 2014).

2.7.2 Challenges facing South African higher education

The legacy of apartheid coupled with South Africa's developmental needs has led to several challenges in higher education. A review of South African literature on this topic yielded four broad challenges:

Inequality amongst universities

Under apartheid universities were divided along racial and ethnic lines and not supported evenly in terms of resources (Le Grange, 2009). This resulted in historically white institutions becoming well-resourced, internationally recognised institutions while historically black institutions developed into lesser-known, poorer institutions (Ponelis et al., 2012). To address this government has focused its attention on the development of previously disadvantaged universities with R12 billion being set aside for higher education infrastructure (Jordaan, van Heerden & Jordaan, 2014; Singh, 2015)

Access to higher education

Challenges in the quality of secondary education in previously disadvantaged communities coupled with the economic exclusion of these communities limited access to universities for large portions of the population. Through interventions such as National Student Financial Aid Scheme (NSFAS) accessibility of higher education has been improving since 1994 with 65% of the student population being black South Africans as of 2009 (Ponelis et al., 2012). By 2012 there were over 900 000 students enrolled at South Africa's 26 public higher education institutions and government hopes to increase this to 1.5 million by 2030 (Jordaan et al., 2014).

Language of instruction

During apartheid, because of racial and ethnic segregation, South Africa universities typically had one dominant language of instruction which was English or Afrikaans. After apartheid

there was a restructuring of higher education which initially reduced the number of higher education institutions from 36 to 23 (Makalela & McCabe, 2013). One piece of legislation that emerged from that restructuring was the Language Policy on Higher Education (LPHE) which promoted multilingualism within universities. In response the formerly Afrikaans universities have become Afrikaans-English institutions while the English speaking universities have remained English (Makalela & McCabe, 2013). Given that over 80% of the country is African and less than 1% of those speak English or Afrikaans at home the absence of ethnic South African languages as mediums of instruction presents a challenge for African students (Casale & Posel, 2011). For example the University of Limpopo has campuses in the rural areas of Limpopo. The majority of the student body comes from Limpopo province where over 90% of the population lives in rural areas. The University expects incoming students to have a strong grasp of English which in reality is not the case given the background of the majority of the students. In response to this problem the university has created English literacy programmes to assist students (Makalela & McCabe, 2013).

Student throughput rates

In South Africa studies indicate that up to 30% of university students drop out in their first year while a further 20% dropout in their second year (Jordaan et al., 2014). One of the main reasons for dropping out of university in South Africa is a lack of funding. Government does provide student funding through NSFAS but this is insufficient to meet the needs of all students (Jordaan et al., 2014). In some cases students who are funded do not complete their degrees which essentially means that the money invested in their education is lost (Cele & Menon, 2006). Many students also struggle to complete their degrees in the stipulated time. This can partially be attributed to the shortcomings in the secondary schooling system which result in some students arriving at university lacking in basic skills such as reading, writing and critical thinking (Jordaan et al., 2014). Foundation programmes have been created to help students in this regard. Foundation programmes are one year programmes that students enrol in at the beginning of their degrees. These programmes contain a mix of degree specific content and literacy and critical thinking skills development designed to improve students' ability to succeed at university. These interventions are funded by the DHET and form part of higher education and university policies (Bernard, 2015).

As the higher education sector in South Africa expands these and other challenges are exacerbated (Singh, 2015). This has led to greater focus on the development of previously disadvantaged institutions, the creation of new institutions, improving the quality of teaching and learning and contextualising curriculum (Singh, 2015). As noted in the introduction, contextualisation of computing curriculum will be the focus of this study. The next section will identify the relevant factors for the research model.

2.8 Theoretical background

Appendix A shows 24 contextual factors that were uncovered in the literature. In order to provide structure to the framework and categorise the contextual factors in a manner that will guide the data collection this study draws on literature from the topic of curriculum responsiveness. As described earlier, curriculum responsiveness is the degree to which a curriculum caters to the needs of a particular society or context (Maphosa et al., 2014) and consists of four categories namely, economic responsiveness, cultural responsiveness, disciplinary responsiveness and learning responsiveness (Moll, 2004). The curriculum responsiveness categories are described below. Within each category there are contextual factors which are classified under that category. The contextual factors are highlighted in bold. Some contextual factors appear under more than one category as these factors can be viewed through different lenses. Research literature is used to explain the importance of the contextual factors and how they relate to each other as well as the South African context.

2.8.1 Economic responsiveness

Economic responsiveness is the degree to which a curriculum responds to the skills needs of the economy (Moll, 2004). These skills are typically used by the different industries that form part of the economy. **Industry skills needs** are thus important because industry is a potential employer of students. One of the concerns of industry in South Africa is the shortage of ICT graduates which prevents organisations from fully utilising ICTs (Plaathies & Mitrovic, 2014). Another concern is the quality and relevance of the curricula (Calitz et al., 2010). Students are graduating with skills and competencies that do not match industry needs further exacerbating the ICT skills shortage (Calitz et al., 2010). Closely related to the needs of industry are the needs of **society**. Developing countries face many socio-economic challenges which ICT can play a role in addressing (Dlodlo, 2009; Larsson & Boateng, 2009). However in order for this to take place the appropriate skills need to available (Ayalew et al., 2012).

Only taking the needs of industry and society into account suggests that the needs of other stakeholders namely staff, students and government are unimportant which this research argues is not the case. The needs of these stakeholders must be taken into account holistically hence **stakeholder communication** is very important. In South African universities there are forums for such communication to take place. For example some universities have industry advisory boards. Industry advisory boards are forums where industry, academics and students gather to discuss industry issues and skills needs in relation to the curriculum (Calitz, Evert & Cullen, 2015a).

Student needs can fall into different curriculum responsiveness categories. In the economic responsiveness category student needs refers to student **expectations** which form part of the student needs and expectations factor. For many students the prospect of employment is more important than the pursuit of knowledge (Ponelis et al., 2012). Thus students increasingly expect higher education to prepare them for employment (Kroeze, Ponelis, Venter, Pretorius & Prinsloo, 2012). However in South Africa research has shown that higher

education is failing in this regard as ICT skills taught in higher education do not fully prepare students for employment (Calitz et al., 2010). Some students seek employment outside of their home country and therefore also expect their qualifications to have **international recognition** (Tedre et al., 2008).

Teaching staff are an important component of curriculum adoption (Ladwig, 2010). Ladwig (2010) identified factors related to teaching staff that need to be considered in order for curriculum change to be successful. These include educator beliefs about education, their pedagogical knowledge, content knowledge, teaching methods and research interests (Ladwig, 2010; Tedre & Kamppuri, 2009). In addition, the availability of staff needs to be taken into consideration. South Africa faces a challenge in attracting and retaining academic staff (Theron, Barkhuizen & du Plessis, 2014). The causes of this challenge include uncompetitive salaries, inadequate research funding, heavier workloads due to increasing student numbers and perceived unfairness in promotion practices (Theron et al., 2014).

In South Africa government is an important stakeholder in higher education as it is not only responsible for setting policy but also provides significant funding to the sector through research grants and student funding. One of the ways government expresses their desired outcomes is through **government regulation**. Academic qualifications offered by higher education institutions in South Africa must comply with the requirements outlined in the NQF (Kroeze et al., 2012). For a bachelor's degree a student must be equipped with the attributes outlined in level 7 of the NQF. Examples of these attributes include knowledge and understanding of one or more disciplines, ability to relate new knowledge to existing theory, the ability to use theory and evidence to solve problems, communication skills and group work skills (Kroeze et al., 2012; Maphosa et al., 2014).

Government regulations can sometimes be driven by political considerations. In South Africa a popular topic in the current **political environment** is transformation. Transformation of Higher Education in SA has several meanings. Some view transformation in terms of demographics and argue that representation of previously marginalised groups should be the priority. Others argue for a deeper definition of transformation that includes not only demographics but also tackles issues of privilege and power as well (Development Bank of Southern Africa, 2010). Proponents of the second view feel this is necessary because even if an institution is transformed in terms of numbers it is still possible for discrimination to occur. It is therefore important to view transformation as not just a process of making HE institutions representative but as an ideology that seeks to reduce the domination of one societal group over another (Development Bank of Southern Africa, 2010).

Practical examples of transformation related issues include challenges faced by women and black South Africans regarding success and discrimination, changing of university structures to promote equity and access and changing of curricula to reflect African needs and values (Botsis, Dominguez-Whitehead & Liccardo, 2013). In order to contribute to transformation within South African **society** higher education has been called upon to:

- expand access to disadvantaged groups such as people of colour, women and disabled people
- Promote diversity, tolerance and human rights within education institutions and externally
- Improve quality of teaching and learning and develop curricula that are responsive to the national and regional context (Development Bank of South Africa, 2010).

By focusing on industry needs economic responsiveness also suggests that the sole purpose of higher education is skills training. Moll (2004) cautions against this instrumentalist philosophy of education suggesting the development of knowledge and individuals is also an important function of higher education (Moll, 2004). Other education philosophies include progressivism (education as a means to develop the individual) and social reconstructivism (education as a tool for social change) (Goodman & East, 2014). The guiding philosophy of a curriculum is apparent in the curriculum objectives which set out what the curriculum outcomes should be for example imparting certain skills or developing certain attitudes in students. In order to contextualise a curriculum it is important to align the objectives of the curriculum with those of the degree programme that the curriculum will be used for. **Curriculum objectives and values** is thus another important factor to consider.

2.8.2 Cultural responsiveness

Cultural responsiveness is the level to which the cultural background of students and society is incorporated into the curriculum (Nkomo, 2014). Research has demonstrated the importance that cultural background has on teaching and learning, particularly **pedagogy**. Pedagogy is a term used to describe teaching methods (Khan & Law, 2015)**.** The pedagogy employed must align with the learning styles of students which are rooted in a student's **cultural** background. South Africa is a diverse country with an increasingly multicultural student population at higher education level (Jackson, 2013). The extent of the multiculturalism present in South African higher education made it a potentially difficult aspect to research, and it was consequently removed from the research framework. During the course of data gathering and analysis, cultural issues arose and so were included as an emergent category.

2.8.3 Learning responsiveness

Learning responsiveness is the degree to which the teaching, learning and assessment methods (**pedagogy**) accommodates the needs of students (Pade-Khene, 2015). Learning **Student needs** consist of **educational background of students** and **student motivation**. In South Africa students from previously disadvantaged groups have limited knowledge of computers as their primary and secondary schools generally do not have the resources to teach ICT subjects. In contrast wealthier, historically white schools have the resources to provide computing education to their students (Le Grange, 2009). As a result there is a disparity in computer skills amongst students who enrol in computing degree programs (Brown, Moola, Mugjenkar & Sands, 2008). If this disparity is not recognised and catered for

it can negatively impact the ability of students from poorer communities to succeed academically. Such challenges increase the need for academic support to be offered to students (Singh, 2015). Foundation programmes are an example of the kind of support mechanisms offered in South African universities (Jordaan et al., 2014). When contextualising a computing curriculum in South Africa educators must be cognisant of the different levels of computer literacy amongst students and the need to offer academic support to some students.

Student motivation refers to what drives students to engage in learning activities (Apiola, Tedre & Oroma, 2011). Are they actually interested in learning the content or do they simply want to pass the assignment? In their research on programming education in Tanzania Apiola et al. (2011) found that their students were mainly motivated by the need to pass assignments. One of the reasons for this was that students found the content irrelevant. This suggests that learning needs to be practical and perceived as relevant in order for students to engage. One way to achieve this is to employ a **problem oriented pedagogy** based on real challenges within the local context (Apiola et al., 2011).

The **language** of instruction can be interpreted to fall under student needs. In South Africa many institutions use English as the language of instruction. This can negatively impact students who are not fluent in English making language a relevant factor to consider (Apiola et al., 2011).

In order for students to be able to work as ICT professionals they need to have **practical skills** as well as theoretical knowledge so they not only know what to do but how to do it (Tedre et al., 2008; Tedre et al., 2009). The **pedagogy** thus needs a strong practical element in addition to the theoretical elements.

The pedagogy employed in a computing degree is partially affected by the infrastructure resources available at an institution. For example, practical lectures in a computer lab may not be feasible if there are insufficient computers to cater for an entire class at once. In South Africa, there is a lack of adequate infrastructure at some universities as mentioned in the previous section (Jordaan et al., 2014). Therefore **university infrastructure and financial resources** must be taken into account when determining the pedagogical methods to employ.

The **university structure** may also have an impact on teaching and learning because the faculty in which a degree program is situated may have an impact on aspects such as funding and decision making (Tedre et al., 2008). Having different departments offering different computing degrees may lead to competition for resources (Bass & Heeks, 2011).

When considering how to teach students (**pedagogy**) it is also important to consider what is being taught to students (**curriculum content**). As mentioned in the literature review ICT skills are divided into two broad groups called technical and non-technical skills (Ahmed et al.,

2012). However there is no universal agreement on what exactly these skills should include (Lee et al., 2002). Part of the reason for this is the fact that different countries have different contexts (Tedre et al., 2011). For example different countries may have different **socio-economic conditions**. In developing countries smartphone penetration may not be as high as that in developed countries. Therefore it may be beneficial to teach students how to make mobile applications for smart phones as well as more basic mobile devices so that both markets can be catered for (Tedre et al., 2011).

The **natural and technological environment** of the country may also need to be catered for in the curriculum content (Tedre et al., 2011). Mountainous regions may suffer from weak connectivity and areas that suffer heavy rainfall or snow may be vulnerable to unreliable electricity supply. The technological environment is relevant as developed countries tend to have more advanced ICT infrastructure than developing countries (Apiola & Tedre, 2011; Vesisenaho, 2010). Curriculum content in a developing context should be cognisant of this. An example would be in teaching web development. Students in a country with slow internet speed should be taught to develop websites that do not require large amounts of data to render in a web browser.

Given that some students desire to work both locally and internationally the challenge for computing educators is therefore to provide content that is both locally and globally relevant. Curricula such as IS2010 attempt to address this challenge by including both required and elective courses. The required courses cover knowledge the curricula authors feel an IS professional should possess regardless of their context while the elective courses allow for locally relevant subjects to be introduced (Topi et al., 2010).

The combination of core and elective courses offered also impacts the **level of specialisation** that can be achieved. Some computing disciplines allow for specialisation in different career tracks at undergraduate level. Examples of IS career tracks include business analyst, application developer and project manager (Topi et al., 2010). Offering career tracks in a developing country may not be constructive as ICT professionals face additional challenges that their counterparts in developed countries do not. Addressing these challenges requires a broad skillset as opposed to a specialised skillset (Tedre et al., 2011). Thus it may be more beneficial to provide ICT students with a more “all-round” and **interdisciplinary** education to make them more effective employees (Tedre et al., 2008; Tedre et al., 2011).

2.8.4 Disciplinary responsiveness

Disciplinary responsiveness refers to how responsive the curriculum is to changes in the underlying discipline (Pade-Khene, 2015). For example in the field of Information Systems there is a shift towards teaching more courses related to data management as data becomes more prevalent in society (Pade-Khene, 2015). To achieve this there needs to be a mechanism through which a curriculum is continuously evaluated and improved on the basis of research within the discipline (Tedre et al., 2008). This would keep the curriculum current and hence

make it sustainable. Obtaining accreditation is one way to keep curricula current. Accreditation is a quality assurance process which checks whether a degree programme or academic department meets certain criteria (Ponelis et al., 2012). **Curriculum evaluation and sustainability** is therefore an important factor to consider.

2.9 Research framework

This section will briefly define the contextual factors that will form the research framework and depict the research framework in a diagram. The definitions are based on the previous section. Some factors have been consolidated to form one broad factor. Where this has happened the constituent factors are shown in brackets The contextual factors are defined below.

2.9.1 Economic responsiveness

Curriculum objectives and values: The stated outcomes that the curriculum hopes to achieve as well as the implicit or explicit educational philosophy that underpins the curriculum.
Teaching staff: The number of teaching staff available, the skills and research interests of the staff and the staff attitudes towards the curriculum and education.
Industry skills needs: The demands from industry for graduates which possess certain skills, competencies and knowledge as well industry demands for more graduates.
Government regulation: Government policy such as transformation (*political environment*) and legislation related to higher education qualifications such as the NQF and HEQF.
Student needs: Student expectations of the course particularly whether it will prepare them for employment and whether the course has *international recognition*.
Society*:* The need for ICT professionals with the appropriate skills to address *socio-economic* challenges such as access to healthcare and education.
Stakeholder Communication: Mechanisms and forums such as industry advisory boards through which stakeholders can engage on curriculum related issues.

2.9.2 Learning responsiveness

Curriculum content: The subjects that are taught in the degree programme, the career tracks (*level of specialisation*) these subjects cater for and the *interdisciplinary* nature of the curriculum content. Whether the curriculum content prepares students for the *socio-economic, natural* and *technological environment* they will work in.
University infrastructure and financial resources: The availability of resources used for teaching and learning in a computing degree.
University structure: The organisational structure of the university in terms of which departments are situated in which faculties, what degree those departments are responsible for and the impact this may have on the curriculum.
Pedagogy*:* Teaching and assessment methods employed and areas of emphasis such as *practical skills*.

Student needs*:* The educational backgrounds and resulting academic support needs of students (*educational background of students*), motivation for learning (*student motivation*) and ways to improve student motivation such as using *problem oriented pedagogy*. Also includes *language* needs of students if they are not fluent in the language of instruction.

2.9.3 Disciplinary responsiveness

Curriculum evaluation and sustainability: The mechanisms used to ensure the curriculum is continuously updated and in line with trends in the computing field. Whether these mechanisms are based on research and if accreditation forms part of this process.

Figure 4 below depicts the research framework. The factors are grouped according to the responsiveness categories provided by Moll (2004) from which the factors have been derived.

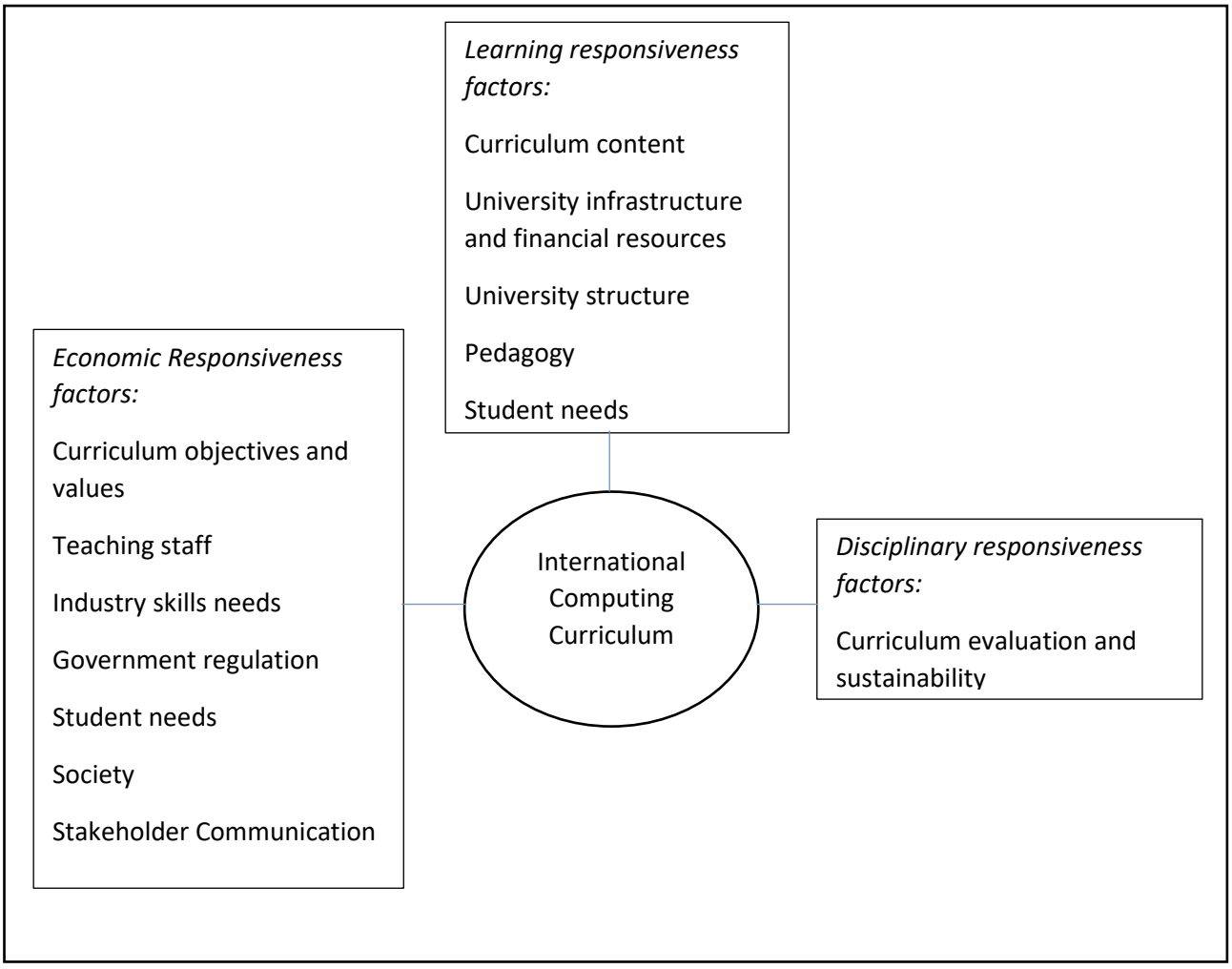


Figure 4: Factors to consider when researching the adoption and contextualisation of an international computing curriculum in South Africa.

2.10 Literature review summary

A curriculum refers to a program of study aimed at achieving particular educational objectives (Fahey, 2012). A curriculum consists of the knowledge to be taught, the structure of curriculum in terms of which courses are taught when, the teaching methods that can be employed and the assessment methods that can be used. A curriculum is specified in a curriculum scheme which is a document which specifies what a curriculum entails. Van Veen et al. (2004) suggest that there are three types of curriculum schemes: curriculum guidelines, curriculum frameworks and model curricula.

An international computing curriculum is a curriculum developed by international professional and scientific bodies such as the Association for Information Systems (AIS), Institute for Electrical and Electronics Engineers (IEEE) or the Association for Computing Machinery (ACM) to provide guidance to educators developing computing programs (Cassel et al., 2008; Ponelis et al., 2012). Universities in Africa and the rest of the world adopt international curricula for several reasons some of which are linked to globalisation such as competition for students. Some researchers argue that international computing curricula are designed by people who lack an understanding of the African context. This results in computing curricula that do not suit the needs of African countries (Dasuki et al., 2015).

Previous research on curriculum contextualisation in Africa has been conducted in countries such as Tanzania, Botswana, Ethiopia and Nigeria. Little in depth research has been conducted in South Africa on this topic. Given that local needs differ from country to country this is a research gap that needs addressing as the findings of other studies may not be applicable to South Africa. This research aims to address this research gap. Previous studies have derived their research framework from ICT4D literature, previous curriculum contextualisation literature and information on their local context. This study has derived a framework based on previous contextualisation studies, the South African context and curriculum responsiveness. The next chapter will outline the research methodology.

CHAPTER 3

3. Research methodology

The aim of this research is to examine one case of the adoption and contextualisation of an international computing curriculum at a South African university in order to improve the understanding of this process for literature as well as practice. The focus on South Africa is motivated by the lack of research on this topic as uncovered in the literature review chapter. The previous chapter outlined the research framework which was derived from the South African context, previous curriculum contextualisation research and curriculum responsiveness. The research methodology chapter explains how the research was conducted and the rationale behind the research methods that were employed in this research.

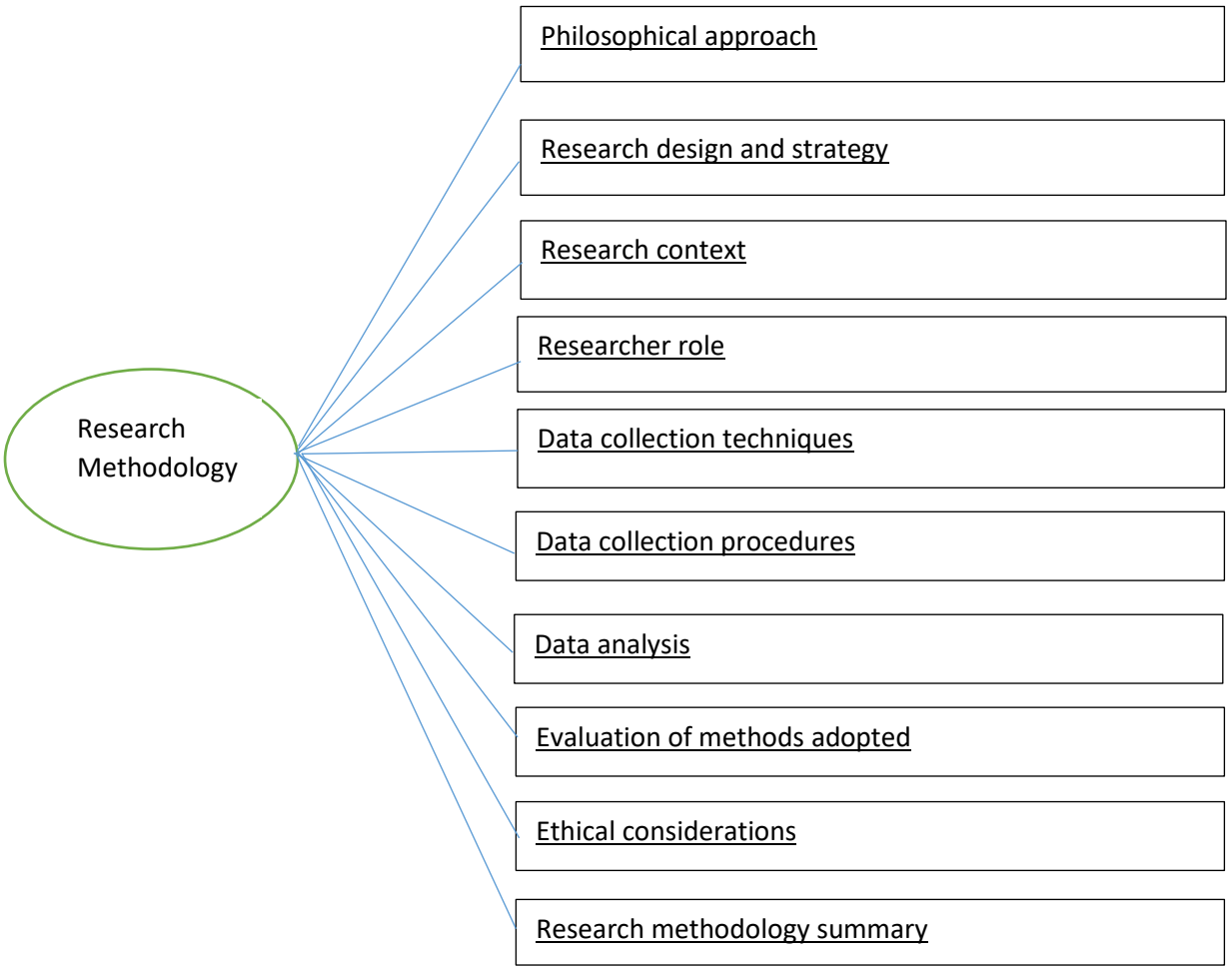


Figure 5: The structure of the methodology chapter.

This study is an exploratory case study which is guided by an interpretivist philosophy. The unit of analysis is the adoption and contextualisation of an international computing curriculum by a South African university. The first section of this chapter explains the philosophical approach employed in this study. The second section outlines the research design and strategy. This is followed by a description of the research context and then an explanation of the researcher's role. The data collection techniques and procedures are then discussed after which the data analysis in explained. The methodology is then evaluated followed by a description of the ethical considerations made in this study. The chapter concludes with a brief summary. Figure 5 depicts the structure of the methodology chapter.

3.1 Philosophical approach

This study adopts an interpretivist approach as the ontology and epistemology of interpretivism are appropriate for this study. Ontology can be defined as an assumption or set of assumptions that inform the way people view the world while epistemology are assumptions about the most effective way to investigate phenomena in the world (Bhattacherjee, 2012).

The interpretivist ontology argues that peoples' perception of reality is subjective. How people view reality depends upon the social context through which people interpret reality. Social context in terms of interpretivism refers to the values, beliefs and culture of a group of people (Walsham, 2006). This study adopts a similar philosophical view in that this study argues that how an international computing curriculum is implemented is subjective and depends on the contextual realities in which the curriculum is implemented and how those responsible for implementing the curriculum view the context and the curriculum itself. The epistemology of interpretivism is that the most effective way to investigate phenomena is to do so from the perspective of those people who are affected by the phenomena. As a result interpretivist findings are specific to a certain group of people and or situation and cannot be generalised to other groups of people with different characteristics (Walsham, 2006). Given that this study is focused on obtaining findings for a specific South African university the epistemological view of interpretivism is appropriate for this study.

Another reason for choosing an interpretivist approach is that the main alternative philosophy, positivism, is underpinned by ontology and epistemology which are incompatible with this study. Positivism assumes that reality is objective and is independent of people's perspectives (Bhattacherjee, 2012). In terms of this study this would mean adopting the position that all South African universities and all African universities face the same circumstances when adopting an international curriculum regardless of their contexts. Such a view conflicts with the literature on contextualisation which emphasises that higher education contexts within Africa are different and therefore present different challenges when adopting international computing curriculum (Larsson & Boateng, 2009). Positivism also assumes the best way to investigate phenomena is through a so called objective approach

which attempts to discover findings that can be applied to different contexts (Bhattacherjee, 2012). This approach would be incompatible with this study as this study aims to uncover findings that are specific to a particular South African university based on their specific experiences (Bhattacherjee, 2012; Lin, 1998, O'Donaghue, 2006).

3.2 Research design and strategy

This study adopted an exploratory research design. Exploratory research aims to make new discoveries about phenomena and thus tends to focus on phenomena on which little research has been done (Mabuda, 2009). An exploratory design is therefore appropriate because, as outlined in the literature review, there is very little research on adopting and contextualising international computing curricula at South African universities. Exploratory studies typically employ qualitative methods which are used to obtain deep meaning and understanding from the perspective of the research subject (Creswell, 2013). Qualitative methods are appropriate for this study as this study is concerned with the views and perspectives of the research informants.

The alternative research designs are not appropriate for this study. A descriptive design is inappropriate because the research aim and the type of data used in descriptive research are incompatible with this study. Descriptive research only describes phenomena and does not seek to understand it as exploratory research does. The data collected in a descriptive study would therefore not provide the necessary richness to meet the objectives of this study. Experimental research is concerned with establishing cause and effect between variables that are already defined (Bhattecherjee, 2012). This research has neither well defined variables nor aims to establish causality. Experimental research also requires the researcher to exert a high level of control on the research environment which will not be possible in this study as data will be gathered from the field as opposed to a lab setting. Relational research seeks to determine the influence that two or more phenomena have on each other in order to determine how they relate to each other. Relational research is typically positivist in nature and thus does not cater for the subjective view of the world that interpretivism holds (Bhattecherjee, 2012). A relational design would therefore also be inappropriate for this study.

A case study strategy has been chosen for this research. According to Yin (1994) a case study approach is appropriate for a study which has "how" or "why" research questions aimed at investigating events the researcher has no control over. This study meets these two conditions. A case study can be considered as the exploration of a case which occurs within a bounded system (Cresswell, 1998). The bounded system concept is a defining characteristic of a case study (Cresswel, 1998). The term bounded system refers to the boundaries that delimit the case (Henning, van Rensberg & Smit, 2004). Examples of cases include teachers, events, programs or communities (Cresswell, 1998). The case in this instance is an undergraduate Information Systems degree program. The bounded system is a South African university. The choice of the case study method is supported by the literature review which

demonstrated that previous research on this topic also predominantly employs case study methods. A case study can consist of single or multiple cases (Cresswell, 1998). In this study a single case will be examined in order to obtain the necessary depth of understanding. Given the time constraints of the research project (1 year) a single case is also more practical. A case study should also employ multiple sources of data such as observations, documents, interviews and reports (Cresswell, 1998). This study will use interviews, documents and reports as information sources. Situating the case study within its context is also very important (Cresswell, 1998). The South African higher education context has already been explored in the literature review. The case study context will be explored further in the following section where the research site will be described.

3.3 Research context

Permission to use the research site was granted on condition of anonymity. Therefore throughout this research the university in question will be referred to as University X (UX). The research site is the department of Information Systems (IS) at UX in South Africa. This choice is justified for two reasons. Firstly in order to answer the research question the research site must be a South African university which has adopted an international IS curriculum. UX is an appropriate choice because the undergraduate IS degrees at UX are based on the IS2010 curricula guideline developed by the AIS and ACM (Topi et al., 2010). Secondly UX is a convenient choice because the researcher studied IS at UX and therefore has access to the research informants. The rationale for the second choice is known as convenience sampling which is commonly used in exploratory research (Biggam, 2008).

The UX IS department offers three undergraduate degrees: the Bachelor of Commerce (BCom) in Information Systems which is a three year degree, the Bachelor of Commerce (BCom) in Information Systems and Computer Science and the Bachelor of Business Science (BBusSci) which is a four year degree. The fourth year of the BBusSci is similar to the stand alone Honours degree. The BCom degrees are more focused on information technology as they teach computer science and information systems courses in all three years while the BBusSci is focused on business related subjects and includes courses on marketing and business law which the BCom does not do (UX-Faculty of Commerce, 2016*). In order to limit the scope of this research project the BCom degrees will be the focus of this study and these will be described in more detail in the Results chapter.

3.4 Researcher role

When conducting qualitative research a researcher can adopt roles ranging from complete outsider to complete insider (Unluer, 2012). As a former student and student employee of the UX IS department the researcher's role will be partly that of an insider and partly that of an outsider. The researcher is partly an insider because he has had first-hand experience of teaching and learning within the UX IS department. Through that experience the researcher has developed relationships with some of the staff members and gained an understanding of

the culture of the UX IS department. These relationships have had an important bearing on this study as one of the researcher's former classmates is now a lecturer at the UX IS department. The researcher and the former classmate have a personal relationship through which the researcher learnt that the UX IS department uses IS2010 and made some changes (contextualisation) to the curriculum before implementing it.

The researcher is partly an outsider for several reasons. Firstly the researcher left UX seven years ago. The UX IS department has undergone changes in structure and personnel since the researcher departed. Secondly any prior knowledge of the IS department the researcher has, is limited to that obtained from being a student and a tutor. In those roles the researcher would not have been privy to information around the curriculum. Therefore from the perspective of knowledge about the curriculum from a staff perspective, which is the perspective that was sought out in the data collection phase, the researcher is an outsider.

The insider-outsider role has several advantages and disadvantages. As an insider a qualitative researcher has a better understanding of the research site and has relationships with the research informants making data more accessible (Unluer, 2012). However as an insider the researcher may make implicit assumptions about what they will uncover during the research which may negatively influence the findings. In the case of this research such a risk is minimal because the researcher was an outsider in terms of the curriculum adoption and contextualisation process as the researcher was not involved in any processes related to the IS undergraduate curriculum. Furthermore, care has been taken to provide data from either primary or secondary data sources to support any claims made by the researcher to ensure that pre-held views (either conscious or subconscious) do not creep into the analysis or interpretation of results in this study.

3.5 Data collection techniques

The data for this study was collected from primary and secondary sources. The methods employed were determined by the research objectives. An important assumption made in determining the objectives is that UX had actually contextualised IS2010 either before or after adopting the curriculum. This assumption is based on two sources; firstly previous research on this topic in Africa indicates that some sort of contextualisation generally takes place at some stage in the adoption of international computing curricula (Ayalew et al., 2012; Bass & Heeks, 2011; Dasuki et al., 2015). Secondly conversations with staff at the UX IS department indicate that there are some differences between the taught curriculum and what is prescribed by IS2010.

The third and fourth research objectives influenced the choice of data collection methods. Objective3 is to explore processes, practices and staff views related to the adoption and contextualisation of an international computing curriculum at a South African university. Objective 4 is to identify the challenges that were encountered in adopting and contextualising the international IS curriculum. In order to meet these objectives data was

collected from three sources: the IS2010 curriculum guideline document, official UX documents which included the 2016 Commerce faculty handbook (FH) and an internal review document (IRD) from the UX IS department, and for primary data, interviews with respondents. In order to meet the conditions of anonymity of UX, references to their internal documents need to also comply with that requirement.

IS2010 is a published curriculum produced by the ACM and the AIS to provide guidance for implementing undergraduate IS degrees. The IS2010 document was used to determine the contents of the IS2010 curriculum. The FH contains detailed information regarding the UX Commerce faculty. The FH contains information regarding qualifications offered by the faculty, departments within the faculty, rules for degrees, research centres within the faculty and courses offered by the faculty. The IRD is a report the IS department produced as part of a review that was conducted in 2013. The report contains details about the degrees the department offers. The information includes descriptions of the courses offered and justification as to why those courses have been chosen. The IRD is a sensitive document therefore the researcher was only given access to 4 pages related to the BCom (IS) and BCom (IS+CS) degrees. Therefore there is additional information that could have informed this study but unfortunately was not accessible. Nevertheless the small section of the IRD that was made available was useful. The IRD and FH supplement the interview data by providing information about the courses that make up the UX BCom degrees. The interviews were used to elicit staff views and get an understanding of what has taken place from their perspective.

3.6 Data collection procedures

In order to collect primary data four respondents were interviewed. The respondents were lecturers in the UX Information Systems department who taught undergraduate courses. The respondents were contacted through a mass email sent to UX IS staff by UX on behalf of the researcher as required for research ethics clearance by UX. The IS department has nineteen full-time lecturers, fifteen of which teach undergraduate courses. Of these fifteen staff members, four were willing to participate in the research. The UX IS department has a diverse staff body in terms of experience. Some staff members have been at the IS department for over ten years while other staff have been at the department for much shorter periods. Although only four respondents participated the sample reflected the IS department staff profile to a fair extent. Two of the respondents have been at UX for over ten years while the other two have been at the university for less than six years. This ensured that the views of both long serving staff and those of newer staff were captured. Brief profiles of the four respondents are given at the start of the results section in order to provide the reader with context through which to consider the data obtained from these respondents.

The interviews were split into two rounds. The first round of interviews were conducted in October 2016 at UX and was conducted in person. These were semi-structured interviews. The interview questions were guided by the contextual factors in the research framework. Appendix B shows the interview instrument which guided the interviews with the

respondents. In order to test the research instrument a pilot interview was conducted in September 2016 with a staff member at the researcher's institution and modifications were made based on the results. Further modifications were made to the research instrument after each interview based on the interview results. For example the first respondent introduced the idea of some lecturers being teachers at heart while others were more research focused. Additional questions probing the competing priorities of teaching and research were added in the teaching staff section to explore this issue in subsequent interviews. Another example was the issue of cultural responsiveness. Initially it was felt that culture was too complex to include in the research. However the respondents applied culture in very broad terms (e.g African, European, Western, non-Western) and this enabled the topic to be explored without the need to unpack the complexities surrounding the different tribes within South Africa. Additional questions relating to culture were thus added to the instruments. Follow up interviews were then conducted in November 2016. All interviews took place in person at UX with one exception which was conducted over Skype. The follow up interviews were used to confirm the researcher's understanding of certain issues and to clarify certain statements. All the interviews were recorded using a tape recorder and a mobile phone as a backup. The interviews produced a total of 3 hours and 48 minutes of material.

The secondary data was obtained from a variety of sources. The IS2010 guidelines were downloaded via Google Scholar. The FH was downloaded from the UX Commerce faculty website. The IRD was provided by one of the respondents.

3.7 Data analysis

Before the interview data was analysed it was first transcribed into Microsoft Word. The interview data was analysed using a technique called qualitative content analysis. Qualitative content analysis is an iterative technique used to analyse textual data (Hsieh & Shannon, 2005; Silverman, 2014). Hsieh and Shannon (2005) describe three different types of qualitative content analysis: conventional, summative and directed.

Conventional content analysis is generally used for studies where the aim is to describe a phenomenon on which very little research has been done. A key feature of this type of content analysis is that the categories are not predefined (Hsieh & Shannon, 2005). The researcher determines categories through immersing themselves in the data. The process begins with the researcher taking note of words or phrases that may be important in relation to the research question. As more key words and phrases are highlighted the researcher may identify labels called codes that can be used to describe several key words or phrases (Hsieh & Shannon, 2005). These codes are then grouped together into related categories. As more coding and categorising takes place sub-categories or entirely new categories may appear in which case the researcher may need to revisit analysis that has been previously done (Hsieh & Shannon, 2005). When reporting and discussing the findings examples of codes and categories will be given to support the research argument.

Summative content analysis is used to understand the meaning behind the language that people use. Summative content analysis starts with identifying key words and phrases in text and counting the number of times they are used (Hsieh & Shannon, 2005). The context in which those phrases and words are used is then described. By understanding the context in which certain language is used a researcher is able to understand the meaning that people attach to that language (Hsieh & Shannon, 2005).

Directed content analysis is similar to conventional content analysis but uses predefined categories (Hsieh & Shannon, 2005). The goal of directed content analysis may be to validate or extend an existing theory or framework. The process begins by defining operational definitions of categories according to a framework or theory. From these definitions, subcategories and codes can be identified. The text data is then analysed for words or phrases that correspond to these categories and codes. Data that does not fall into existing codes is assigned a different code. These codes are then further grouped into sub-categories and finally categories. In doing so directed content analysis can extend a theory or framework (Hsieh & Shannon, 2005).

Given that a framework was derived from previous literature this study used directed content analysis. In order to analyse the data it first had to be coded. Saldana (2016) describes coding as being made up of two stages, first cycle coding and second cycle coding. First cycle coding is the coding that happens initially and is applied to the raw data. Second cycle coding is more advanced and refers to the reorganising of the output of first cycle coding (Saldana, 2016).

First Cycle Coding

The interview data was grouped into three different levels, namely categories, sub-categories and codes. The categories were the categories derived from Moll (2004) e.g. economic or learning responsiveness. The sub-categories were the contextual factors in the research framework e.g. pedagogy or teaching staff. The codes were the sub-factors that were part of contextual factor definitions e.g. staff skills or student motivation. A mix of deductive and inductive methods was used to code and categorise the data based on the operational definitions of the contextual factors. For example the teaching staff sub-category described the number of teaching staff available, the skills the teaching staff possess and the staff attitudes towards the curriculum and education. Data referring to staff numbers, staff skills or staff attitudes were coded under teaching staff which in turn was categorised under the economic category (deduction). Any new codes and sub-categories that emerged were treated separately (induction). For example University Needs emerged as a sub-category with codes such as student numbers and university regulations. This sub-category was placed under the economic category. Where applicable the data may also be classified as a new code within an existing subcategory. Carrying on with the teaching staff example, it emerged from the data that staff faced pressure to produce research and therefore a code called staff pressures was added to the teaching staff subcategory (Moll, 2004; Saldana, 2016). Appendix

C is a sample of how the interview data was coded and categorised according to the research framework.

The IS2010 guidelines and UX documents were treated as text and analysed using a similar approach to the interview data. Data in the documents was summarised and categorised according to the research framework. The results of this analysis are presented in the results chapter.

Second Cycle Coding

Axial coding was chosen as the second cycle method. Axial coding involves reorganising first cycle data to draw attention to any relationships between the categories and subcategories. The purpose of axial coding is to answer 'what', 'why' and 'how' questions (Saldana, 2016). The results of the axial coding are presented in the interpretation and implications of results chapter. The research question for this study relates to how an international curriculum is adopted and contextualised and the associated challenges. The discussion is organised in a way that is intended to answer the research question. The first section of the discussion explains how UX adopted and contextualised IS2010. The second section explains what challenges were encountered during this process.

3.8 Evaluation of methods adopted

This section addresses the trustworthiness of the research.

Trustworthiness in qualitative research refers to the level of quality of the research. Lincoln and Guba are two respected authors on the topic of trustworthiness of qualitative research (Loh, 2013). Lincoln and Guba (2000) (as cited in Morrow, 2005) put forward 4 elements that constitute trustworthiness, namely credibility, transferability, dependability and confirmability. Each element is described below along with an explanation of how they are established in this study.

Credibility is the level of rigor and plausibility that a research project achieves (Morrow, 2005; Shenton, 2004). This study used several techniques to ensure credibility:

1) *Prolonged engagement* is the process of becoming familiar with the culture of a research site. This enables the researcher to gain an understanding of the research site and build trust with the research informants (Shenton, 2004). This was achieved through a combination of consulting applicable documentation such as course materials and drawing on the researcher's experience as a student and employee of the UX IS department. Each interview added to the understanding of the research site and was therefore used to inform the approach and questions for subsequent interviews.
2) *Triangulation* is the use of different data sources and collection methods. Different data collection methods have different strengths and weaknesses. By using different data collection methods together a study is able to compensate for the weakness of one

method through the strengths of another method (Shenton, 2004). This study used primary and secondary sources and obtained data through interviews and analysis of documentation.

3) *Peer debriefing* refers to obtaining feedback and input from other academics about the research as it progresses. Having an "outsider" perspective helps to expose areas which have been overlooked or arguments that do not make sense. In doing so this helps to strengthen the overall research (Shenton, 2004). This research was done in concert with a supervisor who acted as a peer reviewer.
4) *Member checking* is confirming the interpretation of the data with the research informants. Doing so improves the accuracy of the data analysis (Shenton, 2004). In this study the researcher conducted follow up interviews to ensure accurate understanding of the interview data.
5) *Provision of researcher's relevant biographical information*. It is important to establish the credibility of the researcher and understand what influences his/her thought process about the phenomena (Shenton, 2004). This researcher has disclosed that he was a student and former student employee of the UX IS department.

The **transferability** of a study is the ability of someone from outside the research study to relate a different context of which they have knowledge to the context described in the study. The goal of transferability is to enable a person to apply findings from one qualitative study to a different context by enabling that person to understand what is applicable to their context and what is not. In order to achieve transferability as much contextual detail as possible must be included in the research report (Shenton, 2004). This study aimed for transferability by providing rich descriptions about the research site and the research context (Morrow, 2005). The results section also includes short profiles of the respondents to help with the interpretation of their responses while also protecting their anonymity.

Dependability is the extent to which another researcher could replicate the study. Dependability is aimed for in this study by describing the research design, research methods and analysis process in sufficient detail for another researcher to understand and replicate in their chosen context (Shenton, 2004).

Confirmability addresses the need for the research findings to reflect the perspectives of the research informants and not those of the researcher (Morrow, 2005). This was attempted in this project through member checking, stating the researcher's biases and expectations of the results and a discussion of the strengths and weaknesses of the research methods adopted (Shenton, 2004).

3.9 Ethical considerations

This research was granted approval by the Wits School of Economic and Business Sciences ethics committee, the UX Commerce faculty ethics committee as well as the UX human resources department.

Kelman (1982) put forward a classification of important ethical considerations that must be made in social science research. This classification consists of 4 areas: harm and benefit, privacy and confidentiality, informed consent and deception and social control. These areas are explained below along with explanations of how they were catered for in this research (Kelman, 1982):

Harm and benefits - harm refers to the well-being of the research subjects while benefits refer to the benefits that society obtains from the research. There is an argument that the greater the potential benefits of research the greater the justification for risking potential harm to participants (Kelman, 1982). However some researchers disagree with this argument and believe research should not result in any physical, emotional or psychological trauma to the people involved in the research (Bhattacherjee, 2012). To minimise any potential harm to respondents the research interviews were conducted in physically secure locations that were chosen by the respondents. In addition the interview questions were reviewed by an experienced researcher to ensure that they may not lead to any emotional or psychological trauma. Although risk can be minimised it is difficult to remove completely. This is why informed consent is important (Bhattacherjee, 2012).

Informed consent and deception refers to the need to make the respondents fully aware of what the research entails so that they can make an informed decision. Withholding any pertinent information related to the research amounts to deception and reduces the ability of respondents to make informed decisions (Kelman, 1982). To obtain informed consent a letter explaining the research was provided to each respondent (Appendix D) along with a consent letter they were required to sign (Appendix E). Written permission to record the interview was also obtained from each respondent (Appendix F). The involvement of the two ethics committees and UX HR department also assisted in ensuring that the respondents received all the necessary information to enable informed consent.

Privacy and confidentiality is concerned with protecting the identity of research subjects or a research site and not disclosing any information that could cause any adverse social, physical or psychological effects should that information be made public (Kelman, 1982). This research has tried to achieve this goal the final report has been scrutinised by the author as well as the author's supervisor for any information that can be used to identify a respondent or the research site (Biggam, 2008).

Social control refers to the behaviour of the researcher (Kelman, 2008). It is important for researchers not to behave in a manner that is unbecoming of a researcher and amounts to misconduct. For example a researcher must not fabricate their data (Israel & Hay, 2006). To ensure social control the researcher worked closely with a supervisor who monitored the researcher's progress and ensured the appropriate standards are followed.

An important additional consideration is that of *voluntary participation*. Research subjects must not be coerced physically or psychologically into participating in research as this would infringe on their individual liberties (Bhattacherjee, 2012). To ensure voluntary participation the researcher did not pressurise any participants by repeatedly asking for participation, offering incentives for participation or threatening negative consequences for non-participation.

3.10 Research methodology summary

This study adopted an exploratory research design because, as outlined in the literature review, there is very little research on adopting and contextualising international computing curricula at South African universities. Qualitative methods have been employed in this study as this study is concerned with the views and perspectives of the research informants. A case study strategy has been chosen for this research. The case is the adoption and contextualisation of an international computing curriculum at a South African university. Due to a request for anonymity from the target university the university will be referred to as UX in this study. The data for this study was collected from primary and secondary sources. The sources included interviews with four staff members at the UX IS department along with the UX Commerce faculty handbook and an internal departmental review document provided by the respondents. Directed content analysis was used to analyse the data. To address the trustworthiness of the research efforts were made to attain credibility, transferability, dependability and confirmability in the research. Ethical considerations were also followed to protect the identity of the informants and ensure acceptable conduct from the researcher. The results of the data collection will be presented in the next chapter.

CHAPTER 4

4. Results

This study is an exploratory case study which is guided by an interpretivist philosophy. The unit of analysis is the adoption and contextualisation of an international computing curriculum by a South African university. Due to a request for anonymity from the target university the university will be referred to as UX in this study.

The purpose of this chapter is to present and discuss the data obtained during the research project according to the research framework depicted in figure 7 overleaf. The data was obtained from three sources: the IS2010 guidelines, official UX documents which included the UX Commerce faculty handbook (FH) and an internal review document (IRD) from the UX IS department and the interview data. Figure 6 shows the structure of the results chapter. The results chapter begins with a summary of the IS2010 guidelines which will be used to compare IS2010 to the UX BCom curriculum. This summary is followed by a summary of the UX BCom (IS) and BCom (IS+CS) programs based on the UX documents. These official documents supplement the interview data by providing information about the courses that make up the UX BCom degrees. This information helped in comparing the core and elective courses of IS2010 and the BCom curriculum. The third section explores the interview data which is coded according to the research framework which is depicted in figure 7. The actual comparisons between IS2010 and the UX BCom curriculum are done in the third section using the data presented in the first two sections. Comparing the two curricula and exploring any differences will help understand how UX has adopted and contextualised IS2010.

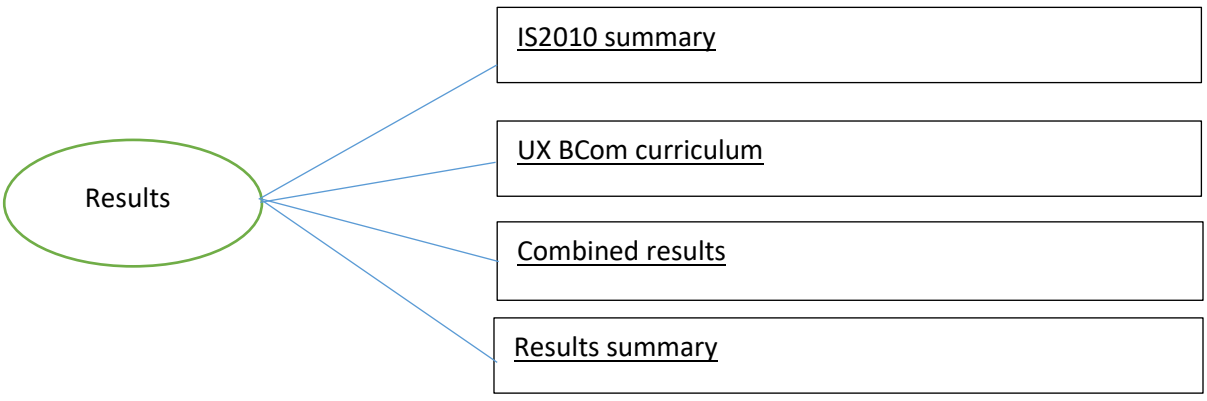


Figure 6: The structure of the results chapter.

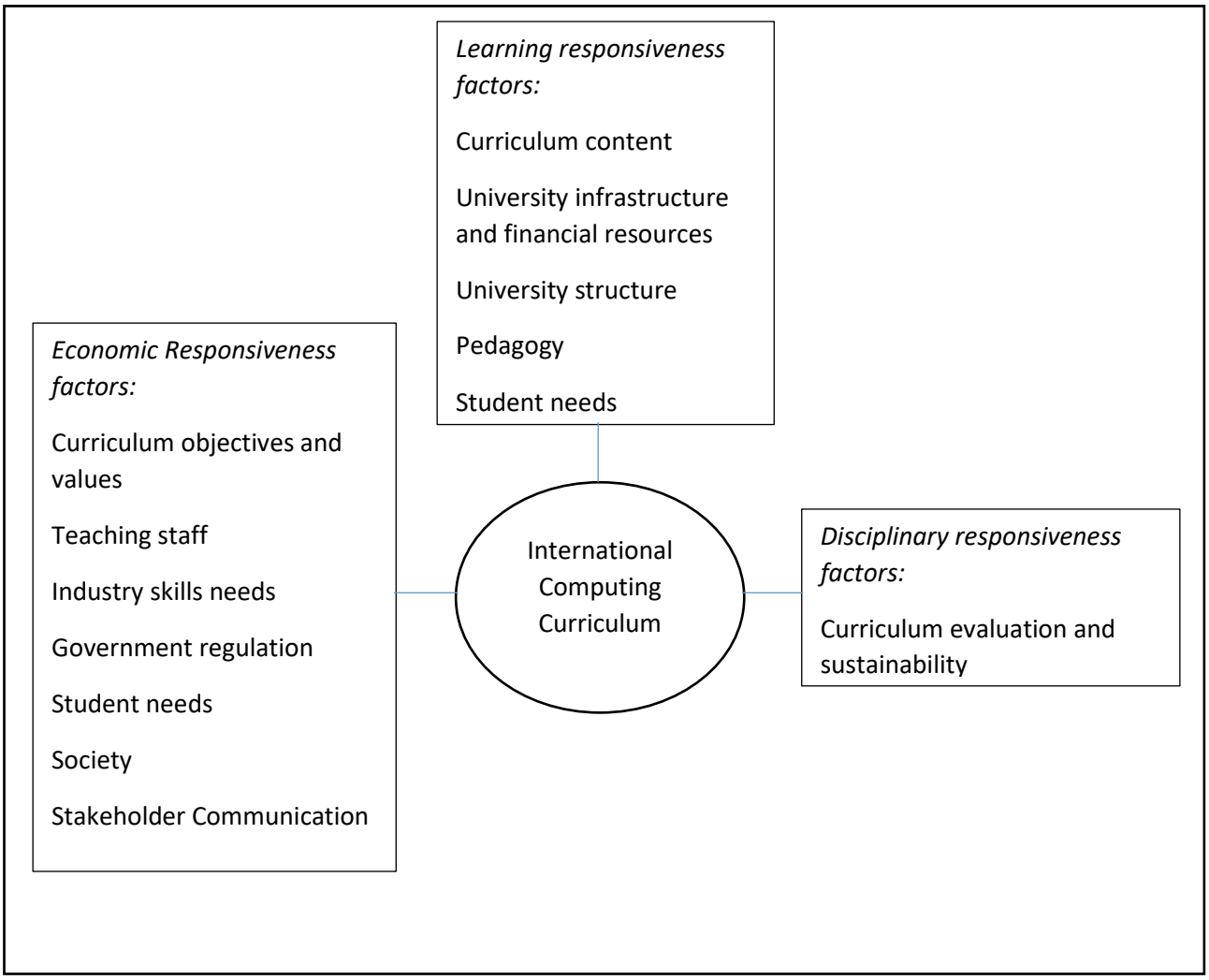


Figure 7: Factors to consider when researching the adoption and contextualisation of an international computing curriculum in South Africa.

4.1 IS2010 summary

IS2010 is a published curriculum for undergraduate IS degree programs jointly created by the AIS and ACM. IS2010 was created due to the need to update IS2002 which was the previous undergraduate IS curriculum model created by the AIS and ACM (Bell, 2013). The period between 2002 and 2010 heralded several changes in the technology which affected the IS discipline. This included the proliferation of web technology, increase use of ERP systems and the introduction of mobile computing (Topi et al., 2010). It was changes such as these that necessitated the need for IS2010.

This section summarises the IS2010 document according to the research framework. The original curriculum document was used as the source and is referenced as Topi et al. (2010).

Only contextual factors related to the research framework that were addressed in IS2010 are included in the summary. The IS2010 document summary is presented factor by factor and consists of the following contextual factors: curriculum objectives and values, curriculum content, teaching staff and university infrastructure and financial resources.

4.1.1 Curriculum objectives and values

IS2010 is "*designed to educate graduates who are prepared to enter the workforce*" (Topi et al., 2010: p363). The objectives and values of IS2010 are shaped by four important beliefs and characteristics (Topi et al., 2010). The first characteristic is the belief that although business is the primary domain of IS it is not the only domain of IS. The curriculum therefore provides expertise for other domains as well. The second characteristic is the clear specification of learning outcomes for the curriculum consisting of high level capabilities and different skills categories (Topi et al., 2010). The third principle is that of specialised career tracks. This is achieved through recommended combinations of core and elective courses, the combination of which determines a career track (Bell, 2013). The fourth characteristic is that the curriculum is flexible enough to allow for adaptation to different contexts (Topi et al., 2010). These four characteristics encompass the objectives and values of IS2010.

4.1.2 Curriculum content

Knowledge and Skills

According to IS2010 an IS professional should have the following high level capabilities: Improve organizational processes, exploit opportunities created by technology innovations, understand and address information requirements, design and manage enterprise architecture, identify and evaluate solution and sourcing alternatives, secure data and infrastructure and understand, manage and control IT risks (Topi et al., 2010).

IS2010 defines three categories of skills which students must attain in order to develop these capabilities:

1) IS knowledge and skills – skills and knowledge specific to the IS discipline including requirements gathering and analysis, design and implementation of IS solutions and managing of IT resources (Topi et al., 2010).

2) Foundational knowledge and skills – skills and knowledge which are not specific to the IS discipline but are important for an IS professional to have. These are mostly the "soft skills" that were referred to earlier in the literature review such as communication, teamwork, leadership and critical thinking (Ahmed et al., 2009). Mathematical skills also fall under the foundational knowledge and skills category. IS professionals need to be able to grasp topics such as algorithms and probabilities to carry out their jobs (Topi et al., 2010).

3) Domain related knowledge and skills – knowledge and skills related to the different domains in which IS plays a role. The primary domain of focus for IS has traditionally been business however other domains have also become more prominent such as healthcare, government, and the non-governmental organisations (Topi et al., 2010). In recognising the importance of other domains IS2010 is supporting the argument put forward in the conceptual framework section that industry skills are not the only important skills that ICT professionals must possess. The skills needs of other stakeholders in society such as government are also important.

IS2010 only specifies courses for developing IS knowledge and skills. The foundation and domain related knowledge and skills are nonetheless still very important and must also be developed. To achieve this IS2010 recommends either creating courses which develop foundation and domain related skills or situating IS in a department, school or faculty in which other curricula have similar skills development requirements (Topi et al., 2010). Such departments, schools or faculties will likely already have these courses in place. The second approach is directly related to the university structure factor identified in the conceptual framework.

Career Tracks

IS2010 specifies seven core courses which are designed to cover the content that all IS undergraduate programs are deemed to require (Topi et al., 2010). These courses consist of a foundation course, data and information management, enterprise architecture, project management, IT infrastructure, systems analysis and design and IS strategy, management and acquisition (Bell, 2013). IS2010 is not completely prescriptive in terms of these seven core courses allowing for flexibility in the number of courses across which the specified knowledge and skills are developed. Figure 8 overleaf shows the courses and their recommended sequence. The foundation course is seen as a pre-requisite for all the other courses while IS strategy, management and acquisition must be the last or one of the last courses delivered (Topi et al., 2010).

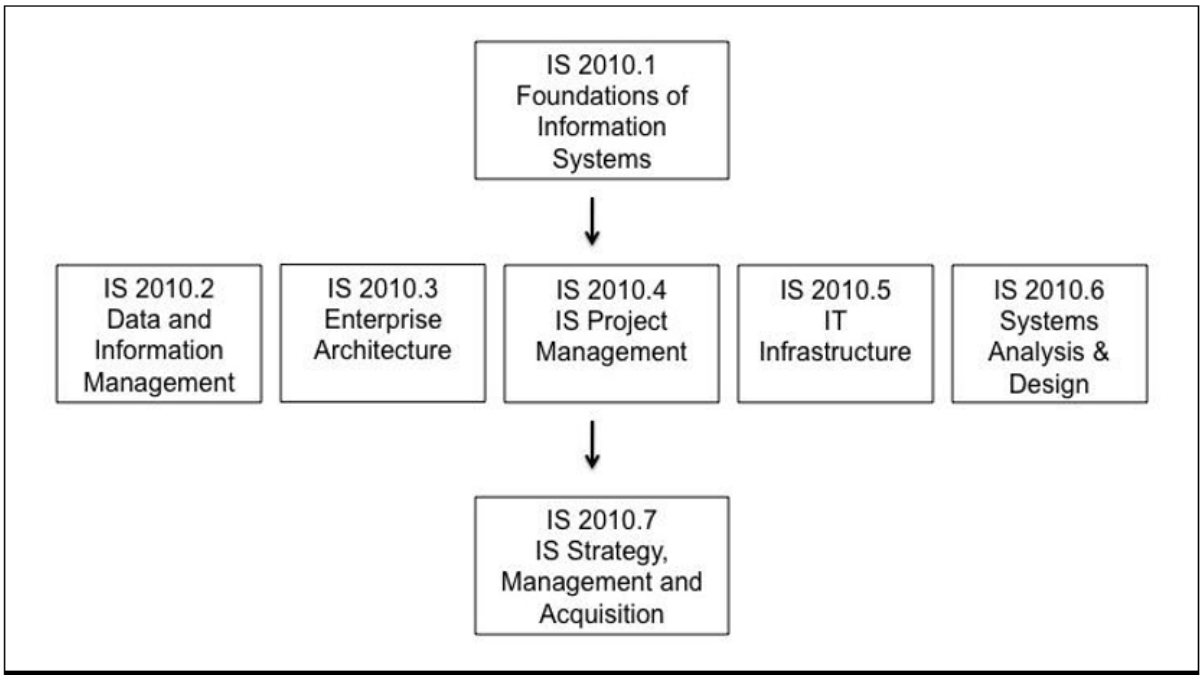


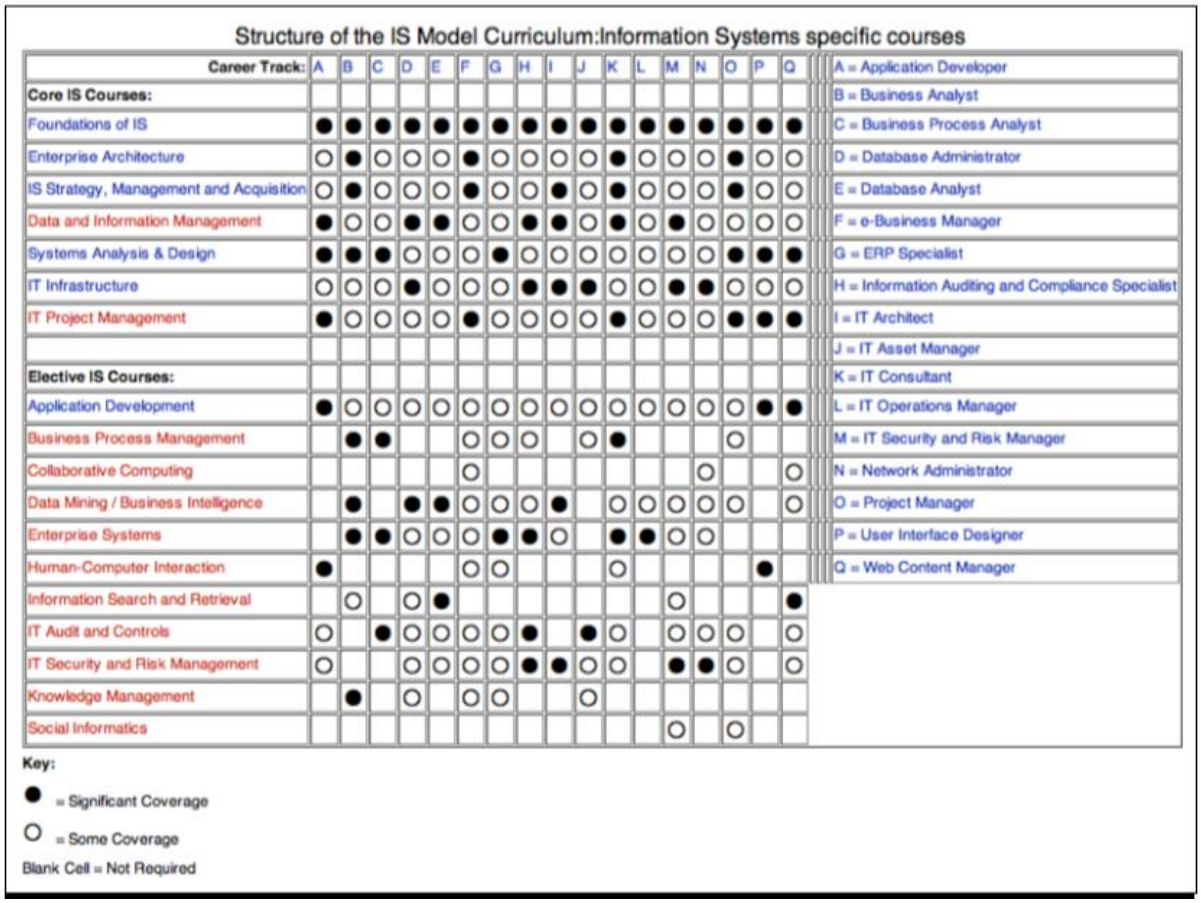
Figure 8: IS2010 core courses as depicted in the IS2010 document (Topi et al., 2010)

IS2010 also includes defined elective courses which is one of the ways in which the curriculum is able to cater for career tracks (Bell, 2013). Elective courses are courses which, when combined with core courses create a degree program for a particular career track. For example the application developer and business analyst career tracks both offer the seven core courses alongside recommended electives (Topi et al., 2010). The application developer program includes an IT audit and controls elective which the business analyst track does not. Similarly the business analyst track offers knowledge management which is not recommended for the application developer track (Topi et al., 2010).

The other way the curriculum caters for career tracks is through the depth of coverage of a course. IS2010 offers two levels of course coverage: “significant coverage” and “some coverage”. Different career tracks may take several of the same core and elective courses but those courses are covered to different levels of depth depending on the career track (Topi et al., 2010). Returning to the application developer and business analyst example, both tracks include enterprise architecture. However while the business analyst track has significant coverage of enterprise architecture, the application developer track recommends “some coverage” of enterprise architecture. IS2010 only suggests what elective courses particular career tracks should offer. Moreover the curriculum does not specify when these elective courses should be taken. This provides the educator the flexibility to contextualise the curriculum (Topi et al., 2010).

Figure 9 overleaf shows the structure of IS2010 in terms of courses and career tracks. It shows the core courses, suggested elective courses and how they form suggested career tracks. Figure 9 also indicates the depth of coverage that is required for each course depending on the suggested career track.

IS2010 defines and describes each course in detail. The specifications include a course description, course discussion, learning objectives and topics to be covered for each course.



Structure of the IS Model Curriculum:Information Systems specific courses

Career Track:	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
Core IS Courses:																	
Foundations of IS	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
Enterprise Architecture	○	●	○	○	○	●	○	○	○	○	●	○	○	○	●	○	○
IS Strategy, Management and Acquisition	○	●	○	○	○	●	○	○	●	○	●	○	○	○	●	○	○
Data and Information Management	●	○	○	●	●	○	○	●	●	○	●	○	●	○	○	○	○
Systems Analysis & Design	●	●	●	○	○	○	●	○	○	○	○	○	○	○	●	●	●
IT Infrastructure	○	○	○	●	○	○	○	●	●	●	○	○	●	●	○	○	○
IT Project Management	●	○	○	○	○	●	○	○	○	○	●	○	○	○	●	●	●
Elective IS Courses:																	
Application Development	●	○	○	○	○	○	○	○	○	○	○	○	○	○	○	●	●
Business Process Management		●	●			○	○	○		○	●				○		
Collaborative Computing						○								○			○
Data Mining / Business Intelligence		●		●	●	○	○	○	●		○	○	○	○	○		○
Enterprise Systems		●	●	○	○	○	●	●	○		●	●	○	○			
Human-Computer Interaction	●					○	○				○					●	
Information Search and Retrieval		○		○	●								○				●
IT Audit and Controls	○		●	○	○	○	○	●		●	○		○	○	○		○
IT Security and Risk Management	○			○	○	○	○	●	●	○	○		●	●	○		○
Knowledge Management		●		○		○	○			○							
Social Informatics													○		○		

A = Application Developer	
B = Business Analyst	
C = Business Process Analyst	
D = Database Administrator	
E = Database Analyst	
F = e-Business Manager	
G = ERP Specialist	
H = Information Auditing and Compliance Specialist	
I = IT Architect	
J = IT Asset Manager	
K = IT Consultant	
L = IT Operations Manager	
M = IT Security and Risk Manager	
N = Network Administrator	
O = Project Manager	
P = User Interface Designer	
Q = Web Content Manager	

Key:

● = Significant Coverage

○ = Some Coverage

Blank Cell = Not Required

Figure 9: Course structure of IS2010 curriculum (Topi et al., 2010).

4.1.3 Teaching staff

According to IS2010 teaching staff should be qualified to teach, modify and plan the courses within the curriculum. Topi et al. (2010) feel teaching staff must remain abreast of developments in the IS discipline and be provided with the necessary support and opportunities to do so (Topi et al., 2010). Such support and opportunities can be in the form of sponsorship for conferences and seminars, academic exchange programs and access to technology and materials for teaching. Given the variety of the course content the research and teaching interests of the staff must be varied enough to provide coverage for the core and elective courses on offer (Topi et al., 2010).

4.1.4 University infrastructure and financial resources

In order for the curriculum to be delivered there needs to be a combination of computing, laboratory, classroom and library requirements. Computing infrastructure consists of hardware, software and technical support. Students need to have access to computers that have the necessary software to enable them to complete their assignments. Computing infrastructure for IS students may be more advanced than other disciplines (Topi et al., 2010).

For example there may be a need to have databases or business intelligence software which may not be a standard requirement for other disciplines. IS specific computing needs must be catered for. These computers must be based in laboratories that allow for small groups or an entire class to be accommodated at once. The laboratories should be able to support class size lessons, individual use especially for students who do not have their own machines and the advanced computing needs of the IS discipline (Topi et al., 2010). Support staff should be available to maintain these computing facilities as teaching staff may not have the time or qualifications to do so (Topi et al., 2010).

Classrooms need to be provided as that is where the bulk of learning takes place. Classrooms should have the appropriate technology to support teaching and learning activities such as presentations. Internet access and local network access should also be available in classrooms (Topi et al., 2010). Libraries are also important particularly for conducting research. A library should provide access not only to physical books but also electronic information sources such as journals (Topi et al., 2010).

4.2 UX BCom curriculum

UX is one of South Africa's leading research universities. The university has 6 faculties: commerce, engineering and the built environment, law, health sciences, humanities and science. As of 2014 UX had 26 357 students of which approximately 5 000 were international students. UX has over 60 research units and approximately 5000 staff (UX, 2017b*). Over a quarter of South Africa's A rated researchers (researchers considered global leaders in their field) are staff members at UX (UX, 2017a*). UX boasts a diverse student and faculty with over 100 countries represented in both population groups (UX, 2017c*).

The IS department is situated in the faculty of Commerce. The department offers bachelors, honours, masters and PHD degrees. At the postgraduate level the department caters for both full-time and part-time students and also offers diplomas in computer forensics, business process management, enterprise systems and business analysis (UX-Faculty of Commerce, 2016*). The IS department is home to a research unit which focuses on the role of ICT in developing countries. Other research areas of the IS department include IS management, IS and education, digital forensics and IS development (UX-Faculty of Commerce, 2016*).

The UX IS department offers two 3 year undergraduate IS degree programs. One is a BCom (IS) and the other is a BCom (IS+CS). Both degrees are 3 years in duration. Both degrees have a 4 year academic development version which is designed for students who need additional assistance in navigating the degrees. Appendix G compares the courses in the BCom IS and the BCom (IS +CS). The courses in bold are absent in the other degree. One difference between the BCom (IS) and BCom (IS + CS) is that BCom (IS + CS) offers CS courses instead of some of the Commerce courses that BCom (IS) offers. Another difference is the structure of the courses. For example in the BCom (IS) the Business Law course is taken in first year while

in the BCom (IS + CS) the Business Law course is taken in the second year. The BCom(IS) is more flexible offering a choice of 3 electives as opposed to the 1 elective in BCom (IS + CS).

The internal review document is a report produced by the department as part of a faculty review that took place in 2013. In that review the department had to describe their curriculum and justify the choices that were made with regards to the curriculum. The internal review document states that both degrees use IS2010 as a basis. Figure 10 and Figure 11 below are taken from the internal review document and show how the UX degree courses map to the IS2010 courses. As can be seen from the figures all the core IS2010 content is covered along with several IS2010 electives. Knowledge Management and Collaborative Computing are not offered by UX.

IS2010 Core Content	IS Major Courses
Foundations of IS	INF1002F
Enterprise architecture	INF2010S, INF2011S
IS strategy, management and acquisition	INF3003W, INF3012S
Data and information management	INF2008F
Systems analysis and design	INF2009F, INF2011S, INF3003W
IT infrastructure	INF2010S
IT project management	INF3003W
IS2010 Elective Content	IS Major Courses
Application development	INF1003S, INF2011S, INF3003W, INF3014F
Business process management	INF3012S
Data mining / business intelligence	INF2008F, INF3012S
Enterprise systems	INF3012S
Human-computer interaction	INF2011S, INF3014F
Information search and retrieval	INF1002F, INF2010S, INF3014F, INF3003W
IT audit and controls	INF2008F, INF2011S, INF3003W
IT Security and risk management	INF3003W
Knowledge management	???
Social informatics	INF3014F

Figure 10: IS course mapping for the UX BCom (IS) degree.

IS2010 Core Content	IS+CS Major Courses
Foundations of IS	(CSC1016S)
Enterprise architecture	INF2011S
IS strategy, management and acquisition	INF3011F, INF3012S
Data and information management	CSC2001F
Systems analysis and design	INF2009F, INF2011S, INF3011F
IT infrastructure	CSC2002S, CSC3002F
IT project management	INF3011F
IS2010 Elective Content	IS+CS Major Courses
Application development	CSC1016S, CSC2002S, INF2011S, INF3014F, CSC3003S
Business process management	INF3012S
Data mining / business intelligence	INF3012S
Enterprise systems	INF3012S
Human-computer interaction	INF2011S, INF3014F
Information search and retrieval	INF3014F, INF3011F
IT audit and controls	IINF2011S, INF3011F
IT Security and risk management	INF3011F
Knowledge management	???
Social informatics	INF3014F

Figure 11: IS course mapping for the UX BCom (IS+CS) degree.

4.3 Combined results

In this section the research data will be explored in accordance with the research framework depicted in figure 7. The data will be presented category by category. Each category consists of subcategories. The framework in figure 7 consists of three categories: economic, learning and discipline. The economic category contains data concerning the objectives of the curriculum and the curriculum stakeholders. The learning category consists of data related to teaching and learning such as pedagogy, student needs and the IS2010 guidelines. The discipline category addresses how curriculum is reviewed and kept up to date. A fourth category called culture emerged from the data and is also presented. This category is for data referring to different aspects of culture such as institutional culture and how that impacts the curriculum.

The first category that will be discussed is the Economic category followed by the Learning category. The Cultural category will then be explored and then finally the Discipline category. Selected quotes have been included from the transcript to give examples of the respondents' answers. In some quotes the question posed by the interviewer is included to give context to the quote. The quotes also have an identifier indicating which respondent the quote is from. Below are brief descriptions of each respondent which will assist in understanding the respondent's perspectives and provide context and background to their responses:

Respondent1
Respondent1 is a senior staff member. Respondent1's tenure at the IS department started before IS2010 was published. Respondent1 is a course convener for IS undergraduate and postgraduate courses. The majority of Respondent1's career has been spent as a lecturer at different institutions. Respondent1 holds a postgraduate degree from UX. Respondent1 is the longest serving staff member of all the respondents.

Respondent2
Respondent2 is a senior staff member. Respondent2's tenure at the IS department also started before IS2010 was published. Respondent2 is a course convener for IS undergraduate and postgraduate courses. Respondent2 has management experience within the department and has also served on university bodies such as the Senate. Respondent2 holds a postgraduate degree from UX. Respondent2 is the second longest serving staff member of all the respondents.

Respondent3
Respondent3 is a staff member of the IS department. Respondent3 started working in the IS department after IS2010 was adopted by the department. Respondent3 is a course convener for IS undergraduate courses and holds a postgraduate degree from UX. Respondent3 is the third longest serving staff member of all the respondents.

Respondent4
Respondent4 is a senior staff member. Respondent4 started working at the department after IS2010 was adopted by the department and is the newest staff member of all the respondents. Respondent4 convenes undergraduate courses.

4.3.1 Category: Economic

Sub Category: Curriculum Objectives

This subcategory refers to the stated outcomes that the curriculum hopes to achieve. The subcategory was renamed to curriculum objectives to reflect the data more accurately. Four codes were identified in this subcategory. The codes were desired objective (do), achieved objective (ao), objective interventions (oi) and addressing objective challenges (oc).

The stated desired objective of the UX BCom degrees is to find a balance between developing students as individuals and training students to be IS professionals who can work in different domains such as industry, the public sector or the non-profit sector:
R(1): "…one key element... was to have a reflective practice component and that component was specifically there to develop the person themselves, to create the self-awareness and from there onwards to develop self-leadership and team skills so it's not just about subject matter, it's about addressing the whole person."(do).

However in practice the BCom degrees seem to be mainly training students to work in industry:
R(3): "...honestly speaking I think we are more, if you put a scale we are not halfway I think we are more into creating students who are ready to work for companies" (ao).

The reason for this is that the department faces pressure to attract as many students as possible. In order to attract students the department needs to offer degrees that prepare students for work:
R(3: "So yeah attracting as many students as possible is becoming a priority and that aligns with teaching them or preparing them or linking them to prospects of getting a job. If you have a degree that doesn't necessarily prepare students for a specific job it becomes difficult to make it at least in the faculty of Commerce" (ao).

The bias towards preparing students to work in industry has been recognised and efforts are being made to address this bias. One way is to use public sector case studies in the coursework to encourage students to take an interest in domains other than industry. However the effectiveness of such efforts is questionable:
R(3): "Some of our projects at third year level we encourage them to work with public sector" (oi).

The lack of effectiveness is partly due to the difficulty in differentiating between desired and achieved outcomes:
R(3): *"...sometimes it's difficult to differentiate between what we are actually doing with what we think we are doing" (oc).*

Discussion
The staff would like the BCom degree programs to prepare students to work in various domains and develop students as individuals. In practice what is happening at UX is that, due to faculty pressures, students are mainly being prepared for work in the industry domain. This explains why the majority of non-IS courses in the UX BCom degrees are Commerce subjects. The UX staff have introduced public sector and community based case studies and projects to encourage students not to focus solely on careers in industry. However this has not had the desired effect partly because the staff have difficulty distinguishing between what they want to achieve and what they are actually achieving.

One of the objectives of IS2010 is to prepare students for work in different domains and not just industry. Despite intentions the UX curriculum appears to focus mainly on industry readiness and as a result the IS2010 objectives and the UX curriculum objectives do not align. Furthermore, according to Moll (2004) an economically responsive curriculum prioritises the needs of sectors such as government in addition to those of industry (Moll, 2004). Therefore in terms of objectives the IS2010 curriculum is potentially more economically responsive than the UX BCom curriculum.

Subcategory: Teaching Staff

In the literature review teaching staff were identified as important stakeholders in a curriculum. This subcategory consists of codes which represent important matters related to staff that emerged from the data. The codes are staff pressures (sp), staff numbers (sn) and staff skills (ss).

One of the pressures staff face is to prioritise research over teaching. Given that research is time consuming this has a negative impact on teaching which is particularly disheartening for those lecturers who are teachers at heart:
R(1): "I do feel that as an academic you are sometimes more pressured to deliver research than you are to deliver the deep teaching stuff. That's very time consuming so - because you can count much more easily the research output. I think sometimes those get preference which to me is a sad situation" (sp).

One of the ways staff are pressured by the university to prioritise research is by linking their research output to their career progression. In doing so research is rewarded more than teaching which discourages staff from putting significant effort into their teaching:
R(3): "... when I joined here I got told that "hey focus on your research". So it's - people are almost trying to discourage you from putting a lot of work into your teaching because it doesn't get rewarded. If you want to go up the career ladder you need to focus on your research" (sp).

Respondent4 gives the impression that there is a balance between research and teaching. This balance is achieved due to a culture of research at the university which motivates staff to do research:
R(4): "…what I think makes the balance work is that people are very motivated and like to do research as well so there is a culture of research" (sp)

Some staff manage the competing priorities of research and teaching by integrating the two. By conducting research that is related to teaching the staff can spend the time they feel is necessary to produce quality teaching while at the same time meeting their research obligations. This can be a challenge as staff sometimes teach diverse courses and their research may not be applicable to all those courses:
R(3): "That's usually the best case scenario, align your research to your teaching but it doesn't always work out. We teach very diverse courses so somehow some of your teaching, either pedagogically or any experiments you do with the teaching approach or content might fit into your research, bigger research projects or sort of- your studies but not all the time" (sp)

With regards to staff numbers respondent1 and respondent2 are of the view that staff numbers are insufficient:

R(1): "...I don't know if you know the number of teaching people or the capacity is always a problem"
R(2): "We are completely understaffed and that's just political. So yeah at the moment they just find it cheaper to make us all work overtime than give us new staff" (sn).

Respondent4 also feels that staff numbers are insufficient but that overtime pay that staff receive compensates for that to a certain degree:
R(4): "So I think in general one would feel that there is understaffing, that there could be more staff but of course there is a unique arrangement within this faculty around what you get compensated for as overtime and so that I think balances the concern about staff not being adequate" (sn)

Respondent3 feels that staff numbers are sufficient but did acknowledge that staff with management experience would be a in a better position to answer the question:
R(3): "Interviewer: Do you feel that you have enough staff members to deliver your curriculum?
Respondent: Given the number of students we have I think yes. I don't know, I think this would be a more management issue but yeah I haven't seen a huge problem with regard to staffing" (sn).

At UX staff skills can be a challenge particularly in topics that are new such as Big Data. It is difficult to attract expertise from industry to fill these gaps and so staff have to upskill themselves through training. In order for upskilling to happen staff need to be willing to work hard and learn new skills as the training would take them away from their teaching and research commitments:
R(2): "...sometimes we have to develop staff. So in some cases so for I suppose big data, well we are not really involved yet but there is an understanding that we've got to get more skills in the business intelligence space. So sometimes we would get involved in training" (sk)

R(4): "So I can imagine it's hard to recruit for those specific niche areas because I think it's hard to attract someone who has already got a job in industry to actually volunteer and come and do some time here or to actually shift into an academic position but that's balanced by I think the work ethic and the willingness that staff have to learn new skills" (sk)

Discussion
The IS staff face pressure to prioritise research over teaching. Staff are advised to focus more on their research if they want to further their careers. Those staff who are passionate about teaching would prefer teaching to get more recognition. Respondent4 feels that there is a balance between teaching and research and that research is encouraged rather imposed through a culture of research. This contradicts the views of respondent1 and respondent3 which indicate that a balance does not exist and that research is given priority. The difference in views could possibly be explained by the differences in length of service. As respondent4

has been at the department the least amount of time it is possible respondent4 has not encountered the pressure that respondent1 and respondent3 speak of. Staff manage the competing priorities of research and teaching by combining the two where possible. Staff use their research to inform their teaching and their teaching to inform their research. The IS2010 guidelines acknowledge that staff face pressures related to research productivity which add to their workload but do not give advice on how to manage this pressure (Topi et al., 2010).

There is also disagreement amongst the respondents with regards to staff numbers. Respondent1, respondent2 and respondent4 felt that staff numbers are insufficient. Staff are paid overtime in order to compensate for the shortage of staff. Respondent3 feels that staff numbers are sufficient. To resolve the difference in opinions it would be useful to consider the profile of the respondents. Respondent1 and respondent2 have been at UX the longest out of the all the respondents. Respondent2 also has some management experience which gives respondent2 more insight into these issues. Therefore the responses of respondents1 and respondents2 carry more weight which means that the UX IS department should be considered as understaffed. The IS2010 guidelines mention that determining the sufficient number of staff depends on how many students there are. There should also be sufficient specialisation amongst the faculty to ensure that the curriculum can be sufficiently covered (Topi et al., 2010).

Staff skills are a challenge at UX particularly when it comes to topics that are new in ICT such as Big Data. However the success of the upskilling is dependent on the commitment of the staff as upskilling distracts from the staffs' other commitments. IS2010 recognises that staff skills shortages often arise given the constant change that takes place in the IS discipline (Topi et al., 2010). The interview data shows that such challenges are occurring at UX due to the emergence of new fields such as Big Data. It is difficult for UX to attract expertise from industry to teach new topics and so UX has to send existing staff on training. IS2010 suggests that training in new technologies should form part of the staff workload and that universities should support their staff in this regard by providing the resources necessary for training (Topi et al., 2010). However given that the success of the upskilling is dependent on the commitment of the staff it seems training is not part of staffs' regular work load but something extra that staff have to take initiative to do.

Subcategory: Industry

The data in this code refers to skills that industry requires of students (isk). According to the respondents industry in South African places more value on soft skills rather than the technical skills. Respondent2 believes that IS2010 mainly speaks to technical skills and not soft skills:

R(2): "We also did a survey where we asked… every company which was the most important and guess which one was the most important? Interpersonal competencies. This [highlights interpersonal competencies on a research document displayed on a computer screen]. So this is a survey in South Africa on organisational knowledge. None of this is in IS2010" (isk).

One of the ways industry skills needs are determined by UX is through market research. Respondent2 talked about how salary trends are used as a way to determine what skills are in demand:

R(2): "…sometimes we would look at these salary trends like career junction salary trends, what's the latest demand in skills and often you can use salary as an indication of demand"(isk).

Discussion

One of the ways the IS department determines industry skills needs is through market research. According to this research soft skills are more important to South African industry than technical skills. The IS2010 guidelines do list soft skills amongst the learning objectives and topics to be covered in the course outlines. However the comment above indicates that the soft skills listed in IS2010 are not comprehensive enough. This is one shortcoming of IS2010 that has been identified by the respondents.

Subcategory: Government

This subcategory consists of government regulation (gr) and government skills (gs) needs. The UX BCom degrees correspond to NQF level 7 (UX Commerce Handbook). From a regulatory perspective the government only impacts curriculum decisions when a new qualification is being created or when "major changes" to a qualification need to be made. In such instances the government has to provide approval and the respondents emphasised that the approval process is lengthy and arduous:

R(4): "But I know that if you want to develop a new course and if you want to make major changes to a course then there is a fairly sizeable approval process" (gr).

However once that approval has been granted lecturers have some flexibility to make changes to the programme:

R(3): "I mean once a degree program has been approved, as far as I know there is minimal oversight from the government. So we have a sense of autonomy in terms of the exact content of the degree program" (gr).

In terms of skills there is an effort by the respondents to stimulate interest in public sector careers. This is done through the use of case studies. However stimulating interest in the public sector amongst students is a challenge as the nature of the Commerce faculty and the other courses the BCom students learn tend to encourage an interest in working in business and maximising earnings:

R(2): "Yes so unfortunately in Commerce from the first year they say "I came to do Commerce because I want to earn money and drive a nice car" and from the word go the accounting courses and economics courses teach you about making profit" (gs).

The above comment from respondent2 echoes the comments made by respondent3 in the curriculum objectives subcategory. In that subcategory respondent3 mentioned how interest

in working in industry was cultivated within students in the BCom programmes making it difficult to encourage students to work in domains other than industry.

Discussion

Government regulation only impacts the BCom curriculum if a new qualification needs to be created or substantial changes need to be made to an existing qualification. Equipping and encouraging students to work in government is one of the stated desired objectives of the BCom curriculum and is also encouraged by IS2010. However it is difficult to achieve this objective because the Commerce faculty is orientated towards industry and industry values. As a result the UX curriculum is not economically responsive (Moll, 2004). Public sector case studies and projects are used in IS courses to develop public sector skills and knowledge within students. IS2010 makes no mention of government regulation. This is possibly due to the global nature of the audience of IS2010. Government regulation will likely differ from country to country and region to region making it impractical to address in a document such as IS2010.

Subcategory: Society

Society was identified as a curriculum stakeholder because ICT skills are important for socio-economic development. Society also impacts on curriculum by applying pressure on universities for causes such as transformation which is discussed on p23 of this research report. This category has two codes: society skills needs (ss) and societal pressures (sp). The non-profit domain is one of the domains that IS2010 encourages students to be exposed to. At UX the skills and interest needed to work in the non-profit sector are cultivated through the use of case studies and projects in the same way that interest in working in the public sector is stimulated:

R(1): "....what I have done over these years that I have done the ...course, I have themed it. So there were a couple of years where the environment and the social, the community where they (the students) were forced to choose only projects that were community based" (ss).

While analysing the interview data it became clear that society also applies certain pressures on higher education as well. In the case of South Africa the issue of transformation was mentioned as a factor that that has recently begun to impact curricula at UX:

R3: "…it (transformation pressure) started last year (2015) from students protesting. Yeah so it definitely came – before that there was very little conversation here on transformation. It was just a tick box to – but ever since last year it has been put in all important documents, university documents and it's supposed to trickle down into implementations at a departmental level"(sp).

Discussion

The department tries to meet societal skills needs through the use of case studies and projects in the same manner that government skills needs are catered for. Although not explicitly mentioned by the respondents it is possible that efforts to meet societal skills needs

encounter the same challenge that is encountered in trying to teach public sector skills. If the Commerce faculty promotes a focus on business and profits which reduces interest in working in the public sector it is possible that interest in working in the non-profit sector will also suffer.

In the initial research framework transformation was placed under the Government code grouping as it was initially felt that transformation pressure came mainly from government. However the interview data suggests that transformation pressures also come from other sections of society such as students and civil society. IS2010 does not directly address transformation since it is a South African issue rather than an IS issue. However the IS2010 document does claim that IS2010 is designed with enough flexibility to cater for different contexts (Topi et al., 2010). Therefore applying transformation needs to a curriculum based on IS2010 should, in theory, be possible.

Subcategory: Student Needs

The initial conceptual framework had a student needs factor under the economic category. When the data was analysed it became difficult to distinguish the difference between economic student needs and learning student needs since both factors were concerned with the learning motivations of students and how that impacts teaching and learning. It was therefore decided to only have one student needs factor under the learning category. In terms of motivation the learning category will show that most students at UX appear to be interested in obtaining employment. Issues related to teaching skills for the industry, government and society domains have already been covered in the subcategories above.

Subcategory: Stakeholder Communication

This subcategory is concerned with how the various curriculum stakeholders communicate with one another in order to shape the curriculum. There are five codes in this subcategory. These codes are staff-industry communication (si), staff-government and society communication (sgs), staff-student-industry communication (ssi), student-staff communication (ss), staff communication (sr).

Communication between staff and industry is facilitated through a partnership where industry representatives engage directly in the teaching and learning through workshops and guest lectures. This gives industry an opportunity to communicate what they feel is relevant and provides another avenue for industry to communicate their skills needs in addition to the research mentioned in the Industry subcategory:

R(1): "We have created a partnership with... a software development company, they do quite big projects. They wanted to catch the students earlier in their curriculum so they decided they will help us to rewrite the cases that we use throughout the year to drive the deliverables and workshops" (si).

R(4): "...on the technical courses, so capstone third year course and honours systems development course those are two where we work with industry quite closely on projects and it's often through them that we get the most feedback as to what students need" (si).

There are also Advisory Boards which are forums where industry can make recommendations about what they feel is important. One of the shortcomings of the Advisory Boards is that there are no representatives from the public and non-profit sectors:
R(3): "So we have an Advisory board that I have personally attended at least once or twice for instance so that's one avenue and we usually have people from different companies, predominantly IT companies. We don't have – which is my objection – we don't have a lot of people from public sector and informal sectors or NGOs" (si) (sgs).

A way of including students in the communication between staff and industry is through sponsored projects. In these projects industry act as the clients while students provide the services with lecturers acting as advisors:
R(1): "So we have had several meetings with [Company X], with [name removed] and with us and then also the students were on board. So I think it's nice and I think with the projects the students feel they sort of participate as well" (ssi).

Staff-student communication is conducted in several ways. There are communication channels such as reflective essays and course evaluations used to solicit feedback which the lecturer incorporates into their teaching. If the channel is not anonymous, such as the essay for example, students may not be completely forthcoming. This is not a problem with course evaluations because of the anonymity. Students are also incentivised to complete a course evaluation possibly because they may not be interested in completing one if it is not for marks like the essay is:
R(3): "…we solicit feedback from multiple levels. Usually if they are doing a project part of the section in their report requires them to reflect and provide feedback of their experience and what they felt but obviously students in many cases feel because that part of the report, because it's going to be associated with their name sometimes they are not as critical and then the second level now is the course evaluation that is done by every course, it's anonymous and we incentivise students to do it because we value. So in my courses I give 1%" (ss)

Beyond essays and course evaluations lecturers such as respondent3 try to develop relationships with their students so that students are comfortable approaching them:
R(3): "*I personally try build relationship with students so that they can approach me and raise questions, raise their frustrations in a dialogue way and I can try explain some of the interventions" (ss).*

Amongst the staff it appears collaboration happens mostly in pockets where certain staff will work closely together and this compromises the level of coordination within the degree programs:

R(2): "We sometimes get it wrong. So… sometimes someone in the second year course puts something and then does not always tell the person in third year. So we are supposed to deal with that through our section meetings but that doesn't always happen. So sometimes things fall through the cracks unfortunately" (sr).

Discussion

The IS2010 guidelines do not discuss stakeholder communication explicitly and so the staff have to create their own ways of facilitating communication amongst the various curriculum stakeholders. Ideas can be drawn from the way IS2010 itself was created. There is a wiki blog that was launched for the IS2010 project where various stakeholders can comment and provide feedback. There were also numerous panels that were constituted to discuss IS2010 before it was published (Topi et al., 2010). At UX the communication between staff and industry takes place through advisory boards and direct participation by industry in teaching through guest lectures and workshops. Students are able to communicate directly with industry and staff when students have to do projects where industry takes the role of the client and the staff act as advisors. Staff solicit feedback from students through reflective essays and course evaluations. Some staff also take the initiative of cultivating relationships with students so that students feel comfortable expressing their views about the curriculum to staff.

There is little communication between staff and the public sector or non-profit sector as evidenced by respondent3's complaint about advisory boards not having public sector and non-profit sector representatives. The communication only takes place during student projects which involve the public sector or non-profit sector. In the curriculum objectives subcategory it was established that the BCom degrees predominantly prepare students to work in industry. This would explain why industry has greater involvement in the curriculum than the public sector and non-profit sectors.

Staff do communicate and collaborate with one another but sometimes this can be insufficient. Staff work together on courses and hold meetings within their sections. However this communication and collaboration mostly happens amongst small groups of staff rather than the department as a whole. As a result there can be a lack of coordination across the curriculum.

Subcategory: University Needs

This code was not in the initial research framework but emerged in the data analysis. The university was identified as another stakeholder which impacts the curriculum. University Needs consists of the following codes: student numbers (sn), research output (ro) and university regulations (ur).

According to respondent3 one of the measures that is important in the Commerce faculty is profitability which is linked to how many students are in the faculty. There was a time the IS

department faced the prospect of being closed down because of a lack of profitability. As a result attracting students became the main priority for the IS department. In order to attract students the department has to offer degrees that increase the chance of employment and so employment readiness becomes the teaching objective:
R(3): "Yeah there is a financial pressure in the faculty of Commerce because it's – the model here is you are driven by numbers, how many students you have. There was a time when we as a department – we were threatened that we were going to be shut down because we don't have the numbers" (sn).
R(3: "So yeah attracting as many students as possible is becoming a priority and that aligns with teaching them or preparing them or linking them to prospects of getting a job. If you have a degree that doesn't necessarily prepare students for a specific job it becomes difficult to make it at least in the faculty of Commerce" (sn).

Research output is important to UX given its status as a research institution. UX ensures its research needs are met through university guidelines that reward staff primarily based on research output. This causes staff not to prioritise teaching:
R(3): "…given the typical university guidelines – at least in the past I know they are working on it now – in the university you will get rewarded or promoted predominantly based on your research output not teaching so staff tend to not prioritise teaching" (ro).

With regards to curricula, university regulations are applicable when making changes to an existing degree or proposing a new degree. This involves approval from various committees and in some cases competition from other departments:
R(2): "An actual course in a qualification, that's internal within the university. It has to go to Senate. That's where often there are territorial battles. So you can create a new course called data science and there is going to be a huge fight because every faculty is fighting over it" (ur).

University regulations can be restrictive when it comes to new initiatives aimed at improving degree programs. For example the IS department would like access to different types of students but the university and faculty requirements do not allow for that. Efforts to achieve this have been hampered by regulations at the university.
R(3): "…we realised some of our entry requirements are restricting us from tapping into certain types of students and to go around that we try and create joint degree programs, joint majors so we are working on a joint merger with Humanities for instance and usually to set that up there is a series of guidelines that we have to adhere to at a university level" (ur)

Discussion
In the government and society subcategories the respondents indicated the Commerce faculty has values that are similar to those of a business such as prioritising profits. These values can be seen in the university needs subcategory as well. The IS department has faced the possibility of being closed down because of insufficient student numbers. In order to attract more students the teaching must be aligned as much as possible to industry. This in

turn contributes to the difference between the stated desired curriculum objectives and the achieved curriculum objectives. The IS department would like to focus on more than preparing students for work in industry however the pressures of profitably forces the department to prioritise the work readiness of their graduates. The focus on the industry domain does not align with IS2010 objectives which encourage a balance of knowledge across different domains (Topi et al., 2010).

The university expects teaching staff to produce research as well as teach. However the university prioritises research and incentivises staff to prioritise research by linking research output to career progression. UX's focus on research can be explained by the pressures of globalisation on universities which were discussed in the literature review. These pressures push universities to prioritise activities which enhance the reputation of a university such as research output. This helps to attract more students and research funding leading to more revenue for the university (Souto-Otero & Enders, 2015). At UX faculties and departments inherit university objectives and these objectives also shape the IS curriculum that is offered.

In the government subcategory it was established that government regulation impacts the curriculum when new qualifications are created. Before government approval is sought university approval needs to be granted. This approval is not only for new qualifications but for big changes to existing qualifications as well. Like the government approval process the university approval process is quite lengthy and can discourage departmental initiatives such as joint majors that require university approval. In some cases a new course needs to be created and added to a qualification. This requires university approval and can meet resistance from other departments if other departments already offer a similar course or want to offer that course.

4.3.2 Category: Learning

Learning responsiveness contextual factors relate to the teaching and learning of students.

Subcategory: Curriculum Content

This subcategory consists of the following codes: career tracks (ct), course content (cc), IS2010 document (isd), skills and competencies (sc) and staff views (sv).

One of the features of IS2010 is the career track options. IS2010 suggests several career tracks which are shown in Figure 9. This diagram also shows how IS2010 recommends the use of elective courses and different coverage levels of core courses to cater for career tracks. The UX IS department decided to limit the career tracks they offer due to student numbers and budget constraints:

R(2): "You know some departments have options but I think because of budgetary constraints and student numbers we a long time ago got rid of our options" (ct).

However the respondents did not agree on what career tracks the department does offer. Respondent1 said that career tracks are not the goal:

R(1): "Interviewer: Earlier you spoke about how most of your students or some of them go into Business Analyst and Project Management roles. Is that a deliberate effort on your part? Respondent: I think for me at undergraduate level no because undergraduate actually is a broad base and many students also go into development… The focus is to empower students to be able to hit the ground running and to understand the intricacies of the real world than to focus on a specialisation" (ct)

Respondent2 and respondent4 said that the aim is to produce Business Analysts (BA) and Application Developers (AD):
R(2): "So we - every time it's raised there we seem to reaffirm that we are predominantly producing business analysts but also application developers and we are committed to 3 years a program"
R(4): "the two that, if I remember correctly that were pushed were the Business Analyst and then also the Software developer roles." (ct).

Respondent3 said that the BA role was the main career track that the department aimed for:
R(3): "…we have made a declaration somewhere that we predominantly prepare our IS graduates to take the role of Business Analysts, that seems to be the dominant theme" (ct).
This assertion is supported by the IRD which clearly states that the purpose of the BCom (IS) and the BCom (IS+CS) programs are to produce BAs.

The reasons behind the choice of career tracks appear to not have been communicated to the newer members of staff:
R(3): "Interviewer: How did you, or why did you decide that Business Analysis is what we are focusing on as a department?
Respondent: I don't know how it came about. I mean really I found that. I mean I work on the university website and I found that declaration somewhere on the website so I don't know how we got to that" (ct).

The lack of agreement as to what the career tracks are offered by the department along with the lack of understanding of the newer staff suggests a lack of communication. This is curious as Respondent2 suggested that conversations around this topic are held each year:
R(2): "…there have been some people in the department who say we don't produce application developers and others who say it's absolutely critical that you do that entry level job. So of course from a strategic point of view we have to re-establish every year do we still agree?" (ct).

In the UX curriculum the course content does not distinguish between career tracks. The BCom degrees do not have a set of courses explicitly for a BA and another set of courses for an AD. The only difference in course content occurs between the BCom (IS) and the BCom (IS+CS). When asked about the rationale behind having a BCom (IS) and a BCom (IS+CS) it was explained that this choice was motivated by student interests rather than the desire for career tracks. It had been observed that some students take more of an interest in programming,

others focus more on the business side of technology while some students have an interest in both. Having these two degrees is a way of trying to cater for students who are interested in the business aspect of technology or both business and programming. Those students who purely want to program would ideally go to CS:
R(3): "…there was a point in time when we realised there was a need for, I mean there were some students who were neither pure IS and neither pure Compsci in a sense that they didn't want to just be hard core programmers but they still wanted to do some programming and that degree was created to accommodate that" (cc).

Figure 10 and figure 11 above show how the UX courses map to the IS2010 courses. Collaborative Computing is not catered for by UX presumably because it is not a recommended course for the BA or AD career tracks. Knowledge Management (KM) is a course the IS department wanted to offer but was not able to because it is already offered by the Library Sciences department but only at a postgraduate level. The Library Sciences department was not able to create an undergraduate KM course and having the IS department create their own KM course would have created conflict between the two departments:
R(2): "In the case of knowledge management there was this problem that there wasn't really an undergrad knowledge management course. The division that is responsible for knowledge management is a postgrad division called Library Science and how we get them to do a course at that time was problematic so best we don't create a knowledge management course or we are treading on their turf" (cc).

The majority of the non-computing courses in the UX programs are Commerce courses such as such as Accounting, Business Law and Economics. There are two reasons for this. Firstly the Commerce faculty requires students to obtain a certain number of credits to obtain a Commerce degree:
R(3): "There is a minimum number of commerce credits a student needs in order to be able to graduate with a Commerce degree. That number is set by the faculty to make sure that a Commerce graduate has enough understanding of Commerce affairs" (cc).
Secondly any non-Commerce courses that Commerce students do result in revenue being lost to other faculties. This is a problem for the Commerce faculty because profitability is one of the priorities for the faculty:
R(3): "Of course, one must not ignore the financial incentives. A student doing Commerce courses means money coming to the faculty of Commerce. The more 'outside' courses, you allow the more money you will be losing to other faculties" (cc).

Some lecturers use the IS2010 document as a basis for their course content but do not follow the guidelines strictly:
R(3): "However most of the lecturers, the colleagues I have worked with, they loosely use it to structure the content of the degree programme" (isd).

As with the career tracks it appears some historical decisions have not been communicated to the newer staff members. According to respondent3 adherence to IS2010 is not explicitly required by the department:
R(3): "I've worked here as a lecturer for the past x years – my experience is – I have not come across an explicit discussion at a departmental level that requires lecturers to follow IS2010 curriculum" (isd).

Newer staff in some cases inherit courses without being made aware of how the IS2010 guidelines relate to the courses:
R(4): "So I know the whole department has looked at IS2010 quite carefully a few years ago in the way they shape the curriculum and what needs to be in each course and I have basically just taken that on so I have not specifically had to take anything out of IS2010" (isd)

As a staff member whose service began before IS2010 was published respondent2 was able to offer some insight into the process that unfolded when IS2010 was first adopted. Initially the existing staff members mapped IS2010 against the UX BCom curriculum at the time:
R(2): "…so what we did as a department when it first came out is we had a strategy meeting and then we looked at our curriculum and we mapped it against that document" (isd).

The staff then had to decide on the content. In order to decide what content to teach the staff first had to decide on what career tracks to offer. The BA and AD career tracks were chosen because of constraints related to student numbers and finance as mentioned earlier. After that the local job market and the university context was taken into account in order to make the final decision. The university context includes the university structure, teaching staff and university regulations:
R(2): "So that's the first thing is to say what, who are you producing? So we are the A (Application Developer) and the B (Business Analyst). So when you look at these you say okay have we got all these courses in? We haven't then blindly said well we need to have all these courses. We have in a way looked at the local job market because this is an American centric document so we've had to say ok what is the demand locally and which of these can we do and in a way we've also, we've looked at the market and we've also looked at UX's context" (isd)

During this process the department identified several gaps in IS2010 in terms of course content. The first was that IS2010 did not place enough emphasis on programming. The department felt programming was crucial for all students to understand whereas IS2010 makes programming optional for certain career tracks:
R(1): "I know IS2010 didn't put that much emphasis on programming but we do in our undergraduates at the moment… that was one of the areas where we sort of diverted a bit"
However given that the department chose career tracks which have programming the lack of programming emphasis did not have an impact on the decision making process:

R(2): "The department got all upset about programming no longer being a required course but that was just a point of view. We kept it in as required because we chose the roles that required it so it made no difference to us" (isd)

The second gap was that IS2010 places a greater emphasis on technical skills than on non-technical skills. This was a problem because according to the department's research non-technical skills, particularly interpersonal competencies, are the biggest priority for companies. This issue was raised under the Industry Skills subcategory as well:
R(2): "None of these learning objectives [in the IS2010 document] refer to these interpersonal competencies like the ability to secure trust, to do requirements elicitation, to work – facilitate workshops, you see? Those kind of things which are critical to the job." (sc)

The third gap was a lack of justification in the choice of some topics and the coverage of topics. The IS2010 document does not explain why KM is important for example. Only IT infrastructure and enterprise architecture are justified. IS2010 also does not explain why some tracks must have 'significant coverage' of a topic while others should have 'some coverage'. Furthermore the document does not define what these different coverage types mean:
R(2): "…they didn't justify why some of these things are here. So for example if we go back to our diagram, how do we – why knowledge management? They made a nice black dot, sometimes they make black dots and little open dots but it's still not clear why the black dot, why the open dot. You know so sometimes I think about it and I go ok how much is an open dot and how much is a solid dot, what does that really mean?" (isd)

The transition to a curriculum based on IS2010 was made easier for some courses because the department had been using the previous version of the ACM/IEEE curriculum, IS2002. Therefore some changes involved updates to existing and while others involved the addition of several new courses:
R(2): "When IS2010 came along we had looked at the previous version. So there wasn't a big change. In some ways – what we did do was to rename some of our courses to match the descriptions in IS2010 but we were teaching it anyway" (isd).

In addition to helping staff decide what course to teach IS2010 is also useful in justifying the choice of the teaching content to students:
R(3): "I don't follow it very strictly but I use it in many cases to create consensus and in some ways to add a little bit of - what's the word – legitimacy to my courses" (isd).

The department endeavours to teach students a range of skills and competencies. These include technical skills related to software and soft skills such as teamwork and interpersonal competencies, understanding of business and technology, skills that can be applied in industry and entrepreneurial skills that can be applied to community challenges. Striking a

balance between teaching industry skills and socio-economic development skills is difficult as there is limited time to deliver the degree programmes:
R(4): "We try and keep the balance between teaching them entrepreneurial skills where they think about their own ideas and things that the community needs where they see something and those who want to go to industry and what skills they would need in that type of environment. So it is a challenge because you can't always cover both fully in the limited time you have with students" (sc).

As part of the interviews the respondents were asked what they understood by the term curriculum. The understanding of the respondents is that a curriculum is a conceptual map that is useful for guiding choices related to content, structure and pedagogy:
R(4): "So to me it's the content that we deliver to the students but also I think I would include the way in which it is delivered, the structure of the course. So the assessments, the way the course allows students to reflect on what they have learnt so to me it's a fairly broad concept beyond just the actual book you are teaching someone" (sv).

International computing curricula are viewed by the respondents as useful as long as they are taken as guidance rather than prescription. This is in fact the way the IS2010 authors state the guidelines should be used (Topi et al., 2010). Due to the amount of work that goes into developing international computing curricula they are seen as having valuable insights into what is relevant in the discipline. However it is important to take the context into consideration when adopting model curricula:
R(3): My take on model curriculum is to use them as rather guidance and not as prescribed...The advantage you have with these curriculums is obviously this education project has been going on for a long time. You can learn a lot from those because they probably experienced some of the similar issues. It helps you orientate yourself but you have to use them with a critical mindset and critically look what can work in your context" (sv).

The importance of context feeds into the reservations some staff have about international computing curricula as they are seen as being generic and not being flexible enough to allow for the integration of local context:
R(3): "Part of my reservation with the international accreditation or curriculum is how much of it allows for one to add in local social issues. The more international you are trying to be the more generic you are trying to be which means getting rid of the specifics of your context" (sv).

Not all staff agree the local context is a priority. Some feel adherence to international practice is more important so there are differing views within the department on the value of international curricula:
R(3): "before students raised it via protest I already picked up that there was lack of effort in trying to link our knowledge to the context and we felt being in IT we are fairly neutral. See we are not anthropology, we are not literature. Those courses are the ones we have to look –

technology is technology it doesn't matter where you are and I don't think so. It's very much, we are socio technical. So society first and then the technical aspect second
Interviewer: Is that a view your colleagues share?
Respondent: I wouldn't say it's unanimous. It's a debateable issue. Some people still believe it's an international thing and we should follow international practice" (sv).

Discussion

To adopt IS2010 the IS department first decided on what career tracks they wanted to offer. Due to student numbers and budget constraints the department initially decided to focus on the BA career track. There are conflicting views as to whether they currently offer the AD career track. It appears that what the department has done is focus primarily on the BA track but offer enough programming knowledge such that those students who want to be developers are equipped to do so. In addition to their BCom (IS) the department also offers a BCom (IS+CS) which does not necessarily cater for specific career tracks but for the interests of students. This is because some IS students have very little interest in programming while others take more of an interest in programming.

There is evidence of the lack of coordination that was uncovered in the Stakeholder Communication subcategory. For example respondent2 says the conversation about career tracks is revisited by staff every year. However some staff, particularly the newer staff members, seem to not participate in such conversations. This can possibly be explained by the lack of coordination within the department which was alluded to in the Stakeholder Communication subcategory. If certain staff work together more closely than others it is possible that not everyone is involved in such discussions. This raises questions about the ability of the department to meet the curriculum objectives if the staff do not have a common understanding.

Given that IS2010 is viewed by the staff as American-centric the staff feel they cannot follow IS2010 exactly. In order to determine what changes need to be made the staff look at South African industry needs and the university context. The industry needs are elicited through research conducted by the department and the relationships the staff have with industry which were described in the Stakeholder Communication subcategory. Using the industry needs the staff have determined that there is a lack of emphasis on programming and insufficient coverage of interpersonal skills. The UX context refers to the university structure, university regulations and teaching staff. The UX context poses several challenges such as staff shortages and relationships with other computing disciplines. The effect of these challenges on the curriculum has been to prevent the IS department from teaching certain courses in their BCom degrees such as KM. An additional shortcoming of IS2010 according to the respondents is a lack of justification regarding the subject choices and levels of coverage required.

The UX BCom degrees offer all the core courses specified by IS2010 and several elective courses. UX has combined some IS2010 elective courses into a single course. For example Business Process Management and Enterprise Systems are mapped to the INF3012S course as shown in figures 10 and 11. The additional courses that form part of the UX BCom degrees are predominantly Commerce courses such as Accounting, Business Law and Economics. This is because of faculty requirements regarding Commerce credits for Commerce degrees as well as a desire to maximise revenue by having Commerce students take as many Commerce courses as possible. The large number of Commerce courses that need to be included in the BCom degrees make it difficult for other non-Commerce courses to be included in the curriculum due to time limitations. This limits the ability of the IS department to incorporate courses related to other domains such as government.

The IS department has used IS2010 to refresh existing courses and determine what courses should be added. For example respondent2 in the curriculum subcategory pointed out that HCI was a new course that they had not previously offered to their students. The reason some existing courses could be used as a basis for some of the IS2010 recommended courses is because the IS department had used the previous version, IS2002, before IS2010 came out.

In addition to the lack of coordination amongst staff there is also a lack of agreement among staff on certain issues such as the importance of integrating local context into the curriculum. Some staff feel that following international practice is best while others feel context is very important. For those staff who believe context is important there is a feeling IS2010 is not flexible enough to allow for adaptation to the local context. This is interesting to note because the authors of IS2010 claim the guidelines are flexible enough to be adapted to any context.

UX staff apparently use IS2010 to guide them in developing their courses but do not necessarily incorporate everything that IS2010 suggests in terms of structure and content. Although the IS department claims in the IRD document to base their IS degree curriculum on IS2010 there is no specific instruction to staff to use IS2010. It appears staff use their own discretion in determining how to apply IS2010 to their courses. This contributes to the lack of coordination across the degree programs.

The skills the UX BCom degrees teach include the IS knowledge and skills, the foundational knowledge and skills specified in IS2010 and interpersonal competencies not specified by IS2010. The domain skills taught are primarily related to the industry domain. There is some effort in teaching skills related to the public sector and socio-economic development but not however to the same extent as industry skills.

Subcategory: University Infrastructure and Resources

The infrastructure and resources that were mentioned by the respondents were hardware (hd), software (sf), space (sp), support staff (ss) and data (dt).

The respondents feel that there are sufficient computer resources for delivering the UX IS curriculum:
R(4):"…in all our IS classes we have computer labs where there are enough equipment, enough computers for every student to work on." (hd)

In terms of software the adequacy of the resources depends on the type of software. Some software is open source or can be obtained through partner agreements such as the Microsoft academic agreement. Other proprietary software, particularly in the fields of Business Intelligence and Enterprise Systems is a challenge due to the cost of such software:
R(3): "When it comes to the technology it depends. Some of the basic technology we do have in our system. We have SQL, we have access to SQL servers for databases, we have access to Microsoft access, we have access to basic programming APIs or IDEs but when it comes to courses such as Business Intelligence, courses such as Enterprise Systems then it's a different ballgame because most of these use proprietary products which are expensive" (sf).

The university employs support staff to attend to the IT needs of the university. Each faculty has dedicated IT staff. The support staff in the Commerce faculty are particularly helpful:
R(2): "I think at UX we are very fortunate and Commerce even more so. So we've got Commerce IT and to an extent they have been very flexible" (ss).

Physical space is considered insufficient particularly with regards to venues that can accommodate computers:
R(3): "I think UX has a very good student to computer ratio especially in IS. So if anything the problem in IS or at UX in general is space. So if you want to expand a class and let's say double the size it's hard to get a venue especially one that requires computers for the students to work on" (sp).

Data used for teaching emerged as an important resource because the data determines how well the teaching relates to the local context. This in turn has an impact on students' ability to engage the material. Some of the data used in class is sourced from developed nations and as such is difficult for students to relate to. For example a case study on an airline is difficult for a student who has never flown to engage with:
R(3): "…sometimes they can give you the technology through whatever projects they are running and they can give you some demo data but it's not aligned to the context. It's demo data that they give to anyone, in Australia, in UK, in US, they give them the same demo data and from practical experience my students struggle to engage with that data or I struggle to fit that data into my teaching sort of vision" (dt).

Respondent3 and respondent4 pointed out that in terms of resources UX should not be considered as an example of an African university because UX has more resources than most African universities:

R(3):"…the basic infrastructure we have. I mean we are unique from most other African universities in a sense."
R(4): "I don't know if you would classify UX as an African university if you would look at it like that because I think from that perspective it is very European in the resources that are available here."

Discussion
IS2010 lists the resources that are required to deliver the curriculum. These resources include computers, libraries, classrooms and software. The university has sufficient computing resources according to the respondents. Open source software and software provided by vendors through academic agreements is easily obtained. Proprietary software is more challenging to obtain due to the cost. Computer laboratory space is an issue which suggests that although the university has enough computers they are not grouped in spaces large enough to accommodate large classes.

Support staff were mentioned in IS2010 as another important resource. Lecturers cannot be expected to maintain and monitor computer labs on top of their other commitments. Furthermore some of them may not have the qualifications to do so (Topi et al., 2010). It appears the Commerce department is particularly well-resourced in terms of IT support as the support staff are found to be very supportive. Relevant data was also listed as a necessary resource in IS2010 particularly for data management courses (Topi et al., 2010). Students need to relate to the data in order to effectively engage the teaching material. At the moment the data used in UX courses is not relevant to the South African context. A simple example is data for an airline case study. This data is difficult for some students to relate because some of them have not travelled in an aeroplane before.

Generally speaking the university has sufficient resources according to the respondents. The respondents made an interesting point about how UX is perhaps more European than African in the sense that UX has significantly more resources than a typical African university. Resources for delivering the curriculum would likely be more of a challenge at other African universities than at UX.

Subcategory: University Structure
The codes in this subcategory are faculty structure (fs), university committees (uc), other computing disciplines (ocd) and department location (dl).

Some respondents feel the department is in the wrong faculty. The pressures of being in the Commerce faculty contradict the philosophical standpoint of the discipline. The department claims the discipline is a social science however the department operates as a business. The focus on student numbers and marketability detract from developing socio-economic development skills and solutions:
R(3): "I actually feel like we are in the wrong faculty. I would have preferred IS to be in the middle of Humanities and – either Humanities and Commerce or Humanities and Science so

that the Commerce – the monetary or market demands don't become the core issue. So at the moment even though it's a discipline so if you look at it as a discipline in content at a postgraduate level we keep claiming that it is a social science… but operationally we don't embody that. Operationally we are forced to run as a business and it comes with certain pressures that contradict our philosophical standpoint." (dl)

At UX there are other disciplines and departments which offer computing courses. For example there is CS which sits in the Science faculty and the Film and Media department in the Humanities faculty which teaches a Human Computer Interaction (HCI) course. The IS and CS departments appear to have a strong relationship. There are conflicting views on whether the existence of these two separate departments leads to duplication. Respondent1 feels there is no duplication because the disciplines focus on different aspects of technology. The focus of IS is on systems and people while CS focuses more on the technology itself:
R(1): "I don't think there is duplication because I think over the years Information Systems and Computer Science have worked quite well together and I think the angle that is taken in Computer Science is a bit different to that of Information Systems. We focus on a Systems approach and not necessarily optimisation and drilling deep into the technicalities and I think it's supposed to, I would say, enhance one another" (ocd).

Respondent3 and respondent4 feel there is duplication and that this duplication is difficult to resolve due to university bureaucracy:
R(3): "*There is duplication of resources ... we teach a database course in IS at undergraduate level, there's an undergraduate course in Computer Science. That course could have been shared but we are not" (ocd).*
R(4): "But I think in terms of content there is a lot of overlap. I would say I think the problem often becomes how do you spread the resources to merge these better together? I think UX has lot of red tape so it's hard to actually get something moving and make it happen" (ocd).

Collaboration between the different computing disciplines is difficult because the university is structured in a way that promotes competition rather than collaboration:
R(2): "Yes so unfortunately universities have put in structures to make faculties and departments compete. So it's really hard work collaborating. So you can have the intent of collaboration but almost everything works against it. Particularly at UX because we've got financial devolution. So everyone is fighting against each other for money. So sometimes it's like, see you fight to have a course" (ocd).

In order for collaboration to take place staff have to take the initiative themselves and work against this structure:
*R(3): "So there is the individual level between lecturer to lecturer, there is some level of collaboration. We know our colleagues, we work together we interact. If I struggle with something I can easily contact someone to some extent. But as an organisational unit it's a challenge, it's a huge challeng*e" *(ocd).*

The IS department is sometimes at a disadvantage to other computing departments because IS faces additional pressures due to being in the Commerce Faculty. For example the IS department faces pressure with regards to student numbers which the CS department does not face. If IS experiences a drop in student numbers they are forced to take measures to remedy that whereas CS does not have to:
R(3): "So a few years ago, I think last year, one of the actuarial science programs decided their students who were doing IS as the – in the first year course they had to do an IS course. At some point they decided they were going to do a Compsci course. So that took away about 50 students or something, I don't know, a chunk of students who were doing IS. And we felt it in our numbers and our profitability. And it affected us. So it sort of felt like we now had to motivate them and to compete with Computer Science and the difference is that Computer Science are not facing this pressure, they really don't care" (ocd).

With regards to IS2010 the university structure has an impact on the IS department when a recommended course in the guidelines is not offered by the IS department. For example IS2010 recommends KM and HCI however the IS department does not offer those. If the courses are taught by other departments then those other departments could be asked to take IS students. However given that the university structure promotes competition this can be a challenge. It would also be problematic for the IS department to create a similar course because that would be seen as encroaching on other departments:
R(2): "In the case of knowledge management there was this problem that there wasn't really an undergrad knowledge management course. The division that is responsible for knowledge management is a postgrad division called Library Science and how we get them to do a course at that time was problematic so best we don't create a knowledge management course or we are treading on their turf. So there is always things like this" (ocd).

If the IS department does insist on creating a new course there are several steps that must be followed some of which involve overcoming opposition from other departments. The faculty accreditation committee must first give approval:
R(2): "So it first goes into the faculty accreditation committee then it gets published in the Dean's communication then it goes to Senate and then it gets published in the Principle's communication" (uc).

Despite all the approval processes in place for new courses and qualifications lecturers do have a certain level of autonomy when it comes to making changes to existing courses and qualifications if the changes are deemed to be small enough. The autonomy is seen as an advantage as it gives the lecturer a certain level of freedom. However the disadvantage is the lack of faculty oversight. This means that within the faculty there is a lack of coordination with regards to teaching and a lack of common understanding of what a Commerce graduate is and how they should be produced:

R(3): "Interviewer: ..so government only really comes in when you want to create a new qualification? So if it's an existing one and you are just making internal changes to a course then it's not going to go all the way to..?
Respondent: yeah it's not going to go all the way to government. To be honest with you it's not going to go anywhere. Part of that is an advantage, obviously the autonomy a lecturer has to structure the courses. Part of it is an advantage but part of it we are increasingly realising now it's also a limitation because there is no oversight at a faculty level for instance" (fs).

R(3): "There is no oversight on what is being taught where and how because we create a Commerce graduate and we plug certain things to them and we claim these things completely make up a graduate who can do so and so but there is not enough coordination in terms of understanding how everything fits together and we could benefit from some aspect of that, not in an administrative way but at least in a consultative way just to have a picture" (fs).

There is a forum within the faculty to discuss teaching however it is not compulsory. As a result not all staff attend which leads to the lack of collaboration and coordination that has been mentioned. The staff who do attend are described as being motivated by teaching which implies that those who do not attend are more interested in research. The notion that some staff can be described as teachers while others can be described as researchers was also evident in the Teaching Staff subcategory where staff who were interested in teaching were complaining about research pressures:
R(3): "We have something called CEG, which is a Commerce Education Group, where we meet once every month or twice every month and people present different ideas on how they are running courses. So that's the only platform that we have but it's only a fraction of the faculty that attends. People who are basically motivated by teaching" (fs).

Those staff that do attend the faculty forum find it useful as it provides an opportunity to collaborate with other staff members:
R(3): I've realised CEG helps me understand what for instance I just realised in the last CEG that there is a course in management accounting that teaches concept of reflection and I realised I have been doing it in one of my courses and they were presenting it as if it's like completely new, something that has never been done. They were struggling with some of the things that they could have learnt from me because I have been doing it for years" (fs)

Discussion
In the Curriculum Objectives and University Needs subcategories it was evident that the Commerce faculty places pressure on the IS department which makes it difficult for the department to achieve what they want to achieve. Respondent3 suggests that these pressures also do not allow the department to adhere to social science principles at the undergraduate level. Being in the Commerce faculty also places an added burden on the IS department with regards to student numbers which other computing departments in other

faculties do not experience. As a result respondent3 feels that the department is in the wrong faculty.

At UX there are other departments that offer computing courses. These departments include computer science and film and media. The organisational structure of the university does not encourage collaboration. This makes it difficult for collaboration to take place between departments. The university rules and regulations discourage initiatives aimed at pooling resources. This leads to duplication of some courses. The IS lecturers try to overcome this challenge by collaborating with their colleagues in other departments on an individual level rather than at a departmental level. This has met with some success however meaningful changes such as joint degree programs are discouraged by the university structure. The university structure does not only discourage collaboration but it also promotes competition between departments. This leads to problems when one department wants to offer a course that is already offered by another department or wants to offer a new course that other departments are also interested in offering. In some cases the competition results in one department simply not being able to include a particular course in their degrees as was the case for IS with the KM course.

The respondents have a clear understanding of the process of obtaining approval for a new course. There are several steps that must be followed if the IS department wants to offer a new course. The faculty accreditation committee must first give approval. The proposal must then go to the university Senate. If approval is granted from Senate then a Principle's communication is issued.

IS2010 recognises that a university may have different computing departments. Using IS and CS as examples IS2010 discusses how the different computing disciplines complement each other rather than compete with each other echoing the comments by respondent1. IS2010 recommends that computing disciplines share courses. How this should be done and which courses should be shared is not mentioned. University models are different and explaining how computing departments should collaborate would be too specific and take away from the generic nature of the IS2010 curriculum.

The Commerce faculty does not have oversight over what is taught across the various commerce departments. This leads to a lack of coordination in terms of teaching across the faculty. There are forums that are meant to address this but attendance at these forums is not mandatory. These forums appear to be attended mainly by staff who are interested in teaching. This is another indication of the different levels of interest in teaching amongst staff. This lack of coordination within the faculty is interesting because in the teaching staff subcategory there was evidence of a lack of coordination within the IS department. In a similar way to the curriculum objectives this shows how certain faculty characteristics are reflected in the IS department.

Subcategory: Student Needs

This subcategory consists of three codes: language (lg), student background (sb) and student motivation (sm). The language of instruction at UX is English. As explained in the literature review the use of English as the language of instruction presents a challenge for some South African students. According to the UX website a student needs to provide proof of English language proficiency in order to be admitted to the university. For South African students this can be either a pass in English Home Language or First Additional Language for the National Senior Certificate or 40% pass in English on the Higher Grade (first or second language) for the Senior Certificate. Despite meeting these requirements some students still struggle to learn in English. This has a negative effect on student marks even if those students are strong academically:

R(3): "…in one of my courses we realised that being an issue. We had a group of students who were all predominantly Portuguese speaking and we could see how they wrote their final reports. They were struggling to and these were brilliant students" (lg).

The language issue does cause frustration amongst some lecturers because they feel what is being assessed sometimes is English competency rather than Information Systems competency. However they recognise this dilemma is difficult to avoid because communication skills are vital to the discipline especially for the BA career track:

R(3): "And one wonders am I assessing English or am I assessing Information Systems? So yeah it is a difficult thing, communicative competency is important. Business Analysts – we think they should have communicative competency but how do you cultivate that?" (lg).

The BCom degrees have several ways of improving the English skills amongst students. There is the BCom foundation programme in the Commerce Faculty run by the Education Development Unit but that is also taught in English and has limited positive impact. The BCom (IS) and BCom (IS+CS) both have a compulsory Professional Communication course in the second year. There are also assignments within the BCom coursework which aim to develop communication skills that aid in developing students' English skills:

R(2): "They have the business communication course. Yeah so they have that in the capstone course itself we have essays, we have the reflective practice exercises that also helps with that communication and then expressing your views we have presentations a lot in this environment and I think all of those are different ways of almost massaging your or exercising your ability to articulate yourself well in that kind of language" (lg).

When the conceptual framework was developed language was viewed as a potential problem for students. However the respondents pointed out that language can also be a challenge for lecturers as well:

R(1): "English is not my language either so I can understand a bit despite the fact that I have read lots in English since I was small, it's still different when you, when you have to express yourself in English and when your thinking needs to be in English... So I have great compassion

with students expressing themselves. I don't know how one can bridge it except, you know years of doing it and working through it" (lg).
Lecturers can only obtain language support from the university when research is involved. There are writing retreats and editing services available to lecturers to assist with their research:
R(3): "The only help available is from research/publication angle. Department occasionally organises research workshops/retreats for staffs to encourage publications. These workshops are usually accompanied with a paid language editing service for research articles developed during the workshop" (lg).

The more computer literate a student is the easier it will be for that student to study computing. The educational background of students has an impact on students' computer literacy levels in South Africa due to the country's history of inequality in education. IS2010 does not address the challenge of varying computer literacy levels amongst students. This means that the teaching staff have to create their own interventions to cater for the different needs of students:
R(2): Interviewer: "So in South Africa… you will get students coming through with different levels of skill. Maybe some have been exposed to computing and others haven't. How do you go about addressing these challenges if at all and does IS2010 give you the space to do that?" Respondent: "No I don't think that speaks to diversity at all. I don't think there is anything about diversity here at all which is why it's silent on pedagogy you know. So how one deals with diversity in a first year course and things like that, there's nothing in this document to help us. That's what we have to work around ourselves" (sb).

Differences in computer literacy are catered for to a certain extent by the EDU program which has courses to help weaker students improve their computer literacy. The mainstream program does not have separate courses and this creates a challenge in balancing the needs of students who have previous experience with computers versus those who do not:
R(4): "So the one thing UX has put in place is an EDU version of most degrees, especially in Commerce at least which has more contact time with students to sort of scaffold their course. In the main stream we still have this problem where some students would have had years of computer experience for example. Other students it would probably be the first year they have actually really dealt with a computer and this does make it challenging for the curriculum" (sb).

The EDU and mainstream first year courses use interventions such as PC buddies and class workshops to address the diversity in computer literacy. It is unclear how effective these interventions are however they are seen as more effective than not having any interventions:
R(2): "Interviewer: Do you find the interventions have been effective?
Respondent: Well… the gulf is so big I don't know. It's better than just saying "sink or swim". I don't know what other – so those are just some of the examples that we do. You can't just

throw technology at first years. It increases their diversity. You have to have interventions like that. Like for example PC buddies, group sessions" (sb).

To a certain extent the international student body, which is predominantly African, also has varying levels of computer literacy. In the Introduction chapter this research mentioned that African countries do share some contextual realities. Varying computer literacy levels is one example:
R(3): "...what I would say is that there is an overlap somewhere perhaps on both sides. Foreign students who come here and are coming from extremely rich families and they would relate to the wealthier South Africans who are also present at this university and then the international students who come here and they will be coming from the poorer class and they will probably relate more to poorer South Africans"(sb)

The integration of the socio-economic background of students is recognised as being important as it has an impact on students' ability to engage with the material. This is seen as an area that the IS department can improve on:
R(3): "…if you are going to teach them a new concept you have a better chance of grounding that concept if you link that concept to their growth, their experiences growing up but if you use case studies that are just based with flying, booking airline tickets – I mean half of the students haven't flown before"(sb).

The UX students seem mostly interested in passing rather than actually learning. The respondents feel this has a negative impact on students' ability to learn:
R(3): "Yeah that's a big big headache. I get so confused about or let's say frustrated with how I can deal with that. The straight up answer is that the majority of students worry about the exam. It really comes down to, is this going to be examined? How is it going to be examined and let me be prepared for that? My personal view is, to some extent that prevents their ability to learn and engage the material."(sm)

According to respondent3 most students enrolled in the BCom degrees are interested in passing because most students are primarily interested in studying a degree so they can obtain employment in industry. Respondent3 feels the reason why many students are primarily interested in obtaining employment in industry is because of the way the IS degrees are marketed. One of the main selling points of the BCom programs is that they prepare students for work. The department markets the programmes in this way in order to attract more students so as to meet their financial obligations to the Commerce faculty:
R(3): "…we have a limited time to cover certain skills, basic skills and then also cover this other additional stuff and once our graduates complete they get hired and the ability of them to get hired usually indicates marketability, how many more students we going to be able to get. So that's the pressure that we are facing"(sm).

Although the respondents believe most students want to work in industry there are some students who want to be entrepreneurs and others who want to work in the non-profit sector. The respondents do not believe that where a student wants to work impacts on their performance:

R(4): "I wouldn't say that what their motivation correlates strongly. I mean you have got some who want to go into industry who are very motivated some who do their entrepreneurship project and they are also very motivated so I don't think there is any specific pointer that way"(sm).

Discussion

Despite UX having minimum English proficiency requirements as a prerequisite for entry into the university learning in English remains a challenge for some students. Even if students are strong academically if they are not fluent in English they struggle with their course deliverables. In order to develop students' ability to write and speak in English UX employs teaching and learning methods such as presentations and essays in IS courses. The BCom programs at UX also have communication courses that students must do which help to develop English communication competency.

The English language is also a challenge for lecturers as well. The staff from UX originate from several, mostly African, countries. This adds another dimension to issues of language competency within the university because not only are there students who need assistance with language but potentially staff as well. UX staff do not see a quick way of addressing English language competency. In their view language competency can only be developed over several years of writing and speaking. This implies that students who struggle with English will continue to do so for the duration of their studies although they will improve over time.

Language competency amongst students is a complicated issue for the IS department to address. Communication competency is very important for the BA track and part of communicating is being able to articulate yourself in a particular language. This creates a situation where as part of assessing students' competence lecturers have to assess English language competency which is not the purpose of the IS discipline. IS2010 does not provide guidance on how to address language issues. As demonstrated by government regulation and university structure IS2010 does not address in detail issues that potentially vary from country to country and this is perhaps why language competency was not addressed.

The computer literacy levels amongst university students in South Africa vary greatly because of inequalities in the primary and secondary education systems. Some students have never used a computer before university, others have studied computing at secondary school and others fall somewhere in between these two extremes. This results in varying levels of computer literacy within one class making teaching a challenge. The IS2010 curriculum does not guide lecturers on what they must do if they have students who have different levels of computer literacy. Therefore, as with language competency, staff have to develop their own

ways of addressing the diversity in computer skills amongst their students. The EDU has courses that help the BCom students enrolled in the academic development (AD) version of their degrees to improve their computer skills. However this does not help those students who enter the mainstream BCom programs. This presents a challenge for lecturers because they have to find a balance between engaging students who have studied computing before while also not overwhelming those students who do not even have basic computer literacy. To address this challenge the staff use collaborative learning in class which keeps the stronger students engaged because they help to teach the weaker students while ensuring the weaker students get the attention they need.

Although IS2010 does not guide lecturers on diversity in terms of computer literacy, IS2010 does suggest prerequisite technology skills students need to have in order study IS. These include web browsing, e-mail, graphics and spreadsheet processing (Topi et al., 2010). These can be used as objectives for extended degree programs to use in their foundation courses.
The IS department recognises the importance of relating teaching to the socio-economic background of students. Given that international students also attend UX it would be natural to question which students' backgrounds must be considered. Fortunately for UX most of their international students come from other African countries and experience has shown UX that international African students also face similar challenges to their South African counterparts. Another factor that is closely related to the socio-economic background of students is cultural background of students. This factor is addressed in the Culture category.

In order to meet their financial obligations to the Commerce faculty the IS department tries to attract as many students as they can accommodate. The department achieves this by marketing their degrees as programs that provide a strong possibility of securing employment upon graduation. For the marketing to be successful the majority of students actually need to secure employment once they graduate. This requires the IS department to create a curriculum that mainly focuses on preparing students for the workplace. This is another example of how the Economic interests of the Faculty impact the curriculum. By marketing the BCom degrees in this way the IS departments attracts students who are primarily interested in passing the coursework rather than actually learning the material. This negatively impacts students' ability to learn. Where students aspire to work, be it industry, government or the non-profit sector, does not appear to affect the students' performance. IS2010 does not discuss how to motivate students to engage the material.

Subcategory: Pedagogy

This subcategory has two codes which are IS2010 (is2) and teaching, learning and assessment (tla). From a pedagogical perspective IS2010 does not provide any guidance. This is because the authors of IS2010 felt that pedagogy fell outside of the scope of the document (Topi et al., 2010). The UX staff highlighted this as a challenge:
R(2): "I think if one looks at the challenges of the document I think the challenges have to do with- ok it's good at doing this matching [pointing to diagram in IS2010 which maps courses

to career tracks], I mean I am not convinced that the matching is always correct but it does very much focus on content and not pedagogy" (is2).

The UX staff have therefore developed their own pedagogy. The pedagogy employed in the BCom programmes is determined by the skills that need to be developed in students. These skills not only come from IS2010 but from the research the staff does on local needs:
R(2): "'Yeah so a lot of the time we will look at competencies and outcomes. So what kind of skillsets do you need and how do you derive them? So I also weave in a lot of my own research. So for example I would either put business analyst and the business process analyst which is a very similar one... So we've looked at what are the competencies needed for a process analyst in South Africa? You need personal competencies, trustworthiness, facilitation skills, leadership skills. Now that's not something you can learn conceptually through a lecture. So a lot of this requires group and in practice- almost practitioner type experience, so work integrated learning" (tla).

The pedagogical methods used by the department include group projects, class discussion, exams, take home assignments, class tutorials, class tests and reflective practice in the form of essays. Assessment happens throughout the duration of a course:
R(4): "if I speak to my... course it's a very reflective course. So there is continuous assessment going on throughout the year but students do spend a lot of time reflecting on what they have done this year. So they have usually written an essay on that. This year we've changed that a little to be regular blogs which are also for marks but this idea that they get to think about what they have learnt and then write about that is encouraged as well. We have formal assessments, two exams throughout the year" (tla).

The effectiveness of the pedagogy is mixed. The group work is seen as effective as it prepares students well for the workplace:
R(1): "I have had many comments over the years of students that say , because they are doing the projects, because it's so project based, it's student centred and it's project based so it's the students themselves who have to take responsibility for their work the moment they do a real life kind of project… So many of them say when they get into the job and the real world they hit the ground running because they know what to expect" (tla).

However the use of group work brings certain challenges such as creating teams that are balanced in terms of capability. For example having a team of Portuguese speaking students means that they may struggle to with their deliverables as the language of instruction at UX is English:
R(3): "*We had a group of students who were all predominantly Portuguese speaking and we could see how they wrote their final reports. They were struggling to and these were brilliant students if you speak to them they can raise serious issues they can engage with you in a very thoughtful conversations but they struggled to write their report. So I decided the following*

year that every group would need to have a diversity of people in terms of nationalities, in terms of race as well and I've realised that helps" (tla).

Exams are another pedagogical method employed by UX but their effectiveness is questionable. There is concern that exams only test knowledge of content rather than actual understanding and ability to apply that content. Lecturers do try to create exams that require more than just memorising content to pass but are not sure if their efforts are successful:
R(3): "*I try to insist in class, promote discussion, promote class attendance and in any ways that I can try to minimise, try to create an exam that does not test just the memorising of content. It's an exam that is applied, that will require a certain level of depth of knowledge that cannot be obtained by simply reading the notes. So you have to engage it, you have to discuss it but still I don't think I am successful in many ways" (tla).*

Discussion
The staff at UX have to determine the pedagogy to employ on their own as IS2010 does not address pedagogy. To do this staff first look at the objectives and outcomes of each course and then try match an objective or outcome with a method of teaching or learning that will help achieve that objective. The teaching and learning methods employed by UX include group projects, class discussion, exams, take home assignments, class tutorials, class tests and reflective essays. The group work has received positive feedback from past students as they feel it effectively prepares them for the workplace. Group work can be challenging if the teams are not balanced in terms of language ability for example. To avoid this problem the lecturer can choose the groups for the students. In the language Student Needs subcategory it was noted that language can negatively impact the performance of students. Creating well balanced groups can reduce the negative impact of language ability on a student's performance. There is concern the exams do not test the students' understanding of content but rather only test their memory. To ensure exams test understanding rather than just the ability to remember the lecturers create exams which require students to apply their minds rather than just remember content.

4.3.3 Category: Culture

Culture was initially excluded due to the perceived complexity of examining culture in a country as diverse as South Africa. However in the data there were references to culture which suggested that despite the cultural diversity amongst staff and students the concept of culture and its impact on the curriculum can be explored. According to Moll (2004) a curriculum is culturally responsive if the curriculum caters for cultural diversity by incorporating different cultural reference points. This makes it possible for learners from different cultures to relate the teaching to their own cultural backgrounds thus improving the students' learning experience (Moll, 2004).

Subcategory: Institutional culture

This subcategory has the following codes: university culture (uc), faculty culture (fc) and department culture (dc). Respondent4 spoke of a culture of research within the university and how this motivates staff to conduct research. Without this research culture it would be difficult for staff to meet both their teaching and research requirements:

R(4): "…what I think makes the balance work is that people are very motivated and like to do research as well so there is a culture of research. I think if the culture wasn't there then the research would be hard to do" (uc).

Respondent3 went further and suggested that research is favoured over teaching. This has resulted in less attention being paid to students which has added to frustrations students have about their learning experience. This problem is being addressed but the progress is slow because the focus on research has hurt the relationship between staff and students making it difficult for both parties to understand each other:

R(3): "The institution in the past had created an atmosphere and administrative mechanisms that favoured research over teaching" (uc).

R(3): "The distance between students and teachers is also a reason why it is taking long for teachers and administrators/executive who most are teachers as well to understand students' frustration" (uc).

The university also has a culture of competition amongst faculties and departments making it difficult for collaboration to occur between faculties and academic departments:

R(2): "The university probably has a culture of type adhocracy. There is competition between Departments" (uc).

The Commerce faculty has inherited some aspects of the university culture. Although research and profits are a priority for the faculty there is also more collaboration within the faculty. The collaboration however is aimed at improving research. There are several initiatives aimed at improving collaboration with regards to teaching such as the Commerce Education Group (CEG) which was also mentioned in the university structure subcategory. However only a minority of staff members participate in these teaching initiatives. This presents a challenge because the teaching collaboration is aimed at addressing systemic issues that students are facing. If the challenges are not addressed in a systemic manner they become harder to resolve:

R(3): "Some collaboration does happen amongst staff members, mostly stemming from individual efforts, especially if its seen as beneficial to their publication output" (fc).

R(3): "However, upon closer look one can easily see that these initiatives are isolated and are only taken serious by a few people other than those who are directly employed to run them. In other words, their impact is not systemic which is a problem given that most of the challenges these initiatives are trying to overcome are in their very nature systemic" (fc).

The department in turn inherits aspects of the faculty culture. Research is also a priority within the department. The department has also adopted a focus on profits to ensure their survival. The department always has smaller student numbers than other Commerce departments due to capacity limitations. The only other way for the department to increase profits is to increase research output:
R(4): "More focus on research within department. Smaller class sizes mean we are always less profitable than the rest of faculty. There is a good culture of research within department and active support of research, more so than rest of faculty in my opinion" (dc).

R(3): "In a profit driven model, a department that doesn't bring profit is always under the threat of being removed or incorporated into another department. Therefore our strategies and priorities in many ways are determined by the need to prove our worthiness in the faculty and since we don't have large numbers of students, especially at undergraduate level, our only leverage is research/publications, hence teaching suffers" (dc).

Discussion
The university has a culture of prioritising research over teaching and promoting competition amongst academic units thus limiting collaboration. The Commerce faculty has inherited the focus of research as a priority. This explains why there is little participation in teaching initiatives such as CEG. There is collaboration amongst staff but this is mainly with regards to research. The faculty also has a culture of prioritising profits. Just as the faculty inherits the university culture, the department inherits the faculty culture. Within the department research is also prioritised over research. However the reasons for research being a priority at department level are twofold. Firstly the university and the faculty demand a certain level of research output from staff and incentivise this through linking research output to career progression as mentioned in the Teaching Staff subcategory. Secondly the faculty pressures the department to be more profitable or risk being closed or merged with another department. The department is unable to accept more students to grow their revenue due to capacity limitations. As a result the department has to focus on research to generate more revenue as that is the only avenue where expansion is possible.

Subcategory: Student Needs
Student background (sb) and pedagogy (pgy) were the codes identified in this subcategory.
Respondent4 feels that the students at UX actively participate in class and that cultural background does not affect the way students learn:
R(4): "Yes, all students in my class participate actively. Background does not seem to be an issue" (sb).

The students at UX are culturally diverse. According to respondent3 the important consideration is whether lecturers are aware of this diversity and how it can impact student learning. In a diverse environment some cultures can be marginalised and this can negatively impact the level of engagement of students:

R(3): "So there is a mix of cultures on the students' side. The question is if lecturers are aware of that mix and what measures are put in place to accommodate other cultures, especially the ones that under normal circumstances can potentially be ignored/marginalized. This could then, in my view, affect the relationship between the student and staff or the even worse affect the student's ability to effectively engage the learning process" (sb).

With regards to pedagogy respondents feel that a collaborative approach to teaching is more effective than a competitive approach because collaboration is considered part of South African culture:

R(2): "A better approach is more collaborative, let's do it as a team. You know that sort of "okay class let's all work together", "you guys that are ahead can you help your friends?"…I suppose it's a non-Western way which probably would never come out of anything like an IS2010. There they would say "right, compete!". "Create a game and see if you can kill your opponents" so I think those are the things that we - sort of more South African context related which is a bit more collaborative type thing"

Discussion

According to Moll (2004) an important aspect of cultural responsiveness is recognising that different ethnic groups have different cultural heritages which lead to them having different learning needs (Moll, 2004). Respondent3 alludes to this when highlighting that it is important for lecturers to recognise cultural differences and their impact on teaching and learning. The response by respondent4 however suggests that such recognition is not taking place. Respondent4 feels that the cultural background of students does not have an impact on student participation. Given the cultural diversity of South Africa it is difficult to understand how cultural background has no impact on the learning of any students at UX. Respondent3 suggested that the focus on research has created a lack of mutual understanding between staff and students. Therefore it is possible that respondent4 simply is not aware of the cultural differences that exist and their impact.

In IS2010 the only mention of culture is in some of the course objectives which say students must learn to appreciate cultural differences and the impact they may have in the workplace (Topi et al., 2010).

4.3.4 Category: Discipline

Disciplinary responsiveness refers to how responsive the curriculum is to changes in the underlying discipline (Pade-Khene, 2015). In this study we take this to include what mechanisms are used to keep the curriculum current and aligned with trends in the discipline.

Subcategory: Curriculum Evaluation and Sustainability

This subcategory has five codes: teaching staff (ts), course content (cc), departmental reviews (dr), accreditation (acc) and external staff (es).

The teaching staff keep their IS knowledge current by conducting and consuming research and maintaining relationships with industry:
R(1): "Interviewer: I just want to briefly touch on how you update your curriculum and make sure that it's in line with international trends and best practice. How do you go about that? Respondent: That's where the research part I think comes in… I also often review papers and so you go to conferences you talk to people across the world… and it gives you a sort of access to how other people think" (ts).

R(1): "In the past we have had very close contact with Microsoft, we have always had the IS expo where students showcase their projects and initially in the beginning that's how the Microsoft firefly started and actually became the Imagine cup" (ts).

Staff also keep abreast of trends in the discipline by sharing information they may have come across. Most of the trends the staff share information about are from North America and Europe:
R(4): "I know the department as a general rule follows trends quite closely. So there is a lot of emails that go around as to have you seen this happening or this is the trend here so we are aware of what the general trend is, I guess this is North American and European trends more than anything else" (ts).

Some courses do not need to be updated regularly as the concepts largely remain the same such as database courses. Other courses do change often and the department has to stay abreast of developments in that particular field:
R(4): "I think there are a couple of other courses which are fairly static so for instance if you think about a database course for example those are fundamentals which haven't really changed a lot so those get refreshed to keep students engaged but I think the concepts are very standard there so there are not a lot of changes you can make whereas in the technical courses obviously things move forward quite rapidly" (cc).

While the department does remain aware of current trends the department does consider carefully what trends it incorporates into the curriculum in case the trends are not relevant or quickly become obsolete. Another aspect that helps the department stay current is the software itself. Software upgrades sometimes force the staff to update their courses:
R(4): "So we are careful as to how quickly we implement any of that because there is a risk that it is not relevant for us here. One of the other things that often drives changes inside the courses, especially the technical courses is just software that gets updated or changed so that plays a minor role as well" (cc).

The department is subject to a review every 10 years and these help in evaluating the curriculum and interrogating the choices that have been made. The review is the responsibility of the faculty Dean and is part of the university's academic review system. The IRD document which was used as a data source was a product of the most recent review:

R(3): "So I think two years ago we went through what is called a review. So we were externally reviewed by a committee. They reviewed the BCom as far as I remember and we had to present and justify the choices we had made and in approaching that we were forced to think through why we are doing things and they obviously gave us some feedback" (dr).

The BCom degrees are not accredited with any professional body and there is no desire to change that. The respondents feel the UX brand is strong enough to validate the teaching to outside stakeholders. Respondents also feel that pursuing an accreditation may distract from the actual goals of the degree programme:
R(3): "I wouldn't pursue an accreditation for instance at that level of detail because my perception or my own take – in many cases the process of pursuing accreditation might detract you from the actual goal. The goal becomes pursuing an accreditation rather than creating a curriculum that is contextually grounded and will create students who can be an asset in their context" (acc)

External staff refers to staff from other universities such as external examiners. External staff were not considered as part of the original framework but emerged from the data. External staff contribute to the UX curriculum in two ways. First as external examiners they provide advice and help ensure the goals of a course are met. Secondly as peers they share ideas and insights with the UX staff thus helping the department to stay current:
R(3): "…the role of the external examiner is to create an environment of fairness and integrity. So you will have to give your external examiner your course outline... and they will review and they will see if they are matching with the objectives and they will advise you" (es).

R(1): "In the Imagine cup we managed to meet the people from NMMU which is also quite nice. Rhodes, the head of the department at Rhodes has been for years our external examiner and he was quite involved. So I think, there is lots of cross pollination of these different universities. That helps a lot. So I think that's one way of keeping track of what is happening everywhere" (es).

Discussion
In terms of disciplinary responsiveness the IS department has two main concerns: keeping current with trends in the IS discipline and evaluating their curriculum. The IS staff use a variety of methods to maintain their knowledge of what is currently happening in the IS discipline. Learning from research for conferences that staff review or attend is one method. Staff can also conduct their own research. In the Teaching staff subcategory it was recommended that staff align their research with their teaching to make the workload manageable. An added advantage of doing so is that conducting research into their teaching helps staff remain current.

Interacting with industry and understanding what technologies and trends they are aware of and using is another way for staff to learn about current trends in the IS discipline. The

interaction with industry is the same as that described in the Stakeholder Communication subcategory. The IS staff also learn from each other and their peers at other universities whom they interact with at conferences and competitions. IS2010 emphasises the importance of staff remaining current in the IS discipline and recommends staff be supported in their involvement of scholarly activities such as conferences, workshops, seminars and membership of professional and academic organisations (Topi et al., 2010). The staff at UX do get such support which is expected given how well-resourced the university is as discussed in the University Infrastructure and Financial Resources subcategory.

Some of the BCom courses do not need to be updated constantly because the fundamentals of these courses do not change rapidly, for example databases. However there are other technical courses which change faster. Some of the trends in these fields become obsolete very quickly while others become established practice. Determining which trend is a passing "fad" and which trend needs to be taught to students is a challenge that staff face.

Departmental reviews and external examiners are used by the department to critically consider the curriculum and obtain independent views on the curriculum. The department has to undergo a review every 10 years. During this review the IS staff have to explain what choices they have made regarding the curriculum and why. This forces the staff themselves to consider what they have done and whether it aligns with their goals. External examiners valuable advice on courses. The examiners give independent opinions on the courses and challenge the staff if the courses do not meet the course objectives.

Accreditation is not a goal for the IS department for two reasons. Firstly the belief amongst the staff is that accreditation can distract the department from trying to achieve their stated desired objective of creating a contextually grounded curriculum. Secondly the IS staff feel that the UX brand provides enough legitimacy to the BCom degrees and therefore an accreditation is not needed.

According to Topi et al. (2010) one of the uses of IS2010 is as a basis for accreditation. Accrediting bodies can use the detail regarding educational outcomes in IS2010 to inform accreditation requirements (Topi et al. 2010). This detail can also be used by educators as a benchmark to evaluate their curriculum against.

4.4 Results summary

Section 3.7 in the research methodology chapter distinguished between first and second cycle coding. First cycle coding is the coding that happens initially and is applied to the raw data. Second cycle coding is more advanced and refers to the reorganising of the output of first cycle coding (Saldana, 2016). The results chapter has presented the results of first cycle coding. The interview data, FH and IRD have been coded and categorised according to the research framework. The data related to each subcategory has been presented and discussed separately. It is evident from the results that some subcategories have an impact on other

subcategories both within a responsiveness category and across responsiveness categories. For example the actual achieved curriculum objective in the Economic category is to prepare students for a career in industry. This along with faculty needs (Economic category) for revenue have resulted in curriculum content (in the Learning category) that is mainly Commerce orientated. The results also indicate that the Cultural responsiveness category should be included in the research framework and can be investigated from an institutional and student perspective. The next chapter presents the results of the second cycle coding process. The purpose is to synthesise the themes and implications of the results.

CHAPTER 5

5. Interpretation and implications of research results

The results chapter presented and discussed the data according to the research framework depicted in figure 7 in the previous chapter. This chapter will attempt to provide an overall interpretation of the results that answers the research questions that guided this research:

1) How has an international computing curriculum been adopted and contextualised by a South African university?
2) What challenges have been encountered by a South African university while adopting and contextualising an international computing curriculum?

In order to integrate the findings of the individual subcategories while also structuring this chapter in a way that is easy to follow, this chapter will present the implications of the results by each category of the research framework. As noted in the results section, the Cultural Responsiveness category was initially discarded but then emerged from the data analysis and has been added to the research framework. This chapter consists of three sections which are depicted in figure 12 below. Section one presents the implications of the results, section two identifies and explains the themes that emerged from this study and section three summarises the implications.

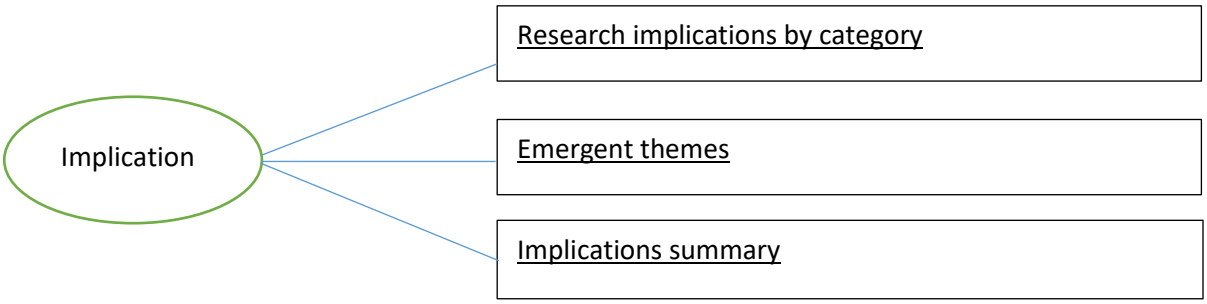


Figure 12: The structure of the implications chapter.

5.1 Research implications by category

5.1.1 Category: Economic Responsiveness

Economic responsiveness is the degree to which a curriculum responds to the skills needs of the economy (Moll, 2004). In this study the Economic Responsiveness category consists of the following subcategories: Curriculum Objectives, Teaching Staff, Industry, Government, Society, Student Needs, Stakeholder Communication and University Needs.

How has an international computing curriculum been adopted and contextualised by a South African university in terms of Economic Responsiveness?

In terms of Economic-Curriculum Objectives, at UX the Commerce faculty objectives appear to determine the IS department objectives. One of the primary objectives of the Commerce faculty is for academic departments to be profitable. In order to be profitable a department needs to attract as many students as possible. Given that many students are motivated by the need to secure employment upon graduation, the IS department needs to offer degrees that enable students to meet that need. Although the staff want to do more than prepare students for work in industry, the pressures from the Commerce faculty to attract as many students as possible forces the department to offer degrees that mainly prepare students for the workplace. The misalignment between staff objectives and faculty objectives was not uncovered in the literature review suggesting that the issue has not been discussed in previous research.

The UX IS department appears to focus primarily on preparing students to work in industry. IS2010 has thus been adopted in a manner that prioritises industry needs. This does not align with IS2010 which advocates that students be prepared for work in domains other than industry. The department has partially adopted IS2010's emphasis on including other domain knowledge in the curriculum through the use of case studies and projects from the public sector and the non-profit sector in their IS courses. However, the effectiveness of this approach is questionable because the industry domain is what gets the most attention in the UX curriculum.

The focus on industry by the IS department implies a narrow view of the type of employment that is desirable to students. As pointed out in the Economic-Government subcategory, Commerce students themselves arrive with such views and these views are reinforced in Commerce subjects such as Accounting and Economics. However, employment in government or the non-profit sector is not necessarily inferior in terms of salary and experience. Therefore, even though UX has to focus on getting students ready for work, UX could benefit from viewing the public sector and the non-profit sector as viable employment options for their students and encourage students to buy into that vision. This would allow for a greater emphasis on fields related to Economic-Society needs such as ICT4D. This in turn

would make the UX curriculum more Economically Responsive while at the same time remaining aligned with the faculty objectives thus enabling greater contextualisation of the UX curriculum. An example of this solution can be found in the IT program at Tumaini University in Tanzania that was launched in 2007. When it was created, this program included compulsory courses on development studies to equip students with skills related to socio-economic development (Tedre et al., 2008).

An interesting observation with regards to the Economic-Government subcategory is the lack of any references to government policy particularly with regards to socio-economic development. For example the South African government has developed the National Development Plan to guide the development of the country. Yet the staff at UX do not seem to use that plan or any other development policy as input into their adoption and contextualisation process. This is perhaps indicative of the focus on industry that the UX department has adopted. If UX was interested in also prioritising government needs then national policy documents would be a useful source of guidance.

Since the faculty prioritises preparing students for work in industry, the strongest relationship in the Economic-Stakeholder Communication appears to be between UX staff and industry. Industry gets involved in the curriculum in multiple ways such as guest lectures, workshops and class projects. Industry participation can be negatively affected by the location of a university. If the university is in a remote location where few relevant businesses are physically present, it can be difficult to get practitioners to do guest lectures or participate in projects. For example Tedre et al. (2008) reported difficulty in obtaining internships for their students in the Iringa region where Tumaini University is.

IS2010 has been adopted by UX with little input from society or government. There is little direct participation in the curriculum from society and government as developing skills for the public sector and socio-economic development is less of a priority than developing industry skills. As suggested above, this could be addressed by broadening the view of desirable employment domains as mentioned earlier and could result in more engagement with society and government.

At UX, staff-student communication is primarily driven by the staff through course evaluations and the relationships staff foster with students. Each staff member appears to have the freedom to choose how such communication is established if at all. Several studies (e.g Ayalew et al., 2012; Fendler & Winschiers-Theophilus, 2010) suggest that student feedback is valuable given that they are the ones who experience the curriculum. Therefore it may be beneficial for UX to establish a department wide mechanism for eliciting feedback rather than soliciting feedback for individual courses only. This would also contribute towards improving the Learning Responsiveness of the curriculum by highlighting what works and what does not across the degree as a whole (Moll, 2004).

Research emerged as one of the Economic-University Needs. At UX, research is valued because it enhances the universities' reputation for excellence. The value that UX places on research is manifested in the demands placed on staff to produce research. The more time staff have to spend on research the less time they have to spend on teaching related activities. Therefore at UX, IS2010 has been adopted in an environment where teaching staff are not able to spend as much time as they would like to on teaching.

When the UX IS department adopted IS2010 the department had to offer new courses such as Enterprise Architecture (EA). Given the difficulty of attracting skills to academia, staff had to undergo training on EA software and concepts which demonstrates a contextualisation around the Economic-Teaching Staff sub-category. Given that the IS discipline evolves continuously, new topics sometimes need to be added to the curriculum and staff training is a useful alternative to employing new staff. For the training to be possible, staff need to be committed and be willing to increase their workload.

Economic-Teaching Staff issues can be difficult for model curricula such as IS2010 to address because one of the goals of IS2010 is to be generic enough to appeal across the entire globe. University staff issues will differ from country to country and even from university to university. For example, in their study in Ethiopia, Bass and Heeks (2011) uncovered a lack of experience and qualifications amongst staff which led to problems teaching advanced subjects and supervising laboratory work. This problem was exacerbated by the fact that there were limited opportunities for staff to upskill themselves through self-study or training (Bass & Heek, 2011). This is not the case with UX as staff have access to learning resources and training courses.

What challenges have been encountered by a South African university while adopting and contextualising an international computing curriculum in terms of Economic Responsiveness?

With regards to Economic-Curriculum Objectives there is a lack of alignment between staff and faculty objectives. This is not a challenge that has been caused by IS2010 but has led to one of the objectives of IS2010 not being met. Agreement amongst stakeholders on curriculum objectives is important if all the stakeholders are to have their needs met. In their study on the CS department at Baze University in Nigeria, Dasuki et al. (2015) found alignment between desired faculty objectives and desired objectives of other curriculum stakeholders. Dasuki et al. (2015) also found that the desired objectives of both the faculty and curriculum stakeholders were being achieved. This suggests that alignment of objectives between stakeholders might contribute to curriculum objectives being achieved (Dasuki et al., 2015). This is an important consideration for educators when implementing an international computing curriculum.

The IS department has encountered challenges related to the Economic-Teaching Staff subcategory such as shortages staff and lack of skills. The IS department at UX does not have

enough staff to deliver the curriculum to the number of students the department has to teach. To address this, the department takes advantage of a faculty policy which allows staff to be paid overtime. This incentivises staff to work extra hours to make up for the shortage of staff. Staff skills have been addressed to a certain degree through staff training.

An additional challenge has been a difference of priorities between some staff and the university. Some staff feel the university prioritises research over teaching and this is something those staff members do not agree with. In order to meet their research obligations while maintaining their commitment to teaching, staff at UX try to conduct research that compliments their teaching and vice versa but this is not always possible. For example, the IS staff have supplemented the skills and competencies listed in IS2010 with additional skills that industry in South Africa has identified as important. These additional skills have been obtained through research conducted by UX staff. This is an example of the type of research UX staff can conduct and publish in order to cope with the pressures of research while remaining committed to teaching. This approach helps to "kill two birds with one stone" and allows staff to maximise the use of their time. This is another example of contextualisation in the Economic-Teaching Staff category.

Meeting Economic-Industry skills demands is another challenge the UX staff have encountered. According to the respondents, industry in South Africa values soft skills more than technical skills. This claim is supported by research literature which shows employers are increasingly highlighting the importance of soft skills (Calitz, Greyling & Cullen, 2014; Liebenberg et al., 2015). Therefore a South African IS educator needs to pay particular attention to developing soft skills in students when contextualising an international computing curriculum. IS2010 does not list all the soft skills that are required by industry in South Africa. To compensate for this, existing research on ICT skills needs in South Africa can be used. Alternatively IS educators can conduct their own research. For their study in Botswana, Ayalew et al. (2012) conducted surveys of university graduates as well as local employers to ascertain industry skills requirements (Ayalew et al., 2012).

Government regulations have not impacted UX's adoption of IS2010 as UX was offering BCom IS degrees that had been approved by government when IS2010 was adopted. However, if a new qualification had been required then government approval would have been needed which would have been a lengthy process.

Transformation pressure is a societal challenge that affects the UX curriculum. The IS2010 curriculum should offer sufficient flexibility to accommodate transformation needs of the curriculum but how this is done in practice remains to be seen as UX has not started the process. When adopting IS2010 in South Africa, curriculum transformation is something teaching staff will have to determine how to manage as IS2010 offers no guidance with regards to that.

University regulations form part of Economic-University Needs. The UX IS department has experienced challenges with regards to university regulations. University regulations have been problematic because they can be so time consuming they delay implementation of certain initiatives. University regulations in some cases have been incompatible with certain initiatives the IS department wants to implement thereby preventing those initiatives from happening. Tedre et al. (2008) is a case study which describes the implementation of an IT degree at a Tanzanian university. In their study, Tedre et al. (2008) explain how having a clear understanding of university procedures helped them to avoid delays in the implementation of their IT degree. Tedre et al. (2008) stressed the importance of senior administrative support. In their case the deputy provost was very supportive of the program and this support proved to be invaluable (Tedre et al. 2008). This shows that having a clear understanding of university procedures as well as having support from senior university administrators helps in implementing a curriculum. University regulations must be thoroughly understood when adopting and contextualising a curriculum in order to avoid delays.

At UX, another challenge is that the Commerce faculty values student numbers and profitability and this prevents the IS staff providing a curriculum that aligns with IS2010 objectives. In fact the faculty objectives prevent staff from achieving their own curriculum objectives. When adopting and contextualising a curriculum, educators must be aware that university objectives will ultimately shape how the curriculum is implemented.

As will be seen in the other categories, one of the recurring challenges encountered by UX when adopting IS2010 is the lack of guidance in IS2010 on certain issues. For example IS2010 does not provide guidance on how any communication amongst stakeholders should be managed. This is surprising considering the IS2010 authors claim IS2010 is a model curriculum. A model curriculum is defined in the literature review as a curriculum that can be implemented as a degree program. Therefore we would expect stakeholder communication to be addressed as it is an important component for continuously improving the curriculum.

5.2.2 Category: Learning Responsiveness

Learning responsiveness is the degree to which a curriculum accommodates the teaching, learning and assessment needs of students (Pade-Khene, 2015). This category consists of the following subcategories: Curriculum Content, University Infrastructure and Resources, University Structure, Student Needs and Pedagogy.

How has an international computing curriculum been adopted and contextualised by a South African university in terms of Learning Responsiveness?

One of the aspects of the Learning-Curriculum Content subcategory is career tracks. The first step UX took when adopting IS2010 was to decide which career tracks defined in IS2010 to offer. This decision was influenced by the needs of the South African job market and contextual realities of the university. The department was essentially guided by two

questions: what does industry require and what can we provide? Student numbers and budgetary constraints have resulted in the department contextualising the curriculum to only offer the BA track. However, the IS department has placed enough emphasis on programming in the UX curriculum so that if students want to pursue careers as ADs they are equipped to do so. A cross disciplinary degree is one way of circumventing limitations that an IS department may have in offering multiple career paths. In the case of UX, university regulations present an obstacle to such initiatives because the regulations can make the approval process lengthy and in some cases may even scuttle such initiatives as explained in the Economic-University Needs challenges above.

Career tracks are one area of a computing curriculum where contextual realities play a large role. For example, in Tedre et al. (2009) the authors argue that the skills shortage in Tanzania has created an environment where IT graduates cannot afford to be specialists. IT graduates have to perform a wide range of tasks, some of which are beyond the scope of the IT discipline such as building modifications, in order to fulfil their duties. Therefore a country like Tanzania requires practitioners with a multidisciplinary skillset rather than specialists. The labour market, workplace of future graduates and university realities are therefore important contextual realities to consider when deciding career tracks (Tedre et al., 2009).

The Learning-University Structure at UX promotes competition amongst departments and faculties. Knowledge Management (KM) is a course taught by the Library Sciences department. Due to competition encouraged by the university the IS department has not been able to offer KM as a course in their BCom degrees. This demonstrates that even if an IS department has the capacity to offer a recommended IS2010 course the university structure can still prevent the course from being offered. This is an example of the contextual realities that need to be considered in the Learning-University Structure subcategory. IS2010 suggests that courses that are common to different computing disciplines should be shared but does not offer guidance on how to do so. Determining how to share courses with other computing disciplines is something IS educators must determine for themselves.

Course content also forms part of the Learning-Curriculum Content subcategory. The difficulty in adopting IS2010 at UX was eased somewhat by the compatibility of some of the IS courses already on offer at UX with the IS2010 core courses. Some of the courses only needed to be updated because UX had been following IS2002. The major challenges were with elective courses such as KM which were due to the presence of other computing disciplines. If UX had not been following IS2002, more effort may have been required to change the existing courses in addition to creating new courses. The IS2010 authors claim that IS2010 was created because a major revision of IS2002 was needed. However, if the UX IS department was able to modify some of their existing courses to suit IS2010 relatively easily, then perhaps IS2010 is not a major revision with regards to certain courses.

Learning-Student Needs are an important contextual reality that a computing curriculum must cater for. As identified in the literature review the language competency and diverse educational backgrounds of students creates challenges in South African higher education. The IS2010 curriculum does not address student needs related to their language competency and educational and socio-economic background. Teaching staff therefore have to address the issue themselves. With regards to language competency at UX the issue is partly managed by the university and partly managed by the department. The minimum entry requirements of the university ensure that students have a certain level of proficiency in English. The IS department uses specific teaching and learning techniques as well as communication courses to develop students' English language competency such as essays and presentations. In Tedre et al. (2008) the IT degree program at Tumaini University uses a similar approach. For many students in Tanzania, English is a third language. The IT program therefore has two communication skills courses to develop spoken and written skills in students (Tedre et al, 2008).

With regards to student backgrounds at UX there is a need for academic support to be provided to students particularly with regards to computer literacy. This is managed through a combination of collaborative teaching and learning approaches such as programming in pairs and supplementary courses for students who need additional support. Liebenberg et al. (2015) support the use of collaborative approaches in addressing different computer literacy arguing that students learn more from each other than from lecturers. Liebenberg et al. (2015) found pair programming in particular to be useful in teaching students new to ICT education as it boosts students' self-confidence.

Due to the pressure of faculty objectives, the IS department has developed a curriculum whose primary objective is to prepare students for work in industry. As a result the BCom degrees attract students who are primarily interested in passing rather than actually learning which has a negative impact on students' ability to learn. In their paper, Apiola & Tedre (2011) explain why student motivation is important. They refer to the concepts of intrinsic and extrinsic motivations. Intrinsic motivation motivates a person to engage in an activity because the activity is interesting. Extrinsic motivation motivates a person to engage in activity for a reward. Apiola & Tedre (2011) argue that a student who is intrinsically motivated will be more creative and engage with the content on a deeper level than someone who is extrinsically motivated (Apiola & Tedre, 2011). IS2010 does not discuss how to develop extrinsic or intrinsic motivation in students. This is another area where the lecturer has to develop their own solutions.

The Learning-University Infrastructure and Resources that the respondents mentioned as important to delivering the curriculum are also listed in IS2010. These resources include computers, classroom space, software, support staff and relevant data. UX has sufficient access to all these resources except classroom space and relevant data. However, it is important to note that UX is a well-resourced institution by South African standards. In fact

the respondents go as far as to describe UX as being European in terms of resources. UX will therefore not encounter the same resource challenges that other African universities may face in adopting an international computing curriculum. For example, in their case study of a rural university in Tanzania, Apiola et al. (2011) found that teachers complained about a lack of software, hardware and learning materials (Apiola et al., 2011). Dasuki et al. (2015) also found similar challenges in Nigeria (Dasuki et al., 2015). These are not challenges that are encountered at UX.

With regards to Learning-Pedagogy the staff at UX have had to decide on the pedagogy to employ given that IS2010 does not provide any guidance. To achieve this the staff have looked at the learning objectives and competencies of each course and combined these with the staffs' own research to determine what pedagogies to apply. One of the most effective teaching and learning techniques has been the use of group work. Previous students have reported that it is very effective in preparing students for the working environment. The use of group work can present challenges such as teams that are unbalanced in terms of ability. For example, it is possible to have a team of students who are not fluent in English which will have a negative impact on the team's performance.

Apiola et al. (2011) examined students' and teachers' perceptions of an IT program at a Tanzanian university. Apiola et al. (2011) also found challenges related to group work. These challenges included situations where only some of the students in a team did the majority of the work thereby creating resentment amongst the team. Another challenge was the selection of the groups themselves which was done by the lecturers (Apiola et al., 2011). Students felt they should choose the groups themselves which is interesting because it contradicts the practise by respondent3 at UX.

Exams are widely used but they tend to test students' ability to remember content. In order to test a students' understanding, the lecturers try to create exams that require students to apply their knowledge.

What challenges have been encountered by a South African university while adopting and contextualising an international computing curriculum?

How UX have used the IS2010 documents also forms part of the Learning-Curriculum Content subcategory. Interestingly IS2010 appears to have been adopted without clear communication to all the staff as to the reason behind the choice of IS2010 or how it must be used. The IS department does not explicitly require staff to use IS2010 even though the IS department claims to base their degrees on IS2010. The staff appear to use IS2010 as guidance at their own discretion. Furthermore staff who were not present when the original decisions were taken have not been told of the reasons behind the choice of IS2010. If the staff are not aware of the historical decisions they may make changes to courses that result in a misalignment with the original curriculum objectives. This raises questions as to what

extent does UX actually use the IS2010 curriculum. Is the UX curriculum largely based on IS2010 or is IS2010 only a small part of what they take into account when making curriculum decisions? Based on the need to take into account budgetary constraints when deciding career tracks, the lack of explicit direction to staff with regards to the use of IS2010 and the impact of university and faculty objectives, it appears that IS2010 is only one of many factors the UX IS department takes into account with regards to their curriculum.

Some staff also use IS2010 to explain to students the rationale behind teaching them certain content. This is an important use of IS2010 because, as Liebenberg et al. (2015) argues, computing students need to see the relevance of what they are studying in order to be fully interested.

The choice of courses to offer presents a challenge for the IS department. KM is a course that IS2010 recommends and which the department would like to offer. However, because KM is offered by another department at postgraduate level the IS department is neither able to develop their own KM course nor get another department to offer a course for their students. In the Economic-Curriculum Objectives subcategory, staff mentioned how they would like to achieve more than to prepare students to work in industry. IS2010 recommends that students be exposed to other domains and Moll (2004)'s Economic Responsiveness emphasises the importance of not only focusing on industry needs (Moll, 2004; Topi et al., 2010). However, because the Commerce faculty requires that students take a certain number of courses none of these recommendations and objectives can be met. The issues surrounding KM and the Commerce courses are examples of how the Learning-University Structure has impacted the adoption of IS2010.

In terms of Learning-University Infrastructure and Resources UX experiences challenges with respect to classroom size and obtaining relevant data for case studies and exercises. This is because most of the datasets provided by vendors are applicable to Western contexts which makes it difficult for UX students to engage deeply with the material. This has a negative effect on the learning responsiveness of the UX curriculum.

Several challenges have been encountered by UX with regards to Learning-University Structure. These challenges are not caused by IS2010 but have had an impact on how IS2010 has been implemented. The first challenge is the competition that is encouraged amongst different departments which led to the IS department not being able to offer KM as a course as explained earlier. The IS staff do make an effort to collaborate with their colleagues on an individual basis but collaborating amongst organisational units is challenge because of the university structure.

The second challenge is the pressure that results from being in the Commerce faculty. The respondents view IS as a social science and the values of the Commerce faculty were felt to contradict those of a social science discipline. Consideration must therefore be given to the

values of the faculty and how those values align with the IS discipline when adopting an international computing curriculum. Faculty related challenges are not unique to UX. In Tedre et al. (2008) the IT department at Tumaini University in Tanzania initially did not belong to any faculty. This had the advantage of reducing the administrative burdens the department had to comply with as there was no faculty that oversaw the department. However, as time went on it was realised that not being in a faculty also meant the department did not have a voice on certain matters within the university (Tedre et al., 2008).

The IS2010 curriculum does not address language competency and or student background so teaching staff have to address the issue themselves. The absence of language competency in IS2010 can be considered both a positive and a negative feature of the curriculum. It can be viewed as positive if one argues that not making communication development skills a core course provides the lecturer flexibility to tailor the curriculum to the language ability of their students. The absence of language competency can also be viewed as negative if one argues that excluding language competency is another example of IS2010 not catering for the African context. English is also a challenge for some staff. It is important that this is not overlooked as a teacher's ability to communicate also impacts how well students understand what they are learning.

The absence of guidance on issues related to students' educational and sociocultural background is surprising given the impact a student's educational background has on learning. Although students across the globe have different backgrounds general guidelines would have been expected for managing different levels of computer literacy given that IS2010 claims to be a model curriculum. In listing prerequisite skills, IS2010 only says what skills students should have. It does not say what must happen if some students do not have those skills and this does not guide educators in addressing student background issues.

The absence of guidance on pedagogy was one of the biggest challenges the staff at UX have encountered. A model curriculum scheme is defined as a curriculum scheme that can be implemented as a degree program (Van Veen et al., 2004). If IS2010 does not specify how courses should be taught then it cannot be implemented as a degree program without significant additions being made to it. This raises a question as to whether IS2010 can be considered a model curriculum. It is perhaps more accurate to refer to IS2010 as a curriculum framework?

5.3.3 Category: Cultural Responsiveness

Cultural responsiveness is the level to which the cultural background of students and society is incorporated into the curriculum (Nkomo, 2014). In this study Cultural Responsiveness consists of Institutional Culture and Student Needs.

How has an international computing curriculum been adopted and contextualised by a South African university in terms of Cultural Responsiveness?

At UX, the Institutional Culture determines the faculty culture which in turn determines the departmental culture. The university has a culture of prioritising research and promoting competition amongst academic departments and this is inherited by the faculties and the departments. The impact such a culture has on the curriculum at UX is to reduce the amount of attention teaching receives and to reduce the ability of academic units to collaborate. As was mentioned in the Learning-University Structure subcategory, the competition amongst academic units at UX has led to the IS department not being able to include certain courses such as Knowledge Management in their curriculum even though the course is recommended by IS2010.

Where possible the UX staff have contextualised their curriculum by using teaching approaches which resonate with the cultural background of students. The lecturers use pedagogies such as group work which, according to Apiola and Tedre (2011), is a common African cultural practice. This is important because students do not respond to teaching methods that do not align with their culture. For example, Fendler and Winschiers-Theophilus (2010) tried to introduce gaming as a way to teach students Software Engineering courses in Namibia. Fendler and Winschiers-Theophilus (2010) found that this did not lead to increased marks or interest from students. The authors theorised that the lack of improvement in marks and interest was because in Namibia, students do not believe you can have fun while learning. Students expect their studies to be difficult not enjoyable and so they do not see the value in a learning activity that they do not struggle with (Fendler & Winschiers-Theophilus, 2010).

What challenges have been encountered by a South African university while adopting and contextualising an international computing curriculum in terms of Cultural Responsiveness?

In addition to meeting university research obligations the IS department has to prioritise research so as to meet faculty demands for profitability. This reduces the amount of attention teaching receives which in turn affects the quality of the teaching.

The main challenge with regards to Cultural-Student Needs is the lack of appreciation by some staff members of the impact of cultural diversity on teaching and learning. This has led to a lack of contextualisation with regards to Cultural-Student Needs. This can be attributed to the university practise of prioritising research over teaching. This practise has filtered down to department level and as a result, the relationship between staff and students has suffered. Tedre et al. (2003) highlight the importance of culture in CS education. They argue that CS is a Western concept with Western values embedded in the teaching of the discipline. Tedre et al. (2003) argue that problem solving methods, logic, views on usability and practicality differ from culture to culture. Having to adopt a Western way of thinking places an unfair burden on students (Tedre et al. 2003). Similar arguments can be applied to the IS discipline. To

address this challenge teaching must be given more priority. This will in turn motivate staff to focus more on students and better cater for their cultural backgrounds.

IS2010 only recommends teaching students about the impact of cultural diversity in the workplace. It is interesting that IS2010 only recognises the importance of culture in the workplace but not in the classroom. This can be explained by the nature of IS2010 itself which is to be generic enough to be applicable to the entire world. In trying to be generic, IS2010 avoids providing specific guidance on curriculum components that can differ greatly from region to region. The lack of cultural responsiveness in IS2010 presents another challenge that educators have to overcome when implementing IS2010.

5.4.4 Category: Disciplinary Responsiveness

Disciplinary responsiveness refers to how responsive the curriculum is to changes in the underlying discipline (Pade-Khene, 2015). This category addresses Curriculum Evaluation and Sustainability. Disciplinary-Curriculum Evaluation and Sustainability refers to how staff ensure their curriculum remains current and aligned with the IS discipline.

How has an international computing curriculum been adopted and contextualised by a South African university in terms of Disciplinary Responsiveness?

The staff at UX remain current in their discipline through maintaining industry relationships and involvement in academic activities such as conferences, workshops and seminars. UX has adopted the IS2010 suggestion that universities provide financial support to their staff in order to help them participate in such activities. This is possible to some degree at UX because the university has sufficient resources. However, a university with fewer resources may struggle to provide the same level of support to their staff. Research is also an important tool that staff use to remain current. This research includes research that the UX staff themselves have conducted.

The department also relies on departmental reviews and external examiners to ensure that the curriculum is responsive from a disciplinary perspective. One of the reasons UX adopted IS2010 was to have an internationally recognised qualification that could be used to attract students. Accreditation is not pursued however, because it is not compatible with the goals of UX. The brand of UX is also strong enough to negate the need for accreditation. Ponelis et al. (2012) argues that an international accreditation is particularly useful for universities in developing countries because it provides international recognition. Internationally recognised qualifications are attractive to employers and therefore will attract more students (Ponelis et al., 2012). If a university feels their brand alone is not sufficient to provide legitimacy to their IS degrees then it may be useful to pursue an accreditation provided this aligns with the goals of the degree program. Alternatively another way to offer internationally recognised qualifications without obtaining an accreditation is to adopt a curriculum such as IS2010.

A valuable mechanism for evaluating the curriculum that UX is missing is incorporating feedback from past students. As mentioned earlier, Ayalew et al. (2010) included survey

results of University of Botswana (UB) graduates in determining the requirements of the new (UB) IS curriculum (Ayalew et al., 2010). Graduates of the degree programs apply what they have learned to the workplace and thus have an important perspective on the current relevance of a degree program. Eliciting feedback from graduates would thus be a valuable exercise in maintaining Disciplinary Responsiveness.

What challenges have been encountered by a South African university while adopting and contextualising an international computing curriculum in terms of Disciplinary Responsiveness?
Certain fields within the IS discipline change rapidly and it is difficult for UX to determine what trends are worth teaching and what trends are not. An additional challenge is getting the skills in order to teach these new trends. As explained in the Economic-Teaching Staff subcategory, staff can learn these additional skills but they need to be committed and provided the resources to do so.

5.2 Emergent themes

This section describes the themes that have emerged from the data analysis:

Institutional factors influence the curriculum: The IS curriculum at UX appears to be influenced from the top down. The university objectives and culture are inherited by the Commerce faculty and this in turn affects the IS department and IS staff which in turn affects the IS curriculum. For example, UX prioritises research over teaching. As a result, at a faculty level research is also emphasised over teaching which is why teaching forums are seldom attended. This then manifests at the departmental level as pressure is put on staff to pay more attention to research rather than teaching, even if staff do not agree with that approach. The top down influence can also be seen in the institutional culture where the university has promoted competition amongst departments and faculties. This has led to a situation where the IS department cannot offer certain courses such as KM and has trouble embarking on ventures such as joint degrees with other departments. Contextualisation research does not explore in depth the impact of the university on a curriculum. Studies such as Ponelis et al (2012) mention institutional factors such as culture and structure but do not go into detail about the impact of these factors (Ponelis et al., 2012). Highlighting the top down influence of institutional factors is one of the contributions of this research and an area that future research should explore further.

The adoption of IS2010 did not take place in a vacuum: The initial premise of this research was that UX adopted IS2010 and encountered some challenges as a result of that adoption. What was not expected, but in hindsight seems obvious, is that UX was already experiencing some challenges and that the adoption of IS2010 was impacted by those challenges. For example language, university regulations, staff shortages, the culture of competition and the lack of collaboration across the faculty are problems that were not caused by IS2010 but impacted IS2010. Therefore when adopting an international curriculum, it is important not

only to focus on the challenges posed by that specific curriculum but to adopt a broader perspective and consider what general challenges are being faced with regards to teaching and learning.

The IS2010 curriculum scheme is not sufficient to create a degree program: The authors of IS2010 describe IS2010 as a model a curriculum. A model curriculum is defined as a curriculum scheme that can be implemented as a degree program (Van Veen et al., 2004). However, given that IS2010 does not include guidance on pedagogy it cannot be implemented as a degree program without significant additions. This raises the question of whether IS2010 can actually be considered a model curriculum scheme and also whether other international computing curricula also have the same shortcoming.

Aside from pedagogy there are additional considerations and additions an educator needs to make when using IS2010. IS2010 is aimed at a global audience and as a result there are certain factors the curriculum cannot address as they differ between geographical regions and higher education institutions. These factors include government regulation, institutional culture and student needs.

There is tension between the BCom degree and the IS major: In the results section it emerged that faculty objectives are not necessarily aligned with what staff view as the goal of IS education. The Commerce faculty has specific requirements for Commerce degrees which entail students obtaining a certain number of Commerce credits. However IS is viewed by UX staff as a social science whose focus is not solely Commerce. This gives rise to the notion of a curriculum within a curriculum and raises the question of which faculty should IS be part of. The location of IS could be determined by the perceived goal of IS. If staff believe IS is meant to support business, then IS should be part of a business school as is the case in some North American universities. If IS is viewed as purely a social science, it may benefit from being part of a Humanities faculty. This is not an area that has been discussed by previous research in depth and would be a useful line of enquiry for future research.

Responsiveness categories impact each other: As noted at the end of the results chapter some subcategories have an impact on other subcategories both within a responsiveness category and across responsiveness categories. For example the actual achieved curriculum objective in the Economic category is to prepare students for a career in industry. This along with faculty needs (Economic-University Needs subcategory) for revenue has resulted in Learning-Curriculum Content that is mainly Commerce orientated. Another example is the student needs subcategory. The Economic needs of students are to obtain employment upon graduation. This impacts their Learning-Student Needs by motivating students to focus primarily on preparing for exams and passing rather than actually engaging the learning material. This is interesting because Moll (2004) suggested that his curriculum responsiveness categories not be considered in isolation but rather they be considered together as they impact each other. The findings of this research appear to support that notion (Moll, 2004).

There is a lack of common understanding amongst the staff with regards to IS2010: As explained in the Learning-Curriculum Content subcategory, not all staff are aware of the reasons why IS2010 was adopted and the intended goals of doing so. Additionally there is no explicit instruction as to how staff should use IS2010. This reduces the coordination across the degree because certain courses may be achieving certain objectives while other courses may be achieving different objectives. This also calls into question how closely UX is using IS2010 and what they mean when they say that their curriculum is based on IS2010.

5.3 Implications summary

The adoption and contextualisation of IS2010 has been viewed from several different perspectives in line with the research framework: economic, cultural, learning and disciplinary. The findings indicate that the contextual factors impact each other across these different perspectives. The findings also indicate that university objectives have a strong impact on the adoption and contextualisation of a curriculum. Lastly the findings indicate that there are two types of challenges that were encountered by UX: challenges caused by IS2010 and existing challenges that impacted IS2010. The major challenges caused by IS2010 were the absence of important elements related to teaching and learning, particularly pedagogy. The challenges that impacted the adoption of IS2010 but were not caused by IS2010 were challenges that the university and the South African higher education context were already facing. These include the language of instruction, institutional culture, staff shortages and students' cultural and educational background.

As indicated in the results chapter several changes needed to be made to the initial research framework as a result of the data analysis. Figure 13 overleaf shows the updated research framework. The factors in bold are the ones that were added to the original framework.

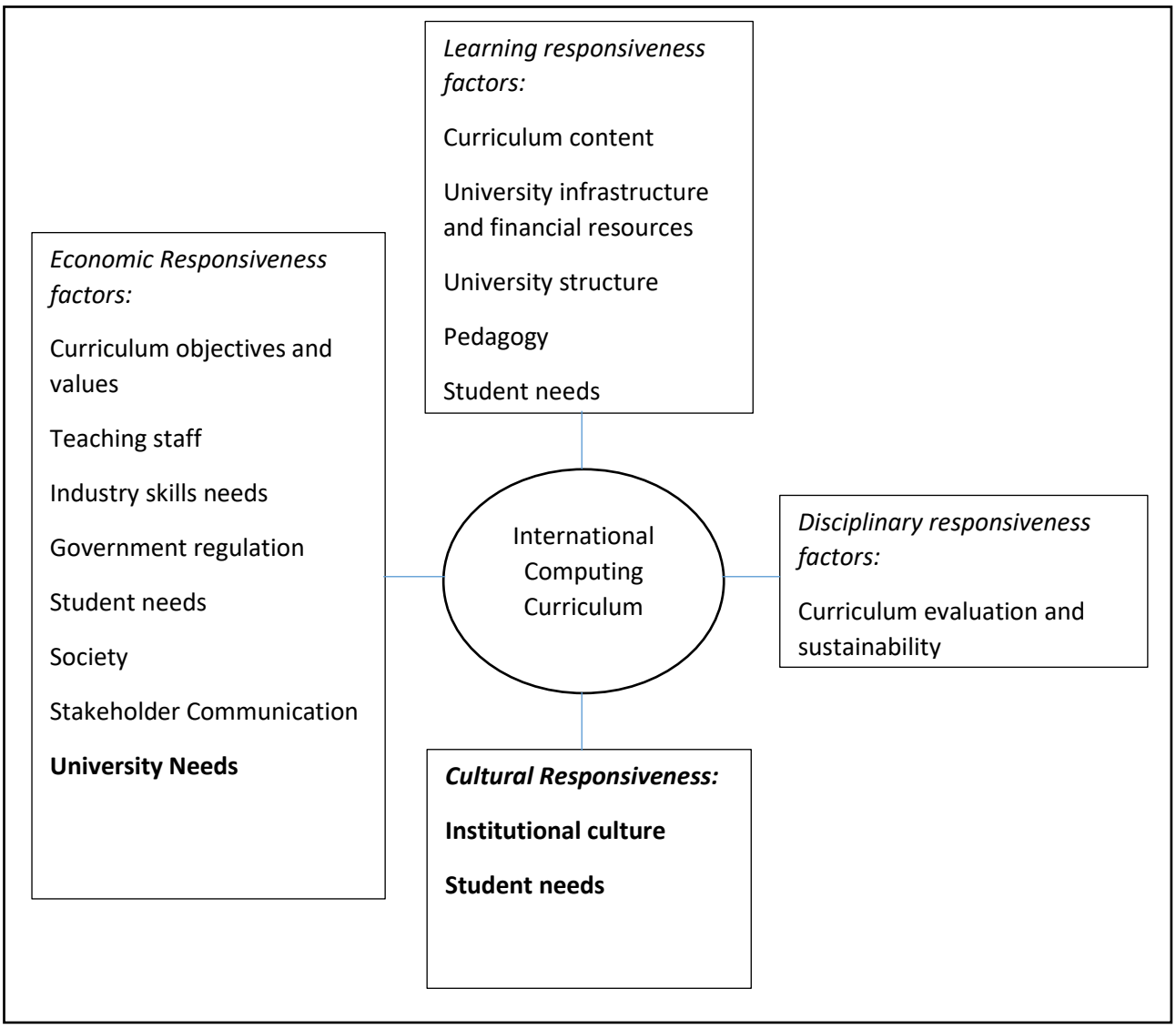


Figure 13: Factors to consider when researching the adoption and contextualisation of an international computing curriculum in South Africa.

CHAPTER 6

6. Conclusion

This chapter will summarise the study, provide insight into the relevance and contribution of the study to academia and practice and describe the limitations and directions for future research. Figure 14 below shows the structure of the conclusion chapter.

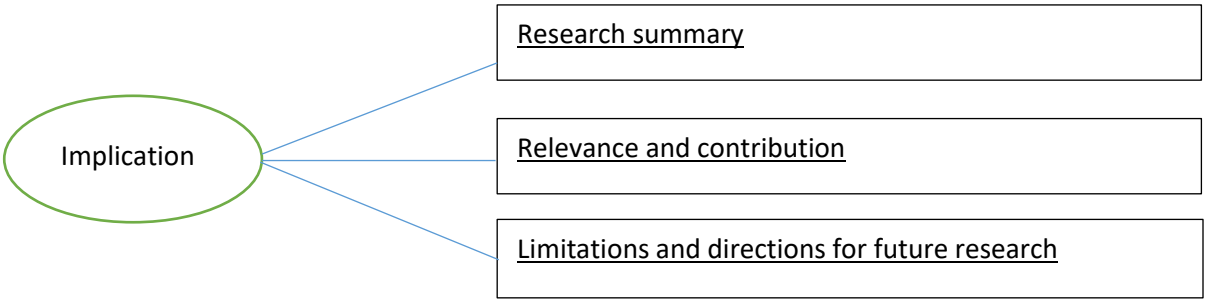


Figure 14: shows the structure of the conclusion chapter.

6.1 Research summary

ICT is important to socio-economic development (Dlodlo, 2009; Larsson & Boateng, 2009). A shortage of ICT skills hamper the ability of a country to harness the potential of ICT (Ayalew et al., 2012). While this shortage is a global challenge, in Africa it is compounded by challenges in ICT education. Some universities in Africa use international computing curricula in order to achieve the perceived benefits of these such as keeping their curriculum current and attracting more students by offering internationally recognised qualifications (Bass & Heeks, 2011).

The concepts and technologies typically focused on in these international computing curricula predominantly reflect developed world views and needs. As a result the curricula are often incompatible with African contexts. This contributes to the ICT skills shortages African countries face by teaching students skills that are not applicable to their local context thereby creating graduates who are either unable to find jobs or to contribute necessary skills. Understanding how international computing curricula can be adopted and contextualised in a manner that both achieves the benefits of using the curricula as well as addresses local needs can limit the negative impact that the use of international computing curricula can have on the ICT skills shortage in African countries. Given that African countries themselves each

have different needs the international computing curricula that African countries adopt must be contextualised in a specific way for each country (Larsson & Boateng, 2009). The literature review revealed a lack of research on this topic for the South African context and this study was conducted in an effort to address that gap.

The aim of this research was to examine one case of the adoption and contextualisation of an international computing curriculum at a South African university in order to improve the understanding of this process for literature as well as practice. In order to achieve this aim this study attempted to answer the following research questions:
1) How can an international Information Systems curriculum be adopted and contextualised at a South African university?
2) What challenges have been encountered by a South African university while adopting and contextualising an international computing curriculum?

To answer these questions an exploratory case study was conducted which was guided by an interpretivist philosophy. The unit of analysis was the adoption and contextualisation of an international computing curriculum called IS2010 by a South African university. Due to a request for anonymity from the target university the university was referred to as UX. The data for this study was obtained from three sources: the IS2010 guidelines, official UX documents which included the UX Commerce faculty handbook (FH) and an internal review document (IRD) from the UX IS department and interview data with four IS staff members.

In the literature review a research framework was derived using a combination of past research on curriculum contextualisation, information on the South African higher education context and a curriculum responsiveness framework developed by Moll (2004). The framework allowed the adoption and contextualisation of IS2010 to be viewed from several different perspectives: economic, cultural, learning and disciplinary.

The findings have provided the following high level answers to the research questions:
1) How can an international Information Systems curriculum be adopted and contextualised at a South African university?
The way UX adopted and contextualised IS2010 was determined by the university objectives, the university context and the needs of South African industry. The university objectives and culture are inherited by the Commerce faculty, which affects the IS department and IS staff which in turn affects the IS curriculum.

The university context in terms of student numbers and budget constraints led to the IS department deciding on specific career tracks to follow rather than offering the entire set as catered for by IS2010. This then determined what courses the department would offer. In addition, given that preparing students for work is a priority because of faculty pressures, the skills needs of South African industry have also been taken into account by the UX curriculum.

2) What challenges have been encountered by a South African university while adopting and contextualising an international computing curriculum?

There are two types of challenges that were encountered by UX: challenges caused by IS2010 and existing challenges that affected IS2010. The major challenges caused by IS2010 were the absence of important elements in the specification of the curriculum related to teaching and learning, particularly pedagogy. The challenges that impacted the adoption of IS2010 but were not caused by IS2010 were challenges that the university and the South African higher education context were already facing. These include the language of instruction, institutional culture, staff shortages and students' cultural and educational background.

6.2 Relevance and contribution

This research has several implications for academia and practice. Firstly the research addresses the lack of prior research in South Africa on adopting and contextualising international computing curricula. Existing literature on this topic focuses on other Africa countries such as Botswana (Ayalew et al., 2012), Nigeria (Dasuki et al., 2015) and Ethiopia (Bass & Heeks, 2011). Given that each African country has unique socio-economic development needs research specific to individual countries is needed (Larsson & Boateng, 2009). This study adds to the body of curriculum contextualisation research in South Africa.

Secondly the research findings have shed light on how a South African university may adopt and contextualise an international computing curriculum and the challenges the university might face in doing so. This will in turn help computing educators in addressing such challenges and provide some guidance on whether or not to adopt international curricula.

Thirdly this research has put forward a theoretical framework (figure 13 in the implications chapter) for studying the adoption and contextualisation of an international computing curriculum in South Africa. Given the different contextual realities different countries face theoretical frameworks for this topic need to be developed specifically for each country. This research does so for South Africa.

6.3 Limitations and directions for future research

The scope of this study is limited to IS and therefore excludes other computing disciplines. UX also has a Computer Science (CS) department that sits in the Science faculty which did not participate in this study. Including the CS department in the research would be of interest given the impact of faculty objectives on how a curriculum is adopted and contextualised. Researching other computing disciplines would also be valuable because international computing curricula are not the same for all computing disciplines. For example IT2008 gives guidance on the number of teaching hours that should be devoted to a module while IS2010 does not (Lunt et al., 2008; Topi et al., 2010). Such differences impact the adoption and contextualisation process and would be of interest.

Future research should also consider replicating this study at a different South African university. UX is a traditional university according to the classification used by the South African higher education department. A comprehensive university or a university of technology may have a different experience to that of UX due to the different missions that the different types of universities have. Another perspective to consider is the type of university in terms of student bodies, physical location and resources. In the Learning-University Infrastructure and Resources subcategory, for example, the respondents spoke of how UX had better resources than other South African universities and hence did not experience the same challenges that less resourced institutions may encounter. It would therefore be worthwhile exploring this topic at a university that has fewer resources. Curriculum contextualisation literature emphasises that there are differences between countries but does not emphasise differences between universities within a country such as resources, student bodies and physical location. This is a gap in the literature that needs to be addressed.

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Appendix A - Contextual factors uncovered in literature review

Contextual Factors	Papers
Culture	Apiola & Tedre (2011), Ayalew et al. (2012), Bass & Heeks (2011), Dasuki et al. (2015), Fendler & Winschiers-Theophilus (2010), Larsson & Boateng (2009), Tedre et al. (2009), Vesisenaho et al (2006a), Vesisenaho et al (2006c), Vesisenaho (2010),
Curriculum Content	Bass & Heeks (2011), Dasuki et al. (2015), Sutinen & Vesisenaho (2006), Tedre et al. (2009)
Curriculum objectives and values	Bass & Heeks (2011), Dasuki et al. (2015), Larsson & Boateng (2009), Tedre et al. (2009)
Educational background of students	Apiola, Tedre & Oroma (2011), Apiola & Tedre (2011), Lund & Sutinen (2010), Ponelis et al (2012), Sutinen & Vesisenaho (2006), Tedre et al. (2008), Tedre et al. (2009)
Evaluation and sustainability	Larsson & Boateng (2009), Ponelis et al (2012), Tedre et al. (2008), Vesisenaho et al (2006b)
Government Regulation	Bass & Heeks (2011), Dasuki et al. (2015), Ponelis et al (2012)
Industry Skills Needs	Apiola & Tedre (2011), Liebenberg, Huisman & Mentz (2015), Ponelis et al (2012),
Interdisciplinarity	Ayalew et al. (2012), Tedre et al. (2008), Tedre et al. (2009)
International Recognition	Ayalew et al. (2012), Tedre et al. (2008), Tedre et al. (2009)
Language	Apiola, Tedre & Oroma (2011), Tedre et al. (2008), Tedre et al. (2009)
Level of specialization/Career tracks	Larsson & Boateng (2009), Tedre et al. (2009)
Natural Environment	Apiola & Tedre (2011), Ayalew et al. (2012)
Pedagogy	Apiola, Tedre & Oroma (2011), Bass & Heeks (2011), Dasuki et al. (2015), Liebenberg et al. (2015), Sutinen & Vesisenaho (2006), Tedre & Kamppuri (2009), Tedre et al. (2009), Vesisenaho et al (2006b)
Political Environment	Bass & Heeks (2011), Dasuki et al. (2015), Larsson & Boateng (2009), Ponelis et al (2012), Tedre et al. (2008), Vesisenaho (2010)
Practical Skills	Ayalew et al. (2012), Sutinen & Vesisenaho (2006), Tedre et al. (2008), Tedre et al. (2009)
Problem oriented pedagogy	Ayalew et al. (2012), Tedre et al. (2008), Tedre et al. (2009)
Society	Apiola, Tedre & Oroma (2011), Ayalew et al. (2012), Bass & Heeks (2011), Dasuki et al. (2015), Larsson & Boateng (2009), Liebenberg et al. (2015), Lund & Sutinen (2010), Tedre et al. (2008), Tedre et al. (2009), Vesisenaho et al (2006a), Vesisenaho et al (2006c), Vesisenaho (2010)
Socio-economic conditions	Apiola & Tedre (2011), Ayalew et al. (2012), Larsson & Boateng (2009), Tedre et al. (2008), Vesisenaho et al (2006a), Vesisenaho (2010)
Stakeholder Communication	Bass & Heeks (2011), Dasuki et al. (2015)
Student needs, motivations and expectations	Apiola, Tedre & Oroma (2011), Liebenberg et al. (2015), Ponelis et al (2012),Vesisenaho (2010)
Teaching Staff	Bass & Heeks (2011), Dasuki et al. (2015), Ponelis et al (2012), Tedre & Kamppuri (2009), Vesisenaho et al (2006b)
Technological Environment	Apiola & Tedre (2011), Ayalew et al. (2012), Tedre et al. (2008), Vesisenaho (2010)
University infrastructure and financial resources	Bass & Heeks (2011), Dasuki et al. (2015), Ponelis et al (2012), Tedre & Kamppuri (2009)
University Structure	Apiola, Tedre & Oroma (2011), Bass & Heeks (2011), Dasuki et al. (2015), Ponelis et al (2012), Tedre et al. (2008)

Appendix B - Interview guide

Introductory Question(s)

i) The questions I'm going to be asking you during this interview all relate in one way or another to the concept of a curriculum. Can I begin by asking you what you interpret curriculum to be?

ii) I am told that at UX you use IS2010 as a curriculum guideline. Are you aware of why IS2010 was chosen?

Economic responsiveness

Curriculum objectives and values:

1) When I look at IS2010 it would seem that it is designed primarily to prepare students for entering the workforce, so it is taking an instrumentalist view. Have you as a department consciously chosen a philosophy? Are you guided instead by an underlying goals or strategies? What goals or educational philosophies would you say your curriculum follows? So, would you say you aim to prepare students for employment (instrumentalist), do you look to develop an individual (progressivist) or do you seek to advance social change (reconstructivism)? Why have you deviated from the instrumentalist view prescribed by IS2010?

2) Can you give me a brief summary of the high-level competencies and skills do you endeavour to develop in your students? Did you get these from IS2010?

A curriculum has various stakeholders with certain needs that they would like the curriculum to fulfil.

Industry skills needs:

1) Industry in South Africa has a demand for certain ICT skills. Are you aware of what these are from an IS perspective and do you try develop these skills in your students? Were these prescribed in IS2010?

Student needs:

1) Research suggests that some students expect their studies to prepare them for employment. Do you factor this expectation into any of your curriculum related decisions? Does IS2010 prepare students for employment in South Africa or have you had to make some changes to what is prescribed?

Society:

1) Like industry, society in general has particular skills needs or expectations from an ICT perspective. For example in healthcare there is a need to be able to support mobile health initiatives and in education there is a need to be able to support improvements in access. Do these types of skills needs inform what you teach in the curriculum in any way? How have you done this while following the IS2010 guidelines?

Teaching Staff:
Teaching staff are a critical component in the delivery of a curriculum.

1) Do you feel there are sufficient number of teaching staff to deliver the curriculum?
2) Do you feel that they have the necessary experience, interest and teaching qualifications? Would you say the curriculum drives what you as a department teach or do the available skills drive what you teach?
3) As staff do you try align your research interests with what you teach?
4) Do staff have any involvement in curriculum decisions?

Government regulation:
Government plays an important role in higher education through setting policy and providing funding.

1) What government regulations affect your curriculum? For example the Higher Education Qualifications Framework? What challenges have you experienced in conforming IS2010 to these regulations?
2) In South Africa there are prominent political issues that inform government policy. One of which is transformation. Does transformation impact on any decisions you make in relation to your curriculum? How do you integrate this into what IS2010 prescribes?

Stakeholder communication:

1) Is there a mechanism in your department or university for communication between the various stakeholders we have been discussing (industry, society, etc.)? For example Industry Advisory Boards.

Cultural Responsiveness (in follow up interviews)

Pedagogy:

1) The student body in South Africa is culturally diverse and research suggests that different cultural groups have different preferred ways of learning. For example there is research that argues that group work and storytelling are effective pedagogies for students of African heritage. How culturally diverse is the group majoring in IS? Is your first year group very similar in diversity the group majoring in IS? Is your pedagogy influenced at all by the cultural background of your students? (If their big 1st year groups are different – are the pedagogies in first year different for cultural reasons or to deal with large classes?)

Learning Responsiveness

Student needs:

1) The language of instruction at UX is English. Does that affect the learning of your students in any way, particularly those whose first language is not English?
2) Building on from language, cultural capital is a concept that speaks to the social assets that students bring with them to university such as speaking ability, personality and

knowledge about how to succeed at university. In your experience how does a students' level of cultural capital impact on their performance.

3) What do you find is the motivation behind student learning? Do you find they actually want to learn or are they only interested in passing the course?

Pedagogy:

1) Some research suggests it is important to develop practical skills in students. How have you gone about this given the curriculum guidelines that you follow? How do you decide what is taught practically in a lab, what is a group assignment and what is a class workshop for example?

University Infrastructure and financial resources:

1) IS2010 gives some general guidelines about the resources needed to support the curriculum. Does the university have the necessary infrastructure to support your curriculum? Are there sufficient computer labs for individual, group and class work? Do you have machines with the appropriate software? Are your classrooms able to support the types of teaching and learning you require? Did the university have the necessary financial resources to acquire and maintain this infrastructure or was there external assistance?

University structure:

1) The department of IS sits in the Commerce faculty. Does this create any challenges say for example when dealing with other departments such as computer science? Is there competition for resources for example?

Curriculum content:

1) Your department offers a BCom in IS and a BCom in IS and Compsci. Why is that? (Trying to get information about career tracks).
2) Some curriculum guidelines advocate for the use of core and elective subjects in order to allow for different specialisations. Does your curriculum offer that? If yes why have you done so? (Optional depending on where question 1 takes us).
3) Does your curriculum content prepare your students for the socio-economic and technological environment that they will work in? For example SA has high levels of inequality and a history of racial discrimination. Do you factor that in to your course content in any way? There are also problems such as internet access in rural areas and bandwidth speed. How do you cater for these challenges? Do you make them aware of these constraints

Disciplinary responsiveness

Curriculum evaluation and sustainability:

1) How do you ensure that your curriculum is regularly updated and kept as current as possible? Are these mechanisms based on research at all?
2) Does accreditation or possible future desire/need for accreditation form part of your strategy of evaluating your curriculum?

Appendix C – Sample of interview data coding

Category	Code	Sub-Codes	Response	Analysis	Axial code
Economic	Curriculum objectives	Desired objective	R(1): It's not just subject matter. That's why I say the one key element... was to have a reflective practice component and that component was specifically there to develop the person themselves, to create the self-awareness and from there onwards to develop self-leadership and team skills so it's not just about subject matter, it's about addressing the whole person.	Desired goal is subject matter and personal development. Partly achieved through reflective practice	Curriculum (skills and competencies), Learning (pedagogy)
Economic	Curriculum objectives	Desired objective	R(3): ...we tend to pick up what is relevant, what is current and create a balance between meeting that but also staying core to the academic project of trying to create a student who is, whose knowledge will transcend just the immediate needs of a company	Want to develop a student who does not only meet industry needs	
Economic	Curriculum objectives	Achieved objective	R(3): ...honestly speaking I think we are more, if you put a scale we are not halfway I think we are more into creating students who are ready to work for companies. There is the – ok I forgot but there's two extremes. One is obviously purely creating a human resource for companies to hire and the other is developing a capable human being who is able to engage with the work and I think we are more into creating a graduate who is ready for employment	currently producing students who mostly meet industry demands rather than developing students	University needs

Appendix C – Sample of interview data coding

Category	Subcategory	Code	Response	Analysis	Axial Code
Learning	Curriculum (CC)	Course Content	R(3): There is a minimum number of commerce credits a student needs in order to be able to graduate with a commerce degree. That number is set by the faculty to make sure that a commerce graduate has enough understanding of commerce affairs.	Commerce courses influenced by faculty regulations	
Learning	Curriculum (CC)	Course Content	Of course, one must not ignore the financial incentives. A student doing commerce course means money coming to the faculty of commerce. The more 'outside' courses, you allow the more money you will be losing to other faculties.	Monetary considerations of faculty influence the courses students do.	
Learning	Curriculum (CC)	IS2010 use	R(1): ...I know IS2010 didn't put that much emphasis on programming but we do in our undergraduates at the moment… that was one of the areas where we sort of diverted a bit. Although they have it as an optional kind of element it didn't carry that much weight. We still focus on that. So the first years do it, the second years do it, the third years do programming. They all do that as well as the analysis and design skills so that they can get the whole picture of developing a system. It's not just the front end.	1 gap in IS2010 was lack of emphasis on programming	

Appendix D- Sample participation letter (SPL)

Date: 10 February 2015

Good Day

My name is Kenneth Mashingaidze and I am a Masters student in the Information Systems Division in the School of Economic and Business Sciences at the University of the Witwatersrand (Wits), Johannesburg. I am conducting research on the adoption and contextualisation of an international computing curriculum by a South African university. An international computing curriculum is a curriculum such as those developed by international professional and scientific bodies. An example of such curricula would be IS2010 developed by Association for Information Systems.

As lecturers who use IS2010 as a curriculum guideline, you are **invited** to take part in an interview. The purpose of this interview is to find out how you have adapted IS2010 to make it more relevant to the South African context and what challenges you have encountered in doing so. By context I mean factors that influence decisions you make about the curriculum such as industry needs, student backgrounds, pedagogy and curriculum content.

Your participation is important and there are no right or wrong answers. This interview is both confidential and anonymous. Due to the nature of the study you will need to provide the researcher with some form of identifiable information however, all responses will be confidential and used for the purposes of this research only. Furthermore no identifiable information will be included in the final published report. Your participation is completely voluntary and involves no risk, penalty, or loss of benefits whether or not you participate. You may withdraw from the interview at any stage.

The interview consists of questions related to factors that need to be considered when researching the adoption and contextualisation of an international computing curriculum at a South African university. The interview should take between 40 to 60 minutes to complete. The interview was approved unconditionally by the Wits School of Economic and Business Sciences ethics committee, Protocol number: CINFO/1109, and the UX Commerce Faculty Ethics in Research Committee.

Thank you for considering participating. Should you have any questions, or should you wish to obtain a copy of the results of the interview or the research, please contact me at 1254327@wits.ac.za.
My contact details: 1254327@wits.ac.za – Cell number: 079 444 0620
My supervisor's name and email are: Susan Benvenuti – Susan.Benvenuti@wits.ac.za

(Researcher's Signature)
Kind regards
Kenneth Mashingaidze
Masters Student: Division of Information Systems
School of Economic and Business Sciences
University of the Witwatersrand, Johannesburg

Appendix E - Sample participation consent form (SPCF)

Title of research project: Adopting and Contextualising International Computing Curricula: A South African Case
Name/s of principal researcher/s: Kenneth Mashingaidze
Department/research group address: Department of Information Systems, School of Economic and Business Sciences, New Commerce Building, West Campus, University of Witwatersrand, 1 Jan Smuts Avenue, WITS 2050
Telephone: 0794440620
Email: 1254327@@students.wits.ac.za
Name of participant:
Nature of the research: A case study on how an international undergraduate computing curriculum has been adapted to fit the context of a South African university.
Participant's involvement: As an undergraduate information systems lecturer you may have been involved and have knowledge of the adoption and contextualization of IS2010 at the UX Information Systems department.

What's involved? Participating in an interview with regards to how the curriculum was contextualized at the university and any challenges encountered along the way.
Risks: None
Benefits: Participating in this research will help further the knowledge and understanding on this topic in South Africa. Adopting and contextualizing computing curricula has an impact on the ICT skills shortage in South Africa and is therefore important to the country's development.

- I understand that permission has been granted to the researcher to conduct this interview by the UX Commerce Faculty Ethics in Research Committee and the UX Executive Director for Human Resources.
- I acknowledge the following: I agree to participate in this research project.
- I have read this consent form and the information it contains and had the opportunity to ask questions about them.
- I agree to my responses being used for education and research on condition that my privacy is respected, subject to the following:
  - I understand that my personal details will not be included in the final report so that I will not be personally identifiable.
  - I understand that I am under no obligation to take part in this project.
  - I understand I have the right to withdraw from this project at any stage.

Signature of Participant / Guardian (if under 18):
Name of Participant / Guardian:
Signature of person who sought consent:
Name of person who sought consent:
Date:

Appendix F - Sample consent form for interview recording (SCIR)

Title of research project: Adopting and Contextualising International Computing Curricula: A South African Case
Name/s of principal researcher/s: Kenneth Mashingaidze
Department/research group address: Department of Information Systems, School of Economic and Business Sciences, New Commerce Building, West Campus, University of Witwatersrand, 1 Jan Smuts Avenue, WITS 2050
Telephone: 0794440620
Email: 1254327@@students.wits.ac.za
Name of participant:
Nature of the research: A case study on how an international undergraduate computing curriculum has been adapted to fit the context of a South African university.
Participant's involvement: As an undergraduate information systems lecturer you may have been involved and have knowledge of the adoption and contextualization of IS2010 at the UX Information Systems department.

What's involved? Participating in an interview and answering questions with regards to how the curriculum was contextualized at the university and any challenges encountered along the way.
Risks: None
Benefits: Participating in this research will help further the knowledge and understanding on this topic in South Africa. Adopting and contextualizing computing curricula has an impact on the ICT skills shortage in South Africa and is therefore important to the country's development. I acknowledge the following:

- I understand that permission has been granted to the researcher to conduct this interview by the UX Commerce Faculty Ethics in Research Committee and the UX Executive Director for Human Resources.
- I agree to participate in this research project.
- I agree that the interview will be recorded
- I have read this consent form and the information it contains and have had the opportunity to ask questions about them.
- I agree to my responses being used for education and research on condition that my privacy is respected, subject to the following:
  - I understand that my personal details will not be included in the final report so that I will not be personally identifiable.
  - I understand that I am under no obligation to take part in this project.
  - I understand I have the right to withdraw from this project at any stage.

Signature of Participant / Guardian (if under 18):
Name of Participant / Guardian:
Signature of person who sought consent:
Name of person who sought consent:
Date:

Appendix G – UX BCom(IS) and BCom(IS +CS) comparison

	BCom IS	BCom IS and Compsci
1st year	Financial Accounting (1F) **Information Systems 1 (1F)** OR Computer Science (1F) Microeconomics (1F) Mathematics (1S) Evidence-based Management (1S) Business Accounting (1S) OR Financial Reporting 1 (2S) Macroeconomics (1S) Business Law 1 (1S)	Financial Accounting (1F) Computer Science (1F) Microeconomics (1F) Mathematics (1F) Mathematics (1S) OR **Mathematics (1W)** Business Accounting (1S) OR Financial Reporting 1 (2S) Macroeconomics (1S) **Computer Science (1S)**
2nd Year	**Commercial Programming (1F) *** **Applying Database Principles (2F)** **Business Intelligence and Analytics (2F)** Systems Analysis (2F) **IT Architecture (2S)** Systems Design & Development (2S) Business Ethics (2S) Introductory Statistics (1S) 2 courses from **	Evidence-based Management (1F) Business Law 1 (1F) **Computer Science (2F)** Systems Analysis (2F) **Computer Science (2S)** Systems Design & Development (2S) Business Ethics (2S) Introductory Statistics (1S)
3rd Year	Professional Communication (2F) Electronic Commerce (3F) **Systems Development Project 1 (3W)** **OR Microeconomics 2 (2F)** **Corporate Governance 1 (2S)** **Marketing 1 (2S)** Business Process Management & Enterprise Systems (3S) 1 course from **	Professional Communication (2F) Electronic Commerce (3F **Computer Science (3F)** **IT Project Management (3F)** **Computer Science (3S)** Business Process shut & Enterprise Systems (3S) 1 course from ***
Electives	** Management Accounting 1 (2F) Macroeconomics 2 (2S) Company Law (2F) **Economics: Co-operation and Competition (2S)** **Labour Law (2F)** Business Finance (2F)	*** Management Accounting 1 (2F) **Microeconomics 2 (2F)** Macroeconomics 2 (2S) Company Law (2F) Business Finance (2F) **Applied Statistics (2F/S)** **C++ and Applications (3H)** **Computer Games (2S)** **Social Infrastructure: Engaging with Community for Change (1L)**

*Can be substituted for Computer Science (1s) in 1st year.