Cape Peninsula
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The strategic role of the Chief Information Officer during post-merger at institutions of higher learning: A CASE STUDY

by

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DECLARATION

I, Alvino George Moses, declare that the contents of this dissertation/thesis represent my own unaided work, and that the dissertation/thesis has not previously been submitted for academic examination towards any qualification. Furthermore, it represents my own opinions and not necessarily those of the Cape Peninsula University of Technology.

Signed **Date**

ABSTRACT

Higher education institutions are considered mission central due to the amount of information processing. Consequently the demand for information provision had dramatically increased in modern times. Universities and other large organisations are immensely challenged to produce accurate information hence it is information centric environments with lots of dependencies.

This particular study followed a qualitative approach which includes interviews to collect the data which will assist the researcher to understand the problems of information retrieving from the IS and the strategic role of the CIO in higher education. Thematic networks were used to analyse the data and a list of themes were identified.

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Appendix A: Interview questions

GLOSSARY

CIO Chief Information Officer

DQ Data Quality

DQC Data Quality Committee

ICT Information and Communication Technology

iEnabler ITS integrator system which allows both staff and students quick access to their information through user-friendly, browsed-based applications

IQ Information Quality

IS Information Systems

IT Information Technology

ITS Integrated Tertiary Software

HE Higher Education

NEPAD New Economic Plan for Africa's Development

SATN South African Technology Network

CHAPTER ONE
OVERVIEW OF THE STUDY

1.1 Introduction

Globally tertiary education undoubtedly has gone through major changes in the last two decades (Webb, 2006). In an attempt to accomplish growth, diversity and rationalisation, the higher education sector in similar fashion to the corporate sector shifted their focus to mergers based on operational strategy (Kavanagh *et al*., 2006; Reddy, 2007). Although all mergers are unique the majority have similarities in certain issues as it presents huge challenges and perhaps one of the most challenging tasks is the integration of IS (Alaranta *et al*., 2008). Even though higher education mergers are voluntarily in South Africa (Paterson, 2005), it may be the first time they went through such a huge change with unpredictable consequences. In some instances external sources were used to assist in the integration of IT departments including the IS.

The ability to integrate different IT departments has developed into a vital skill especially if it can be accomplished in a rather short space of time. According to Brandel (2006) a key to successful mergers is the rapid integration of IT and any delays to integrate systems have repercussions on staff, hardware expenses and maintenance. Paterson (2005) further based this on the fact that various education institutions globally had been reluctant to respond to the desire to integrate IS with higher education business models and it remains a serious ongoing challenge. This can mainly be attributed to two reasons namely, IS are still regarded as a support function by several higher education management and lastly the implementation of IT solutions in higher education is hampered by the shortages of resources (Paterson, 2005).

In the contemporary environment the academic and administration do not seem to work closely together although both of them use the same IS. This could be due to academics focusing on the student academic progress which is one of the cornerstones of the institution and administration uses IT for administrative tasks. The IT department focuses more on the technology needs of the institution and usually owns the IS. During the peak periods at the institution, namely the registrations and assessments, the problems experienced by the academic institutions are even worse than under normal circumstances where the bulk of the data is uploaded during a short time. This is the time when staff members use the IS more excessively when they access, capture and retrieve information. This could be with high levels of frustration and negative perceptions that could influence the use of the IS. This is precisely the time that more strain is put on the IS.

Remenyi *et al.* (2005) suggest eight reasons why the use of IS is complex and can be seen as a distinctive leadership challenge. These reasons will be further discussed in the literature chapter.

1.2 Statement of the research problem

Information needs and systems of merger institutions differ due to data having to be integrated not only from multiple systems but also from different organisational cultures of the merged organisations. The integration processes of the system may not be aligned with the physical consolidation of the business and IT processes. The difference in systems supporting a consolidated programme could result in frustration of the users when using the IS. The IS use and availability of information related problems due to the merger are not known and the consequences cannot be predicted. It is not clear what the role of the CIO is for integrating systems due to mergers of a higher institution.

1.3 Research Questions:

The aim of this study is to understand the role of the CIO by investigating the issues around IS integration and information availability and usability in terms of the user's perceptions in a post-merger university. The role of the CIO is considered to determine how this position can enhance the better utilisation of the IS. The main question considered for this study is:
What is the role of the CIO to facilitate the users' experiences interacting with IS in a post-merger environment?

1.4 Sub-Research Questions:

The sub research questions supporting the main question are:

What should the role be of the CIO in higher education?

What are the issues around information availability and usability?

What are the IS issues experienced by users interacting with the IS?

What are the components and relationships between academic and administrative staff at a university IS that support the academic and administrative support?

How does the post-merger environment influence the operation of a university?

Research Problem:	Information needs and systems of merger institutions differ due to data having to be integrated from not only multiple systems but also from different organisational cultures of the merged organisations. The integration processes of the system are not aligned with the physical consolidation of the business and IT processes. The difference in systems supporting a consolidated programme results in frustration of the users. The data quality related problems due to the merger are not known and the consequences cannot be predicted. It is not clear what the role of the CIO is in a HE to manage the users' needs for information and use of the information systems.	
Research Question:	What is the role of the CIO to facilitate the users experiences interacting with IS in a post-merger environment?	
Research sub-questions	Research method(s)	Objectives
What should the role be of the CIO in higher education?	Literature analysis Case study	Establish the role of the CIO in universities and determine the situation in practice.
What are the issues around the relevancy of information obtained from the information systems for the users?	Literature analysis Case Study (Unstructured interviews)	Identify the issues around information availability and relevancy.
What are the IS issues experienced by users using the IS?	Literature analysis Interviews (structured & unstructured) & questionnaires	Establish the relationship between users and the IS
What are the contributing factors influence the users' use of information and the Information system?	Literature analysis Case study (IS analysis)	Establish the users perceptions of IS
How does the post-merger environment influence the	Literature analysis	Determine the influence that the post-merger has on the

operation of a university?		operation of a university

Table 1.1: List of research problems, primary research question, secondary research questions, research methods and objectives.

The remainder of the thesis is organised as follows: firstly an analysis of the related literature to determine the current status of the field. This is followed by the chapter indicating the research methodology used for this research. The chapters analysing the empirical data and discussing the findings concluded this study followed by the concluding chapter.

1.5 The Literature Review:

The literature analysis is discussed in Chapter 2 but the main concepts addressed are briefly summarised in thus section. The literature discussion is organised as follows: universities in their current environments are briefly highlighted. It than shift its focus to information systems in the higher education sector. The last part of the literature highlights the role of the Chief Information Officer (CIO), which forms the basis of this research. A non-technical understanding is adopted for this study as the emphasis is on the information availability and usability by means of the IS.

1.5.1 Universities:

Du Pré (2009) is of the opinion that “A university is an academic institution at which research is conducted and teaching and learning are offered within the organised cadre of the contact between lecturer and student, and supported by networking, cooperation and collaboration with external academic partners to create, develop and transmit new knowledge”.

Merging of higher education institutions is a global phenomenon and various reasons are provided to substantiate the justification behind the rationale (Fielden *et al*., 1997; Paterson, 2005; Wan *et al*., 2007). In the South-African context it is used primarily to alleviate the inequalities of the past and was spearheaded by the government (Jansen, 2002).

A merger is the amalgamation of several organisations to create a larger organisation. A large number of organisations are driven into mergers due to increased competition in the business domain (Wijnhoven *et al*., 2006). Successful mergers require fast IT integration (Brandel, 2006). Fielden *et al.* (1997) is of the opinion that the motive behind higher education mergers should not be a cost saving initiative but rather strategic and academic. Furthermore Fielden *et al.* (1997) recommend that both the cost and time involved in a

merger should never be underestimated especially the integration of administrative IT systems and procedures.

1.5.2 Information Systems:

IS and computers have a huge impact on the manner in which organisations accomplish business activities (Stair *et al*., 2003). The information age without doubt has their advantage as most of us interact with IS on a daily basis whether it is booking a flight, checking our bank accounts or social developments payments for the less fortunate. IS is a combination of integrated information units (Sabry *et al*., 2009; Stair *et al*., 2003) which handles all data activities that include collection and processing in order to obtain a business objective.

IS success is regarded as a manifold level of occurrence which consist of the following levels: technical, semantic and effectiveness. The technical level deals with producing the information. The semantic level deals with information success and the effectiveness level deals with how the receiver perceives the information (Byrd *et al*., 2006).

1.5.3 Information availability

The value of information has not been used by its full potential although the information age had already settled in. Organisations generate vast amounts of data on a daily basis, but a number of these organisations seemed to be clueless of the value of these data. In today's economic climate an advantage is created by those who control the value of information (Leavey, 2008).

When an IS generates incorrect information large parts of the organisation is negatively affected (Remenyi *et al*., 2005). This is largely due to the size and complexity of the IS within organisations. Generating of incorrect reports can have serious repercussions for organisations in terms of financial sustainability. The availability of information is crucial when users are either searching or retrieving it for various purposes.

1.5.4 User interacting with IS

A large proportion of the organisation is negatively affected in the event of an IS crash or when errors are generated (Remenyi *et al*., 2005).

The use of IT is no more limited to the selected minority but is indeed optimally utilised by the all the stakeholders within the institution (Griffiths, 2003a). All academic programs have a fundamental IT component to ensure that students receive the necessary ICT exposure to enhance their technology skills. Assignments or tutorials are no longer required to be

submitted by hardcopy but rather electronically by means of Blackboard WebCT. In higher education the question remains how IT can provide assistance with the educational mission of the institution. IT is therefore not only used to support the operation of the university but also as an important mechanism to facilitate teaching and learning.

1.5.5 CIO role

The current role of the CIO differs from its original origin hence the shift from IT management to a more senior leadership capacity within organisations (Griffiths, 2003b). Leadership and management skills are required to address the setting of organisational policies and strategies (Sobol *et al*., 2009). The CIO is holistically accountable for the smooth operation of all hardware and software including the interconnected IS (Remenyi *et al*., 2005).

In view of the fact that Information and Communication Technology (ICT) has developed into a vital infrastructure for most organisations, it has an impact on the role of the CIO that had become more strategic and challenging (Lane *et al*., 2007). Generally CIO's have to be vision builders and in addition they should build relationships within organisations. Leverman (2008) cited Gottschalk (2007) states that "The chief information officer (CIO) can be defined as the highest ranking IT executive who typically exhibits managerial roles requiring effective communication with top management, a broad corporate perspective in managing information resources, influence on organisational strategy and responsibility for the planning of IT".

For more than two and a half decades private sector organisations have experienced the benefits of the CIO who is responsible to manage the organisations' primary asset namely information (Lawry *et al*., 2008). The CIO is regarded as the custodian of the information and needs to ensure that information will be readily available in the event should stakeholders require access.

The CIO must ensure that technology provides support to the needs of the business (Evans, 2006). The CIO role transforms IT from being a burden on the business to the business itself where it contributes to the strategic goals of the organisation and creates a competitive advantage (Lawry *et al*., 2008).

1.5.6 IS in Universities

Information Systems (IS) are important for the operation of big businesses, and the success of a merger is pretty much dependent on the holistic integration strategy of appropriate IS (Alaranta *et al*., 2008; Giacomazzi *et al*., 1997; Stylianou *et al*., 1996).

Increased demands for information needs has been experienced by universities in recent times due to pressure from internal and external sources (Dutta *et al*., 2003). Academic IS needs to accommodate a large percentage of information as it supports different aspects of the business which include finance, human resources, students and the library (www.its.co.za). Data needs only to be captured only once in the system e.g., student registration and it will then be available in the entire system for other departments to access that student's information. The student management system consists of the data that covers the complete cycle of all the activities of the student from application, registration, assessment, graduation and even until it reaches the alumni stage.

Higher education institutions are obligated to use IS to maintain their operations or in some instances to provide guidance through cycles of innovation in terms of service delivery and research excellence. Higher education mergers have the expectancy to use their IS to play an important role in influencing various key economic and additional benefits (Paterson, 2005).

1.5.7 CIO role in Universities

The overall responsibility of the institution's investment in IT coupled with the value that IT brings to the institution's mission should be given to the CIO. The IT vision should underlie and be a supportive structure of the holistic education vision of the institution (Griffiths, 2003a). The CIO is a vital role player in terms of the involvement of IT in assistance of the interests of the institution. The role of the CIO is to harbor new ideas where IT might assist to comprehend the vision of the institution. One of the aspects of the CIO as a leader is the expectation of having extensive expertise of IT requirements of the whole institution (Griffiths, 2003b).

The success of IS and IT within organisations is dependent on the CIO's ability to communicate effectively, to train and teach management and users and not upon technology and technical skills as anticipated (Passino *et al*., 1998; Lawry *et al*., 2008). The CIO should have the ability to communicate fluently and clearly and the reason for this is that the CIO discuss intricate matters with executive management and other senior managers (Stephens *et al*, 1994).

Next the research design used for this study is discussed.

1.6 Research Design:

1.6.1 Research approach

An exploratory qualitative approach was used to better understand the use of IS in higher education. The different stakeholders' perceptions are considered and since these are socially constructed, a qualitative approach will provide the necessary insights to understand the aspects researched. It is therefore assumed that the empirical data is subjective depending on the individuals' sense-making of the situation. IS research has change from a focus on more traditional technological issues to a more focus on managerial and organisational perspective (Meyers, 1997). The qualitative interpretive approach will be deemed appropriate for answering the above research questions for this study, in determining the role of the CIO in higher education, and how the integration issues of IS will be addressed.

1.6.2 Envisaged research methods

A case study is being proposed as this type of research method is very appropriate for IS research as indicated by Runeson *et al* (2009). A case study strategy is suitable since it provides a mechanism to study a specific situation in a real-world setting. The users' perceptions are important and thus communication is vital to this type of research in order to establish their viewpoints. Different alternatives will also be explored to some extent to address the issues that they are facing in their daily operations. By engaging with people it can become clear what their concerns are and how they interpret the IS issues.

1.6.3 Units or levels of analysis

The users of IS at the Cape Peninsula University of Technology was the focus point as this institution is currently still facing the challenges which was presented by the merger even though this institution is already entering close to a decade into its new environment. Technological aspects such IS integration is still one of the main obstacles coupled with the fact that IT is still regarded as a separate entity which is not contributing significantly to the business. There is an expectation that universities of technologies must lead technological innovations or be in the forefront of technology development and how technology is utilised to facilitate the use of IT may not be clear.

1.6.4 Sampling techniques: (Motivation for the number of cases or interviews)

Interviews were conducted with representatives from both administrative and academic staff as they are the individuals who regularly interact with the IS and are in the best position to share their experiences of using the IS. All the relevant stakeholders' input indicated their

perceptions with regard to the level of quality information from the IS. During interviews additional information may also reveal which would not necessarily emerge in a straightforward questionnaire. The interviewer was able to adapt his questions according to some of the answers of the participants. Clarity issues received immediate responses and there was no need to return for outstanding questions and issues.

Some staff indicated their fear to reveal their identities due to victimisation so anonymous questionnaires will also be available. This will contribute to a more trustworthy response as their identities will be kept secret but you will have reliable information.

1.7 Data analysis methods:

This is an interpretive study and a hermeneutic approach was used to analyse and interpret the data. This was done by finding themes and categories as well as relationships between the different concepts. The findings were interpreted to establish the meaning in terms of this research.

1.8 Contribution of the research:

This research has the potential to contribute towards a better understanding of a situation in higher education where there is not sufficient knowledge and expertise of the use of the IS in a post-merger higher education setup. Globally it has been proven in various sectors that the CIO position indeed presented technological enhancements and has changed business around to view things more holistically. The CIO in a leadership capacity at a University of Technology could contribute towards addressing the IS/IT challenges. An improved understanding of the IS issues experienced by the users will enable management to better utilise IS, not only as a supporting structure but indeed view IS as the cornerstone of the institution.

The output of this research is:

- A list of all the issues experienced by academic and administrative staff when they interact with the IS
- Guidelines for the university to consider how a CIO can manage the IS better
- These are reported in research papers and this thesis

1.9 Delineation

The focus of this study is on the users' perceptions of the use of the information systems of the University of Technology (UoT) and the perceived value of the information from these

systems to establish the role of the potential CIO in the university. It will not consider how the users utilize the information and system in their work activities but more in general on their views on the information and systems. The relevance of the information and IS in terms of teaching and learning is also excluded. The knowledge that the users gain from using the information and IS is also excluded. The only information systems considered are the institutional systems for the student administration and academic data, namely the Integrated Tertiary Software (ITS), Marks Administration System (MAS) and Learner Management System (LMS).The study also does not attempt to evaluate the information systems or assess the quality of the information since it only considers this from the users' perspectives. Only one UoT is considered and the intention is not to generalize the results but rather to report on the value of the CIO role in the university investigated in this study.

1.10 Limitations and delimitations:

This particular study had been conducted at the Cape Peninsula University of Technology based on that this was the only institution that went through the merger process in the Western Cape as initiated by the government. Currently the study focuses on the views of academic and administrative staff only and student views are not yet considered. Additionally neither one of the other three traditional universities such as the University of Cape Town, University of the Western Cape and the University of Stellenbosch underwent such a process so it would not be relevant to use them as additional sources. Another limitation could be related to trustworthiness as some staff members will not be open and honest due to various reasons.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

In order to provide a solid background for this research a literature review was conducted with the aim to highlight higher education and the role of the Chief Information Officer (CIO) within the higher education sector. The literature contributed to various areas within the research.

The majority of the literature was searched online via CPUT online academic repositories and database subscriptions. In addition Google Scholar was also utilised to retrieve articles. In some instances the CPUT library, Interlibrary Library Loans (ILL) department was consulted to retrieve literature which was inaccessible by the researcher. It was apprehended that searching through printed journals would not necessarily provide any additional insights instead it would consume additional time.

The literature looked primarily at the topic of higher education, mergers, information systems and subsequently the role of the CIO in higher education. These aspects are: The challenges in higher education (HE), information and systems, users' perceptions when dealing with information systems and the role of the CIO in HE dealing with Information Systems (IS).

2.2 Higher education

According to Du Pré *et al* (2008) "The university is an academic institution at which research is conducted and teaching and learning is offered within the organised cadre of the contact between lecturer and student, and supported by networking, cooperation and collaboration with external academic partners to create, develop and transmit new knowledge". Stockley (2011) highlights a number of global trends that are impacting higher education such as higher education being perceived as a global market where students are regarded as customers and the subsequent decrease of public funding for higher education. Student mobility is on the rise internationally and private involvement in higher education is escalating. In addition Stockley (2011) is of the opinion that Asia will imminently rise due to strategies that are being implemented to create "world class" universities. This will have direct repercussions on the West and higher education will decrease significantly.

Presently higher education institutions are becoming increasingly complex. Both inside and outside stakeholders are demanding changes. These are modifying academic programs, the continuation of utilising technology in classrooms, the adoption of innovative ways in assessing the performance of institutions and applying technology strategically in all phases

of administration and academics (Black, 2006). In the case used for this study the Vice Chancelor of the Cape Peninsula University of Technology states that “Universities have become such complex organisations that they have had to adopt some practices established in the corporate world”. Strategic planning is regarded as an essential activity within higher education (Tanga, 2009b).

2.2.1 University of Technology (UoT)

Prof Kader Asmal, Minister of Education announced in October 2003 that technikons would be redesignated Universities of Technology (UoT). The implications for technikons becoming UOTs were based on the fact that technikons were considered inferior to traditional universities. Additionally the name “technikon” became an obstacle with the onset of globalisation and the subsequent drive towards internationalisation. Technology had been identified as the qualifying factor that is inherent to UoT academics holistically as technology is link to all teaching and learning programmes and research projects (UoT, 2008).

The use of technology within a university is not regarded as the primary difference between a University of Technology (UoT) and other universities but instead the distinction is the focus, interweaving and interrelation between technology and the nature of a university which constitutes a technological university. The focus of a technological university is on the study of technology from the perspective of multiple fields of study in comparison to a particular field of study. Furthermore, technology refers to the effective and efficient utilisation of accrued know-how, skills, knowledge and expertise. There is an understanding that in the event that the above are applied it will result in the output of value-added products, processes and services (UoT, 2008).

2.2.2 Challenges in Higher Education

At present HE is facing a number of serious challenges which originates from the consequences of expanding technology, globalisation, competition, funding and widening access to institutions (Logue, 2008). Globally HE is trapped within a technological evolution which demands very rapid change. Our education systems, including the workforce, are directly impacted by this constant change (Corkill, 2008). The Cape Peninsula University of Technology mission statement: “To be at the heart of technology education” (www.cput.ac.za) supports this notion. The question boils down to whether higher education institutions have the resources and capacity available to deal effectively with this technological shift. In many respects higher education is not well-known for its speed of change. In higher education changes are not something new but changes are being enforced.

According to Baty (2010) “African universities face enormous challenges” and this is partly attributed to the fact that Africa inherited a higher education system which was a duplication of the former colonialist education system. Due to Africa being branded as a third world continent coupled with political and economic instability it had perpetuated the situation where higher education institutions encounter these extreme circumstances. Despite all the negativity pertaining to higher education in Africa where various obstacles have to be overcome, African governments are cooperative at looking at alternatives to remedy the situation. One such initiative is NEPAD (New Economic Partnership for Africa’s Development) which is a joint attempt to enhance the utility of institutions of higher learning in Africa. One of NEPAD’s primary goals is to look at mechanisms to revert the process of “brain drain”. NEPAD endeavours the enhancement and Africanisation by its member institutions by the following: enhancing higher education facilities; establishing additional African centres of technology and to encourage specialised research (Bulfin, 2009).

The South African higher education system is confronted with similar challenges which other African countries have encountered (Baty, 2010). South African higher education is presently under mounting strain to deal with issues in parallel firstly to address social transformation and skills requirements of a democratic South Africa (Kistan, 2002; Jaffer *et al.*, 2007); secondly with the enhancement of policy and delivery performance (De Clercq, 2002). It is no coincidence that the global challenges had filtered through on the domestic side and the higher education domain is impacted by these developments. One of these developments is where funding had been linked to graduate throughput which mounted additional pressure on higher education institutions. Furthermore large class sizes, student academic unpreparedness and multilingualism are additional challenges that are being experienced within the South African education sector (Jaffer *et al.,* 2007).

2.2.3 University Mergers

Merging of higher education institutions is a global phenomenon and numerous reasons are provided to substantiate the justification behind the rationale (Fielden *et al*., 1997; Paterson, 2005; Wan *et al*., 2007). In an attempt to accomplish growth, diversity and rationalisation the higher education sector in similar fashion to the corporate sector shifted its focus to mergers based on operational strategy (Kavanagh *et al*., 2006; Reddy, 2007).

About ten years ago institutions of higher education in South Africa have been subjected to a number of mergers (Steyn e*t al.*, 2005). In the South - African context it is used primarily to alleviate the inequalities of the past and was spearheaded by the government (Jansen, 2002). Subsequently in the first democratic elections of 1994 the South African Higher

Education landscape was transformed with numerous strategies that have been implemented with the view to effect significant change within the sector. The objective was to lay a foundation whereby a higher education system was created that is in line with the vision, values and principles of a democratic dispensation and ultimately to contribute to both social and economic development. The merging of universities and technikons was one such mechanism of effecting change (Muller, 2006). According to Naidoo (2009) in the context from a post-merger perspective it exhibited that two merged technikons should be protracted in comparison to the merger of two universities revealing more stability and faster recovery. Additionally the multi-site location of departments and faculties is a major factor which hinders collaboration (Naidoo, 2009).

The development of UoTs was regarded as the core in mergers between two or multiple technikons where one institution was always being historically disadvantaged and the other historically advantaged (UoT, 2008). The Cape Peninsula University of Technology (CPUT) was formed on 1st January 2005 with the merger of the previously Peninsula and Cape Technikons and started operating as a new merged institution on 1st February 2006. The merger at the Cape Peninsula University of Technology is discussed in detail in chapter 4.

2.2.4 Higher Education and Information Communication Technology

The use of ICT's for learning and teaching were identified by the South African government as a main concern. One of the statements of the e-Education for instance states the following:

> *Every South African manager, teacher and learner in the general and further education and training bands will be ICT capable by 2013.* (Department of Education South Africa, 2004: Jaffer *et al.*, 2007)

The provision of insufficient attention to the role of IT in mergers had negative consequences. This might be attributed to the fact that higher education mergers and the extremely quick adoption of IT in higher education have occurred simultaneously. Paterson (2005) further based this on the fact that various education institutions globally were reluctant to respond to the desire to integrate IS with higher education business models and this continues to be a vital constant challenge. This can mainly be linked to two reasons namely, an IS is still regarded a support function by several higher education management and lastly the implementation of IT solutions in higher education is hampered by the shortages of resources. This problem is not limited to the education sector only but continues in the corporate sector as well (Paterson, 2005). Some expectations are that IS have an obligation

to fulfill in leveraging many of the key economic and other benefits arise from higher education mergers (Paterson, 2005).

Worldwide higher education is developing in an era of change. Technological advances and government policies are the main contributors of such changes. This trend is likely to continue because higher education is under pressure to widen access and participation. Nzimande (2009), the Minister of Higher Education and training reiterated the increasing access to Higher Education in his lecture on the 250th seminar at the University of Johannesburg. In addition public funding has declined as government policy had changed by linking funding to throughput rate (Corkill, 2008; Jaffer *et al.*, 2007). Higher education institutions are expected to apply for financial support from other sources apart from national governments as a result of the ongoing erosion of the welfare state. Constant exposure of higher education to external anticipations, to be more noticeably functional for both the economy and society, is a challenge for higher education. Furthermore higher education institutions must identify and address the needs of perceived market forces and build solid incentive-based internal regulation (Brennan, 2008).

2.3 Information and Systems (IS)

Globally we are living in the Information Age in which the economy is to a large degree extending influence by the capacity in acquiring, analysing and manipulating of information. This era is characterised with people needing to have instant access to a broader range of information (Du Plessis, 2010). At present information had become the most valued product for successful development (Shafique *et al.*, 2010). The recognition information receives as one of the four pivotal corporate resources next to human, physical and finance is an indication of its importance (Johnson *et al.*, 2006; Zhuang *et al*., 2011). Sound business decisions are dependent on accurate and sufficient information from several sources and include IS, customers and competitors. Sabry *et al.* (2009) defined IS as "*inter-disciplinary systems that can be described as interrelated information and knowledge components with identifiable boundary, working together for some purpose*". On the other hand Dudas *et al.* (2007) defines IS as "*A collection of interrelated entities that use knowledge to construct useful information out of pieces of data*". A combination of both definitions is used for this study.

2.3.1 Information Systems in Higher Education

Universities and other large organisations are challenged to produce accurate information and based on that can be regarded as information centric environments. Increasing demands for information delivery at universities in recent years caused internal and external pressure

(Dutta *et al.*, 2003). According to Stuckley (2007) it is complicated to contemplate organisations where information processing is more mission crucial than a university. At universities information is acknowledged as a product, currency and medium. Furthermore Stuckley states that “In our colleges and universities, a fact of life is that for every student, every faculty member, and every member of the staff and administration, his or her needs for information and networking resources are the uniquely most important needs those resources have to meet.”. When staff members extract information from systems there is an expectation that the information is factually correct as it will be used for additional tasks or requirements. This information is then used to produce reports or compile lists for other departments or sections which might be higher up in the hierarchy. When this information is incorrect it creates problems for the entire university which could increase the risk of information-related errors that could then subsequently damage the reputation of the university. We have become dependent on information as it provides many benefits. Furthermore the consequences of inaccurate and insufficient information will lead to poor decision making (Zhuang *et al*., 2011).

IS is a fundamental element of the organizational system to create value and it is for this reason that organisations employ IS as part of their business (Dudas *et al.*, 2007). Over the past two decades and a half studies of why organisations implement and utilise IS had questionably become one of the main areas of research in IS (Benbasat *et al.,* 1987; Burton-Jones *et al*., 2008). IS provides numerous benefits for organisations and subsequently for their employees but only if the IS is accepted and used by the stakeholders. The provision of timely and accurate information has resulted in that organisations have become completely depended on their IS (Stylianou *et al.*, 1996). The creation of inaccurate information by IS does not conform to the requirements of its users therefore causing disruption to their operations with substantial maintenance expenses and high cost to organisations (Gorla *et al.*, 2010). In the event that an IS crashes or generates incorrect information large parts of an organisation is impacted and this leads to unproductivity and downtime (Remenyi *et al.*, 2005). Within the context of CPUT, Tanga (2009a) shares this sentiment with the following statement “The data within the Information Technology systems was becoming a nightmare”. It is understood that when information is incorrect and insufficient it leads to frustration on the users side hence it leads to duplication of tasks. It might have serious consequences as users might become disillusioned.

2.3.2 Information System Integration

A very complex process is the rapid integration of systems (Robbins *et al.*, 1999:206), one of the most challenging jobs in mergers is the integration of IS (Alaranta *et al.*, 2008:308). This is despite the benefits that IS integration provides such as improving the organisation’s

competitive position. The positive outcome that emanates from successful IS integration is the provision of quality, accurate and timely information. Secondly, to create IS that function optimally to ensure that the system is available, responsive and reliable. Thirdly, to provide sufficient end-user support and lastly, to provide information accessibility to the entire organisation (Robbins *et al.*, 1999:206). According to Alaranta *et al.* (2008:317) no best practice method exists as there are many different ways to achieve effective post-merger IS integration through planning. Moreover it is recommended that the planning of IS integration needs to adapt to the characteristics of the merger.

2.3.3 Information System Value

Capital expenditure on IT systems has increased over the years and many organisations spend more than half of their budget on IT (Burton-Jones *et al*., 2008; Meeker *et al*., 2007). The value of IS can be realised in several ways such as improving profit margins for the organisation, providing easy-to-use applications and lastly to design easily maintainable software (Gorla *et al.*, 2010). Information Technology (IT) is used to develop IS to assist people to perform a task. Organisations concentrate on the development, evaluation and use of utilitarian IS to improve both individual and organisational performance (Petter *et al.*, 2008). For several years IS has been regarded as the foundation of competitive advantage (Dudas *et al.*, 2007). A management focus has been to drive towards improving IS quality due to the increased organisational dependence on IS (Gorla *et al.*, 2010). Modern IS is commonly noticeable and large amounts of revenue may be generated or lost depending on the effectiveness and efficiency of an IS function. Time and again the CIO is required to encourage the effective and efficient use of the IS but realistically the CIO cannot be holistically responsible for the successful application of IS.

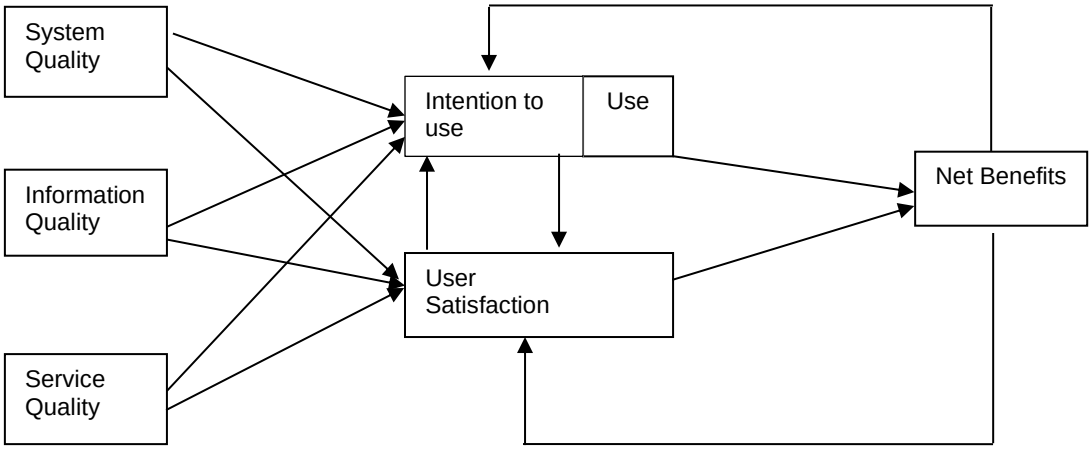

Fig 2.1 Updated D&M IS success model (DeLone and McLean, 2003)

Delone-McLean (2003) model presents a set of six categories:

System Quality: Zero or minimal disruption of employees neither work nor inconvenience customers due to integration (Robbins *et al*., 1999; Cossey, 1991; Merali *et al*., 1993; Alaranta, 2005). System quality is concerned with multiple issues such as whether there are bugs in the system, ease of use, user interface consistency and quality of documentation (Seddon, 1997; Gorla *et al.*, 2010).

Information Quality: One of the positive outcomes of the integrated system is the provision of corporate-wide information accessibility and in addition the information being produced should be accurate, timely and useful (Robbins *et al*., 1999; Alaranta, 2005). Information quality is defined by four dimensions namely: accuracy, completeness, consistency and currency. Accuracy is an accord with an attribute about a real world entity that is either the outcome of an arithmetic calculation or a value which is located in another database. Completeness points to whether all of the data that is present is relevant to the application. Consistency points to the non-existence of conflict between two datasets. Currency points to real time information (Huh *et al.*, 1990; Alaranta, 2005).

Service Quality: Defines as “The degree of discrepancy between customers normative expectations for service and their perceptions of service performance” (Gorla *et al*., 2010).
Use, Intended use: refers to how the end-user uses the IS in practice.
User satisfaction: Individual users might consider it as a bottleneck whereby systems integration may transform it into a more organised system which governs the users work processes more than previously (Alaranta, 2005).

Net benefits: There is an expectation that the integrated system needs to support the primary motives of the merger. Included in these motives are the enhancement of the firm’s competitive position, shaping or enabling business strategies and the integration of IS planning with organisational planning (Alaranta, 2005; Robbins *et al*., 1999; Cossey, 1991).
Petter *et al.* (2008), as depicted by **Fig 2.2,** refered to the lack of research that examines IS success at the organisational level of analysis and indicated that the majority of research studies rely on individual subjects that reports on their own perceptions about an IS. High quality systems will result in greater net benefits and systems that capitulate higher net benefits are regarded to be utilised to a bigger degree. Furthermore it was established that higher levels of user satisfaction will increase the use of the system (Petter *et al.*, 2008).

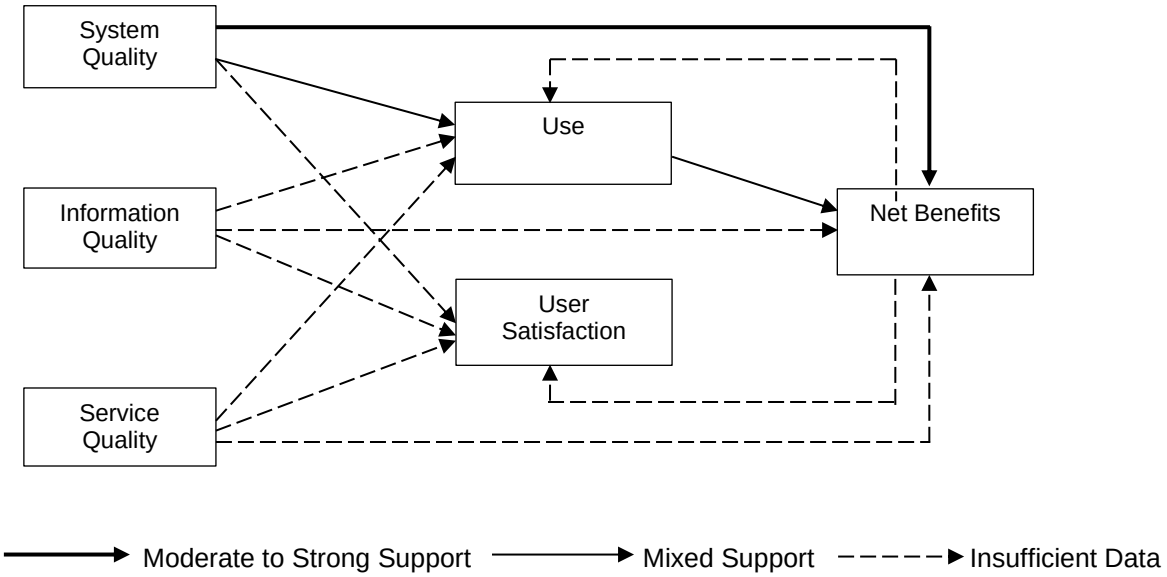

Fig 2.2 Support for interrelationships between D&M success constructs at an organizational level of analysis (Petter *et al.*, 2008).

2.3.4 Perceived use of Information Systems

Effective business support and satisfying user needs in particular have often been characterised by IS failure. In response IS management reduces costs concurrently by attempting to maintain or even enhancing services. Whyte *et al.* (1997) states that "*the qualitative aspects of systems development, implementation and operation as seen by users may not be fully understood, and this may be one of the causes of the failure to deliver information systems that are perceived by users to be successful."* The seminal work by Bailey *et al.* (1983) indicates the initial steps towards a service perspective on IS, whereby a 39-item questionnaire was developed to measure perceived user satisfaction with IS.

Three things closely linked to successful IS as perceived by users and as identified by factor analysis are as follows: the quality of systems employees and services, the quality of the information product that is being delivered and lastly the business knowledge and participation of systems employees within the business. According to Melone (1990) a successful system or business success is not only dependent on satisfied users alone as the possibility exists that systems which users perceive as successful provide little impact on the business. An additional key challenge with outcomes that are derived from user information satisfaction research is both attributed to the range and variety which is attached to user satisfaction (Whyte *et al.*, 1997).

2.4 ICT use in Higher Education

Within the higher education sector the role of ICT's is solicited by various factors such as improving operational efficiency, enhancing quality and widening access across every single function. Furthermore ICT's is required to generate new dynamics in higher education at macro and micro levels. According to Meenakumari *et al.* (2011) in any growth orientated industry change transpires at a non-level pace and the education sector is not immune against technological changes. In the education sector ICT also plays an important part to maintain efficient powerful management and administration. The accelerated need for ICT in higher education is due to the growth in student population where data needs to be processed, stored, retrieved in a fast, systematic and accurate fashion (Meenakumari *et al.,* 2011).

The increased usage of opportunities that is provided by ICT facilities at institutions is linked to the escalation in the number of students at universities and potential students who desire to further their studies. Although other factors exist it is anticipated that ICT performs an essential role in addressing the increased demand for universities. According to a study by Usluel *et al.* (2008) ICT usage in higher education is getting more prevalent as ICT is mostly utilised for communication and conducting research by faculty staff. In addition in higher education the search for technological transformation has developed widespread globally due to the advantages it presents to higher education and the predominance of the internet (Uys, 2007).

2.5 Information Quality

A large number of organisations acknowledge that they encounter challenges with the quality of their information. Nonetheless, only a limited number of them adopt a structured methodology to adequately recognise these challenges in order to design solutions that are effective (Khan *et al.*, 2000). According to Strong *et al.* (1997) the aim of database research is to ensure the quality of data in databases. One of the most critical data quality (DQ) problems in organisations is IS professionals who are unable to identify and resolve quality problems which are defined as inaccuracies in stored data. Additionally the assessment of the quality of data cannot be done independently by data consumers who utilise data as their assessments of DQ importance is on the increase. Generally consumers have a wider variety of options and control over both the data they are using and their computing environment (Strong *et al.*, 1997).

High quality data is defined as data that is acceptable and utilised by data users meaning key aspects of quality are usefulness and usability. High quality data characteristics as depicted

in **Table 2.1** comprise of four categories listed below namely intrinsic, accessibility, contextual and representational aspects. Furthermore Strong *et al.* (1997) define a data quality problem as “Any difficulty encountered along one or more quality dimensions that renders data completely or largely unfit for use.”

DQ Category	DQ Dimensions
Intrinsic DQ	Accuracy, Objectivity, Believability, Reputation
Accessibility DQ	Accessibility, Access security
Contextual DQ	Relevancy, Value-Added, Timelines, Completeness, Amount of data
Representational DQ	Interpretability, Ease of understanding, Concise representation, Consistent representation

Table 2.1 DQ patterns in DQ projects (Strong *et al*, 1997)

A general cause of intrinsic data quality concerns is discrepancies between sources of very similar data. In the beginning the source, to which quality problems should be attributed, is unknown to data users however they are aware of conflicting data.

Gradually there is an accumulation of information about the causes of discrepancies from evaluations about the accuracy of different sources which resulted in a low reputation for fewer accurate sources. Data sources with a poor-quality reputation are seen as having insufficient added value for organisations and consequently will only be used moderately. Additionally another general cause is judgment in the data production process. **Fig 2.3** depicts the intrinsic DQ problem pattern.

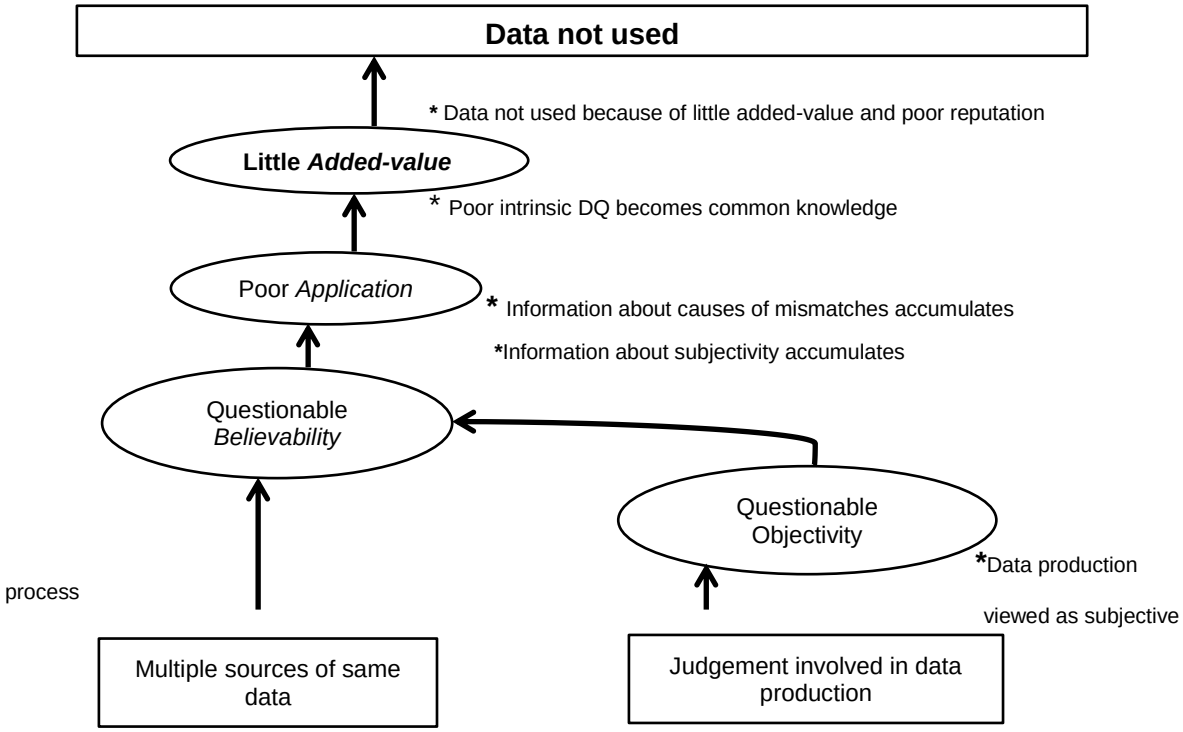

Figure 2.3 Intrinsic DQ problem pattern (Strong *et al*, 1997)

Fig 2.4 depicts the accessibility DQ challenges is branded as primary concerns which is technical and accessibility, both the data representation and data volume matters are interpreted as accessibility challenges by data consumers.

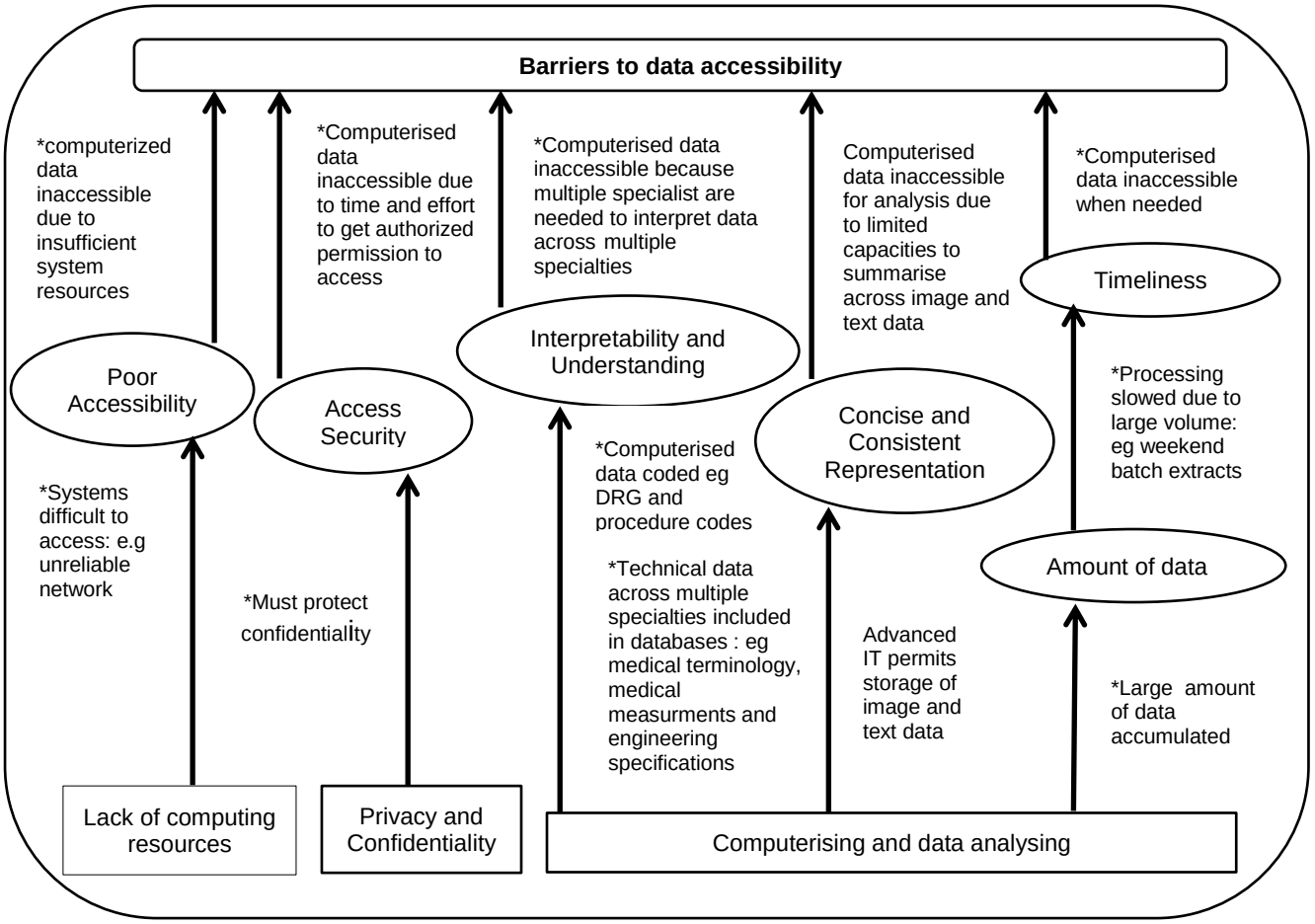

Fig 2.4 Accessibility to DQ problem pattern (Strong *et al.*, 1997)

Numerous factors determine Information Quality (IQ) application, state and existence which is an indication as to why it is considered as a multi-dimensional theory. IQ had been described as information or data that is "fit-for-use" according to a common agreement that was concluded (Wang *et al.*, 1996; Knight, 2011). Researchers have embraced the 'fit-for-use' paradigm for various reasons such as; this paradigm enables the concept that IQ (information quality) is relative whereby information which is considered fit for one with purpose with a high quality output might not have the desired attributes for additional use.

Knight (2011) is of the opinion that the independent assessment of the quality of information by whoever will utilise that information is not permissible. Users' information behaviors will be noticeable by indicating their perceptions of IQ. Furthermore Knight (2011) states that "*It does not matter how well a system works, if the information it provides contains errors, it is a reasonable expectation that this would have an adverse effect on users perceptions of the system's quality".*

2.6 The Chief Information Officer (CIO)

Leverman (2008), who cited Gottschalk (2007), states that "The chief information officer (CIO) can be defined as the highest ranking IT executive who typically exhibits managerial roles requiring effective communication with top management, a broad corporate perspective in managing information resources, influence on organisational strategy and responsibility for the planning of IT". Furthermore the establishment of the executive CIO position is clarified in that it does not only add to the organisation's information intensity and a competitive advantage but also to an additional competitive advantage that is sustained by steadily deploying IT cheaper, faster and more strategically than your opponents (Leverman, 2008; Gottschalk, 2007). In recent times CIO positions gradually and without doubt became more influential in general within the business organisation. According to Villiano (2008) the CIO had been put in a new light because of the role of information technology in corporate strategy, advanced technologies and infrastructure securities.

Information Communication Technology (ICT) became a vital infrastructure for the majority of organisations and thus the CIO role became more challenging and strategic. Information Technology (IT) needs to be put in a context of strategy and if this is not the case then it may be regarded as a weak asset and insignificant. Furthermore, in concluding which option will contribute the biggest value to the organization, it is recommended that you have to be knowledgeable about the holistic business strategy of the organisation (Lane *et al.*, 2007). This resulted in the role of the CIO becoming more strategic aggravating businesses to start changing processes and strategies by means of utilising IT. The roles of both the CIO and IS

have grown parallel in importance within business organisations and it comes as no surprise as to why at present CIO's are deeply embedded in business organisations (Chun *et al.,* 2009).

Preston *et al.* (2008:606) citing (Karahanna *et al.*, 2006) reason that the importance of the CIO to have decision making authority is important in order to control strategic IT initiatives. They are of the opinion that IT will contribute to the success of an organisation due to the cross-functional nature of IT in contemporary organisations. The CIO has the means to effectively contribute to the overall success of an organisation and can assist users directly to achieve better results by encouraging them to utilise technology successfully (Remenyi *et al.*, 2005). The CIO have several areas of responsibilities which include IS, computer operations and end user computing and its objective is to enable the organisation to position IT as a competitive weapon (Stephens *et al.*, 1994).

Given that the role of the CIO is important within institutions it is clear that its responsibilities will change due to its nature and scope. Furthermore CIO's with a holistic understanding of higher education and an institutional viewpoint on strategy and operations will have an advantage in comparison with traditional "IT Director" whose position will literally depreciate (Nelson, 2003). Edwards *et al.* (2009) is of the opinion that "organisations with IT directors are most likely not strategically dependent on information but that they are rather more likely to use IT to support operational processes." According to Leavey (2008) the CIO is in the minority on the senior management team and as a result of this only a few organisations are utilising their information assets to power innovation, strategy and growth.

A critical factor affecting the success of IS and its application as a strategic, competitive tool is the position of the CIO in the organisational hierarchy (Tagliavini *et al.*, 2003). It is highly unlikely that IT projects will have top management backing and commitment if the CIO is not part of the top management team (Applegate *et al.*, 1992; Khallaf *et al.*, 2007). By providing economic justification and allocating resources to strategic IT projects, it seems that the CIO position needs to be integrated with top management. Furthermore top management should be alerted about the benefit of IS to improve the firm's competitive advantage (Earl *et al.*, 1994). CIO's are regularly required to try and influence relevant people within an organisation and a large amount of time is spent on trying to convince senior managers to commit to strategic IS initiatives (Enns *et al.*, 2003a). When an IS creates value it is to some degree also embedded within the organisation (Dudas *et al.*, 2007).

The role of the CIO within the private sector is well developed in comparison to the public sector where this position is still at a formative stage, and it is not surprising that there is gap

of more than two decades between the different sectors. The public sector still needs to recognise the implications of the CIO in an executive position while on the other hand private sector institutions have reaped the benefits with the implementation of the CIO within their organisational structures (Lawry *et al.*, 2007).

2.6.1 CIO roles

Several literature sources have associated the CIO with various descriptions such as a "chameleon" (Remenyi *et al.*, 2005) and as an orchestra leader who attempts to get different elements within the institution to play collectively as a unit (Hawkins, 2004). In the end it all boils down to leadership and Brown (2009) identified six odd IT leadership roles for CIO effectiveness in higher education: business partner, IT educator, classic IT support provider, informaticist and IT strategist, integrator and contract oversight. Based on the above it becomes clear why the CIO is often associated with different characteristics. For this study a combination of the above competencies will be considered.

In general literature is scarce envisioning future CIO's roles and responsibilities. The future role of the CIO is anticipated to shift more to a business specialist and not a technical specialist (Edwards *et al*., 2009). Black (2007) states that "The CIO's role will continue to be challenging and stimulating as the CIO's contributions are acknowledged by all higher education stakeholders".

Undoubtedly the CIO has a bright future however a big concern is the issue around their job description. This depends heavily on current CIO's. According to May (2010) CIO's at smart enterprises will develop into chief innovation officers and apply technology optimally. These might include changes on how business is conducted or producing the latest high-value products and services. CIO's are innovators in the corporation and have the responsibility to delegate people to change business processes. This in the end will allow them the opportunity to take full advantage of the latest technology (May, 2010).

Safeguarding the institution had to a large extent become synonymous to the role of the CIO. This is indicative by the amount of time the CIO dedicates to address business continuity and emergency planning. In the event that campus e-mail or web services become unavailable the CIO is under enormous pressure (Lambert, 2008). Lambert (2008) is of the opinion that technology can contribute value to future strategies of the institution if new opportunities are to be exploited by the CIO.

2.6.2 CIO responsibilities

In order for higher education CIOs to be effective Brown (2009) suggests the following responsibilities as critical:

- Changing business processes and strategic planning of the organisation including a quick to respond department for IT support fundamentals.
- Interactions with various role players including IT vendors, contract supervision and negotiation.
- The alignment of the IT department with the institution to guarantee security, accuracy of institutional data and the holistic integration of internal and external systems.
- Promoting computer usage and knowledge by educating employees the value that IT presents to the organisation through innovations (Brown, 2009).

2.6.3 CIO competencies to support the responsibilities

In order for CIOs to perform their main roles and responsibilities they need to possess a wide-ranging of vital competencies (Lane *et al.*, 2007). From existing literature it is clear that various studies have been undertaken in determining the required competencies of a CIO and one example is that of Gartner (2001) which highlight a number of competencies. Amongst others are listed as the technical stage and service delivery needs to be built and maintained to demonstrate and ensure excellent performance and value. Developing a number of skills such as IS technical, service and management, the outside market can be used as a setting to create an opportunity for clever sourcing and to champion and lead the business.

Lane *et al.* (2007) on the other hand identified another set of critical competencies for the modern CIO.

- Management competencies which include leadership, strategic planning and aligning the business, enable innovation and management by means of IT.
- Competent to manage internal, external and global, vendor and supplier relationships.
- To project, ICT, HR and business process management.
- Competencies for ICT costs, budgeting control, corporate governance and regulating compliance as well as the planning, management and enablement of the supply chain.
- Handle crisis management to ensure business continuity and planning information security.

The value that IS contributes is not merely an indication of the technical systems but rather the manner in which they communicate with human interaction in the higher education

environment (Paterson, 2005) The implementation and initiation of IS which is critical to the success of an organisation is overall the responsibility of the CIO (Enns *et al.,* 2002, Remenyi *et al.,* 2005).

Success in post-merger IS integration has been recommended by the following components: the ability to both exploit opportunities and avoid problems which arises from the merger, end-user satisfaction by means of the integration process and integrated system, support the underlying aim of the merger by improving IS capabilities, utilising resources efficiently and effectively during the integration process (Robbins *et al*., 1999; Alaranta, 2005). DeLone and McLean (1992) defines IS success as a manifold phenomenon which consists of several levels such as semantic, technical and effectiveness. All three levels have a specific generates the information; the semantic level to determine if the information was successfully conveyed for the intended meaning, the effectiveness level to determine if the information is having an effect on the receiver (DeLone & McLean, 1992; Byrd *et al.*, 2006).

2.7 The CIO in higher education dealing with Information systems

Higher education CIO's has over the last three decades developed from being a departmental manager to one of the most senior leadership positions within institutions. Recognizing IT as a key element of institutional strategic planning has attributed to the CIO advancing from a technical manager to a strategic leader in higher education (Black, 2009). As one of the latest additions in higher education executive leadership the CIO role continues to change and repeatedly move in unforeseen directions (Lambert, 2008). According to Nelson (2003:2) a strategic advantage is gained by institutions with actual IT leaders who assume c-level positions as CIO's. Furthermore in higher education the success of IT depends on strategic and operational leadership (Nelson, 2003:2). Moreover the advancement of technology planning to strategic planning has resulted in the success of the CIO mainly due to the recognition of knowledge management as the principal element of strategic planning (Black, 2009).

The unsurprising response to the fast growth of IT and its holistic integration into the entire academic operations, starting from administrative functions and shifting into the research enterprise and currently affecting teaching and learning activities has culminated in the rise of the CIO (Branin, 2009). According to Lambert (2008) the growth of the CIO role was driven by a number of factors such as business processes that requires complex central enterprise systems that were not previously dependent on digital technologies. Success is often defined by the CIO's ability to work with business leaders to support enterprise applications such as Learning Management Systems, human resource systems and financial systems. When either of these systems becomes unavailable both staff and students are substantially

hindered as these systems cater for the basic functions of higher education institutions. The growth of email as a critical use of communication is regarded as a multi-purpose communication vehicle for institutions. Another factor is that higher education changes direction into the crosshairs of new regulation at all levels of government such as local, provincial and national. Furthermore the CIO is accountable for managing future risk of data exposures.

The CIO in higher education is a complicated role based on the fact that several attributes are required such as technical knowledge, communication skills and higher education experience. CIO's deal with a variety of complicated issues such as the rapid changing of software packages, platforms and standards. Guiding and earning the respect of a miscellaneous technical staff is another challenge they encounter. Furthermore they need to manage systems operations accordingly (Laplante *et al.*, 2005).

According to Hawkins (2004) "the inclusion of IT in the campus executive decision-making body helps the CIO in understanding competing priorities, strategic issues, and the campus mission and in making technology investments accordingly". Hawkins states "an IT department should not be left to make, often by default, the choices that determine the impact of IT on a company's business strategy". In similar fashion what is often important for colleges and universities should be the same as for corporate institutions and the requirement that top management leadership should be involved in IT decisions (Hawkins, 2004).

An indication of how essential an institution views technology depends on to whom the CIO reports directly since technology has become essential to higher education institutions (Brown, 2007:3). The CIO as the highest ranking IT executive (Stephens *et al.*, 1994:129; Petrovic-Lazarevic *et al.*, 2004:169; Preston *et al*., 2008:606;) recommends that the CIO should only report two levels from the CEO, should have an overall responsibility for strategic IT decisions, and should have a dominant role in introducing innovative technologies in business. Hawkins (2004) is of the opinion that the CIO and the executive management need to be aware of the role of the CIO which is not about technology itself, but rather about the ability of an institution in obtaining its goals and objectives by means of technology. According to Stephens *et al.* (1994:130) CIO's should be able to communicate effectively due to frequent interaction with top management where complex issues are discussed.

Kelly *et al.* (2005) identified a significant difference between a higher education CIO and in other organisations. It is the responsibility of the higher education CIO to ensure that their institution includes larger social questions about the shortcomings, expenditures and benefits

of technologies. In addition Kelly *et al.* (2005) provide a definition for a higher education role which is to develop a vision for the role of technology systems which is dependable with organisational mission and goals. Furthermore the vision is accomplished by means of effective and complete stewardship of resources and communication with all constituencies.

In comparison with a corporate CIO, a higher education CIO is disadvantaged due to having lesser resources available in terms of finance and personnel (Lineman, 2007:4). Lucey (2009) cited a 2009 Gartner report concluding that for IT to be more productive and agile the CIO must restructure it as the demand for IT will not be reduced because of lesser resources. According to Lucey (2009) academic leaders are familiar with having lesser resources. Furthermore a corporate CIO generally concentrates on addressing the technological needs of the organisation's staff and administrators. Higher education CIO's on the contrary also address the technological needs but of a larger combination of constituencies such as administrators, staff, students, faculty, alumni etc. To create a competitive advantage the corporate CIO makes an effort to close the gap between technological challenges and opportunities. It is expected of the higher education CIO not to only close the same gap but in addition to close the gap of understanding between various stakeholders such as IT and the campus constituency. The world of academia needs to know both technology and business matters (Lineman, 2007:4). It is expected of the HE CIO to concentrate on the educational mission of the institution and administrative system enhancement (Black, 2009).

Protecting the interest of the institution has become more substantially central to the CIO and it is clearly evident on how much time the CIO invests addressing business continuity. Simultaneously the CIO needs to take advantage of new opportunities and give an indication of how technology can be used to add value to future strategies of the institution (Lambert, 2008). According to Lucey (2009) higher education CIO's should be conscious about the requirements of the various role players such as staff, students and faculty regarding the availability of academic resources, compliance to access content, securing research networks and ensuring that admissions are running smoothly. In addition it is important that there is a need to have a comprehensible grip on all the requirements within the university (Lucey, 2009). Furthermore the CIO has to concentrate on the educational mission of the institution coupled with improving the administrative systems (Black, 2009).

The selection of technology tools for the organisation and maintaining them to function effectively and efficiently may possibly emerge as the main activities of higher education CIO's (Kelley *et al.*, 2005). In order for CIO's to be effective they need to have working knowledge of multiple areas to support both administrative and academic systems (Hawkins,

2004). On the contrary, this limited expectation had already been surpassed by the role of the CIO, because it has become obvious that universities have several requirements such as leadership in the development of organisational processes, human skills, and knowledge capital development which relate to the technological tools that filter through universities and society in general. According to Kelly *et al.* (2005) a broader definition of the CIO's role "address questions and issues about the benefits, disadvantages, and issues surrounding technological systems in use and under consideration, as well as those in use elsewhere".

Remenyi *et al.* (2005) have provided eight reasons why administering the deployment and application of IS is complicated and can be regarded as a leadership challenge.

- IS can deliver either a competitive or a strategic advantage for an organisation when correctly implemented but will have the opposite result when badly implemented and any advantages whatsoever will be diminished. The CIO is directly responsible for activities that have an impact on the strategic success of an organisation and must add value otherwise IS will regarded as a nuisance.
- The effective development and implementation of IS is both costly and complicated which normally involves important changes to large components of the organisation. ICT is the biggest single capital expense for lots of organisations and frequently falls under the CIO supervision.
- The CIO's management responsibilities are very demanding since ICT typically has two very distinct purposes. Firstly, developing and implementing new systems and processes and secondly, operating and maintaining the systems.
- The effective development and operation of IS requires diverse skills which is indeed complicated to locate and retain. The CIO is responsible for a large and diverse workforce which need to be recruited, developed and supervised.
- The CIO is responsible for users actions although they are not subordinates and this creates a liability as users interaction with the IS are not minimal.
- The actual delivery of primary functions in the organisation's value chain can become the direct responsibility of the CIO, due to IS becoming critical components of key business processes
- A lack of trust might result from the culture gap between those who are responsible for the ICT function and other business functions
- Over the last decade and a half the role of the CIO has progressed significantly.

Brown (2007:9) identified the following six different fundamental roles and responsibilities for the higher education CIO as depicted in **Table 2.2.**

CIO Role	Responsibility
Business Partner	Organisational strategic planning and revising business processes
Classic IT support provider	Foundations of IT support and responsive department
Contract oversight	Relationships with IT vendors, contract negotiation, and contract supervision
Integrator	Integration of all internal and external systems
Informaticist & IT strategist	Ensure security and accuracy of institutional data and alignment of IT department with the institution

Table 2.2 CIO roles (Brown, 2007**)**

Furthermore **Table. 2.3** depict the CIO attributes within the HE sector. Communication skills play a vital role as the CIO needs to exclude technical terms when communicating and presenting information (Brown, 2007:10).

Communication Skills	Fluent in business language Fluent in HE language Able to communicate and present information without technical terms
Political Savvy	Able to assess situations that might be confrontational and act tactfully Able to work well with a majority of people
IT Knowledge	Understands how IT is applied in the organisation Able to use current IT resources to fill institutional requirements Uses new technology for the institution Familiar with the acquisition of IT
Strategic Business Knowledge	Knowledge of institutional offerings Understanding of market and business processes Familiar with the competition
Education	Master's or doctoral degree
Reporting Structure	Academic or administrative leader of the institution, reporting within one level of the CEO

Table 2.3 CIO Attributes (Brown, 2007)

Laplante *et al.* (2005) cited Cash *et al.* (2004) in referring to the future CIO roles and responsibilities as depicted in **Fig. 2.5**. Five different roles were identified for the CIO coupled with its own challenges. These roles are as follows: business strategist, IT strategist, change agent, technology advocate and functional leader. As a business strategist the challenge for the CIO is to simultaneously uncover the best practices of the business practices and to discover continued cost savings and increased benefits. Rapid implementation is required for these improvements to avoid competitive pressure. Arranging initiatives which assist in the shaping of business processes is one of the approaches of optimising business strategy. The CIO as an IT strategist is obligated to provide answers on important questions of the organisation hence the CIO enacts as chief technology evangelist. It is commonly known that a large percentage of organisations resist change but the CIO on the contrary is regarded as a change agent.

CIO technology advocate - The intelligent deployment of technology within organisations requires the assistance of the CIO. Depending on the size of the organisation CIO's have to provide desktop support and helpdesk services and not necessarily installing and supporting large systems only. Furthermore the CIO needs to be a good leader coupled with various technical competencies. However it is incorrect to expect the CIO to be technically competent as all the individuals in the IT organisation. Any type of technical expertise is less valuable to the CIO in comparison to people, financial and organisational proficiencies. CIO functional expert furthermore CIO's are managers and need to perform various tasks as required by a manager such as protecting the actions of every single staff member. The frequent interaction with different levels of staff justifies why the CIO is completely mindful of what is happening within the business process chain (Laplante *et al*., 2005).

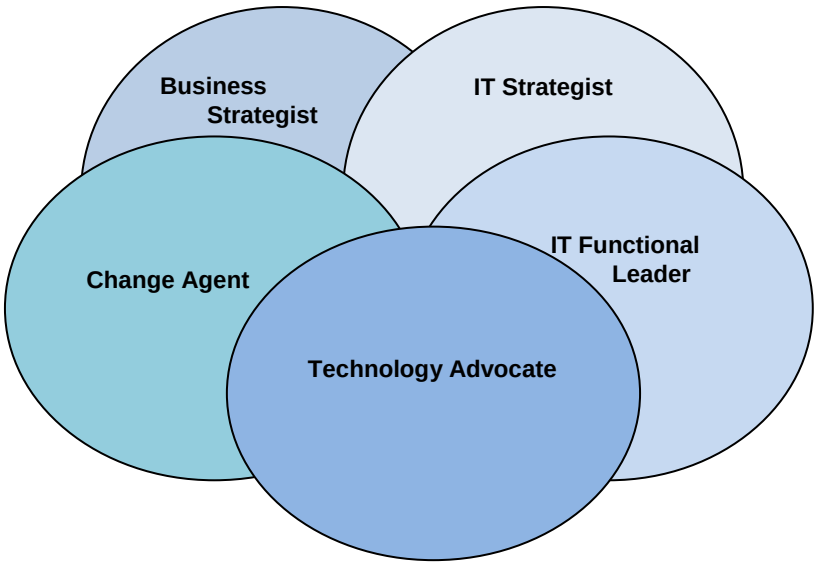

Fig 2.5 Five primary roles of the CIO (Laplante *et al*., 2005)

2.8 Proposed theoretical conceptual framework of the users perceptions of the information from the information systems and the role of the CIO

Based on the literature reviewed for this study and discussed in this chapter, the following theoretical conceptual framework is proposed for this study. This framework was used to guide the empirical inquiry. The main entities considered are the CIO, the users and the information systems. The CIO and users obtain access to the information systems through a network. Since there was not a CIO appointed the roles, responsibilities and attributes of the CIO role were obtained from the relevant literature. The users were represented by the managers of the academics, support and services departments. Their understanding of the CIO role is investigated as well as whether there is feedback from the users to the relevant IT positions that had to take on the role of the CIO.

The perceived use of the ISs by the users is investigated as well as the role of the network in accessing the ISs. The perceived information quality as perceived by the users and IT is considered. The perceived strategic use by IT is also considered. The influence of the network on all these is also considered.

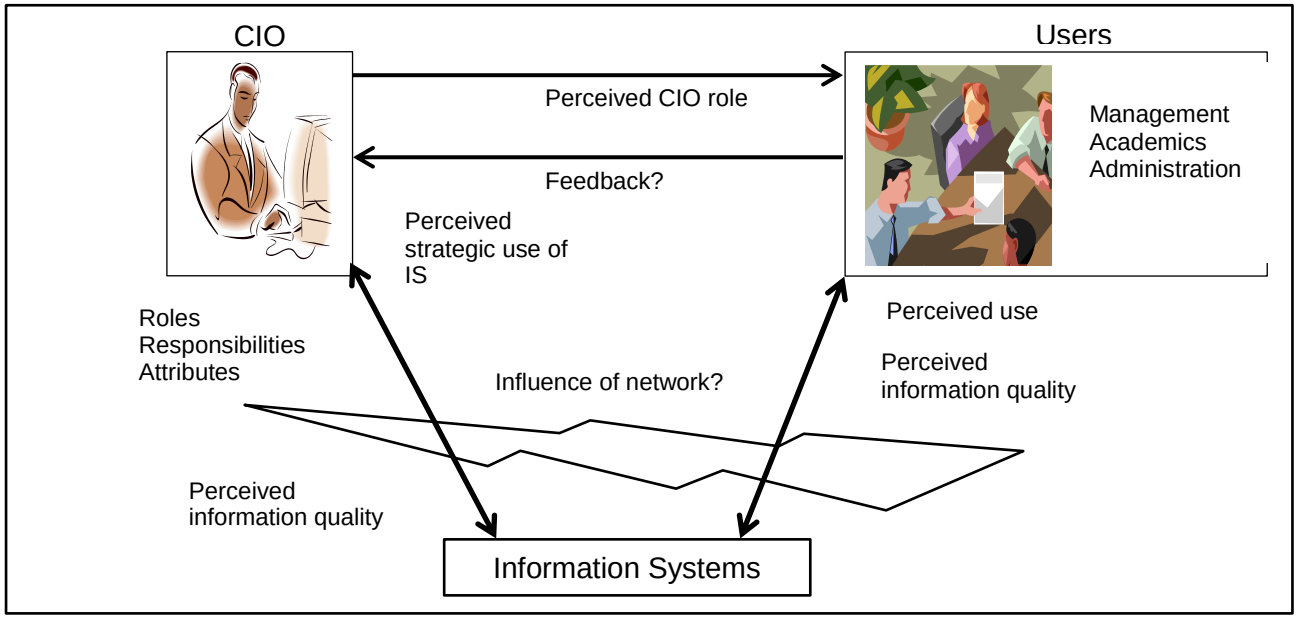

Fig 2.6 Proposed theoretical conceptual framework of the users perceptions

2.9 Conclusion

This chapter focused on the literature review of the research that was conducted by the researcher in order to gather the necessary data to validate that the study was done appropriately. The higher education sector was discussed in general from a global perspective to a continental view and ultimately concluded in the South African context. The merger of higher education institutions in SA was addressed in this chapter and how the users perceived the information within the information systems after the merger.

Subsequently the focus is shifted on information, information systems, data quality, users' perceptions and the impact that is has on organisations.

Lastly it highlights the role of the CIO within the HE environment and how this position can enhance the abovementioned. The literature highlights the leadership role the CIO plays within higher education and how this position can influence the top management of an organisation in terms of ICT direction.

A theoretical framework is proposed of the users' perceptions of the information from the information systems and the role of the CIO.

CHAPTER THREE
RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

The purpose of this chapter is to achieve the objectives of this research study by applying an appropriate research methodology. This research will adopt a qualitative approach and the primary objective in deploying this particular approach is defining an understanding instead of explaining human behavior (Babbie *et al.*, 2009).

This chapter is organised as follows: firstly discussing the research methods which were used in this study by illustrating the Saunders *et al* (2003) research process onion. The first part in this chapter looks at the qualitative aspect of the research. A clear distinction is made and the justification of why the researcher chose a qualitative approach. In the second part the research philosophy, approach, qualitative research strategies and data collection methods used in this research are discussed. A brief overview is provided in detailing all the sub-sections. The case study for this study is described in detail in the latter part of this chapter. The last section considers hermeneutics and thematic analysis to analyse and interpret the data. Furthermore the validity of this research was done by applying the Klein and Myers (1999) principles. The Saunders *et al.* (2003) onion depicted in **fig. 3.1** is comprised of five layers which include research philosophy, research approach, research strategies, time horizons and data collections methods.

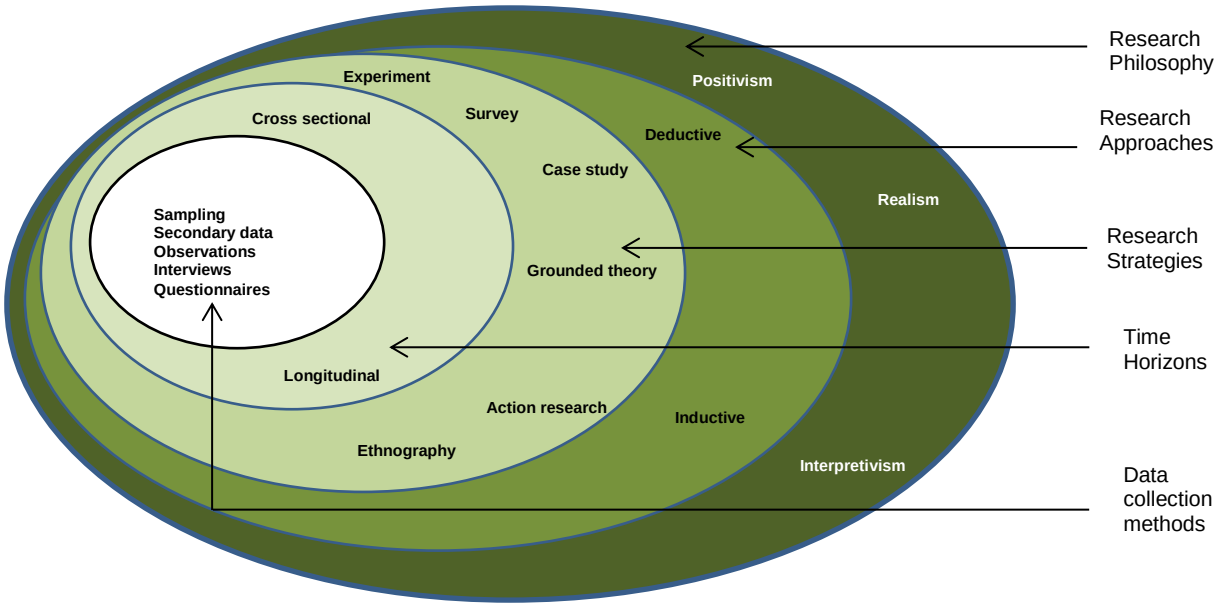

Fig.3.1 Research Process Onion (Saunders *et al,* 2003)

The researcher will discuss each layer depicted in **fig.3.1** from a qualitative perspective.
An exploratory qualitative approach is being proposed in order to better understand the use of IS in higher education. As a result of the growing interest in the application of qualitative

research methods, IS research had commonly moved away from technological towards managerial and organisational issues (Meyers, 1997). In this study the perceptions of the users us of the IS in a higher education institution are considered and since these are embedded in their work practices, a qualitative approach is more suited to unpack the complexities of their encounters.

The primary distinction between quantitative and qualitative methods as depicted in **Fig.3.2** is that quantitative methods deal with numbers and qualitative methods deal with social phenomena (Punch, 1998).

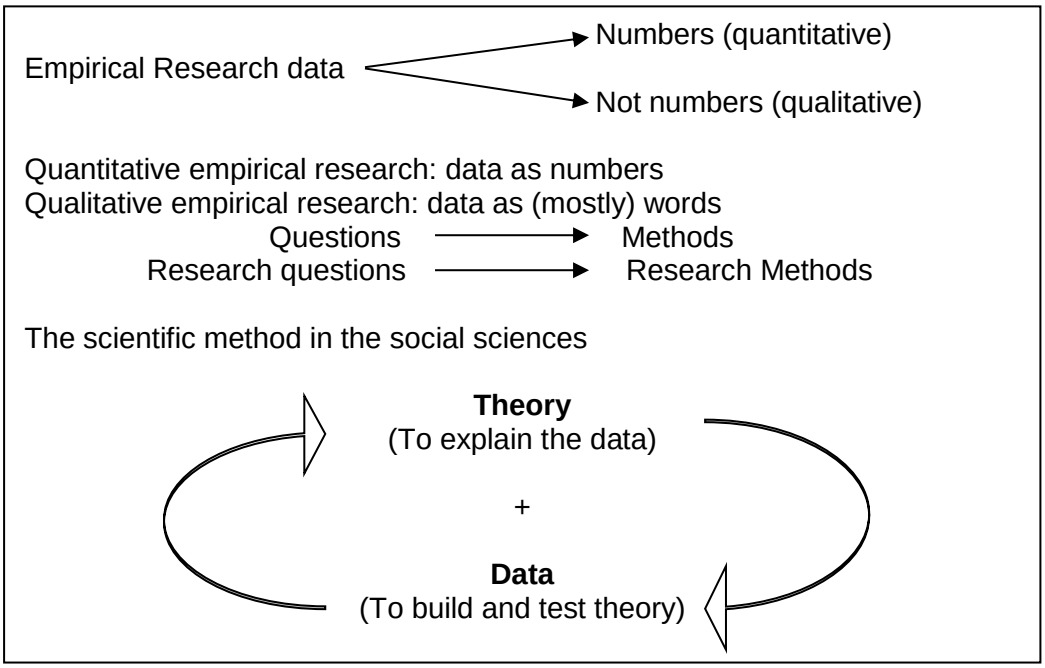

Fig.3.2 Quantitative and Qualitative methods (Punch, 1998)

Qualitative research strength predominantly lies in its competence to present difficult textual descriptions in the manner of people's experience and the issues associated with their experiences in a given research setting. Information about the human aspect of an issue is provided, which is frequently beliefs, opinions, emotions and relationships of the individuals (Qualitative research methods, 2005). According to Bowen (2005) "The main strength of qualitative research is that it yields data that provides depth and detail to create understanding of phenomena and lived experiences". The three most common qualitative methods are action research, case study research and ethnography and its data sources generally include interviews and questionnaires, observation and participant observation, documents and text (Myers, 1997).

3.2 Research Philosophy

Positivism and interpretivism are two key philosophical paradigms (Collis *et al.,* 2009; Shozi, 2012). The two research philosophies adopt uniquely contrasting epistemological stances pertaining to assumptions, purposes and theoretical bases. Furthermore opposing modes of inquiry are being produced by these research philosophies (Kim, 2003).

3.2.1 Positivism

Positivism research paradigm had its origin in the 19th century in an effort to apply the practices of the natural sciences to social phenomena (Smith, 1983; Kim, 2003). The usage to uncover universal laws in predicting the physical, technological world and human activity is of concern to the positivist research paradigm. Decisions are made objectively where the researcher's viewpoint is not to be actively involved with participants and subject matters (Guo *et al*., 2008).

3.2.2 Interpretivism

According to Klein *et al*. (1999) an effective and essential methodology to IS research is the emergence of interpretive research. Additionally on the principle of interaction between the researcher and the subjects, interpretive researchers must recognise that the participants, in similar fashion as the researcher are capable of being both interpreters and analysts. It is suggested by interpretivism that facts are constructed as an essential part of the social interaction between the researchers and the participants (Klein *et al*., 1999).

As opposed to positivism this research paradigm is apprehensive with the discovery of socially constructed significance of truth as assumed by a group or an individual. Gaining a good understanding of the participants domain it is required from the researcher's viewpoint to be actively involved with both the participants and subject matter (Guo *et al*., 2008). **Table 3.1** depicts the differences between the positivism and interpretivism research philosophies (Weber, 2004).

Assumptions	Positivism	Interpretivism	Relevance to this study
Ontology	Person (researcher) and reality are separate	Person (researcher) and reality are inseparable	Reality of the CIO in higher education cannot be separated from the researcher's subjective position to the research study.
Epistemology	Objective reality exists beyond the human mind	Knowledge of the world is intentionally constituted through a person's lived experience	The knowledge is created by the meanings attached to the data collected
Research object	Research object has inherent qualities that exist independently of the researcher	Research object is interpreted in light of meaning structure of person's (researcher) lived experience	The research objects for this study are the users of the information from the information systems in a specific context and their perceptions are part of their lived reality.
Method	Statistics, content analysis	Hermeneutics, phenomenology etc	Hermeneutics will be used to attach meaning to the empirical data.
Theory of truth	Correspondence theory of truth: 1-1 mapping between research statements and reality	Truth is intentional fulfillment: interpretations of the research object match lived experience of object	The truth lies in the views of the users of the information of the information system and their experiences of the actual systems.
Validity	Certainty; data truly means reality	Defensible knowledge claims	The validity of the research findings are obtained by substantiating the findings with the empirical data.
Reliability	Replicability; research results can be reproduced	Interpretive awareness; researchers recognize and address implications of their subjectivity.	The interpretations are based on the principles of interpretive research.

Table 3.1 Alleged Differences between Positivism and Interpretivism **(**Weber, 2004**)**

The qualitative interpretive approach will be deemed appropriate for answering the research questions for this study, in determining the role of the CIO in higher education, and how the integration issues of IS were addressed.

3.3 Research approach

Peirce (1931) defines a research approach as "*the path of conscious scientific reasoning*". Inductive and deductive research approaches are two general approaches in research which possibly will have a positive outcome in gaining new knowledge (Kirkeby, 1990; Hyde, 2000; Spens *et al.*, 2005) however the afore mentioned differ along various factors. Deductive research is most frequently the approach which is being utilised for experimental studies whereas inductive research is most frequently used for non-experimental studies (Nestor *et al.*, 2012).

3.3.1 Inductive

Typically the qualitative researcher adopts an inductive approach to the object under study (Babbie *et al.*, 2009). Instead of starting with an existing hypothesis or theory this particular researcher starts off with an involvement in the natural setting. In this way the events are described as truthfully as possible as they materialise or have materialized, gradually but undoubtedly building second-order constructs. From this a hypothesis and finally a theory will be constructed which will make sense of the observations. For this reason it is referred to as a theory development process (Hyde, 2000). Furthermore inductive reasoning is commonly known as both open ended and exploratory (Trochim, 2006). **Fig 3.3** depicts Trochim (2006) inductive research approach.

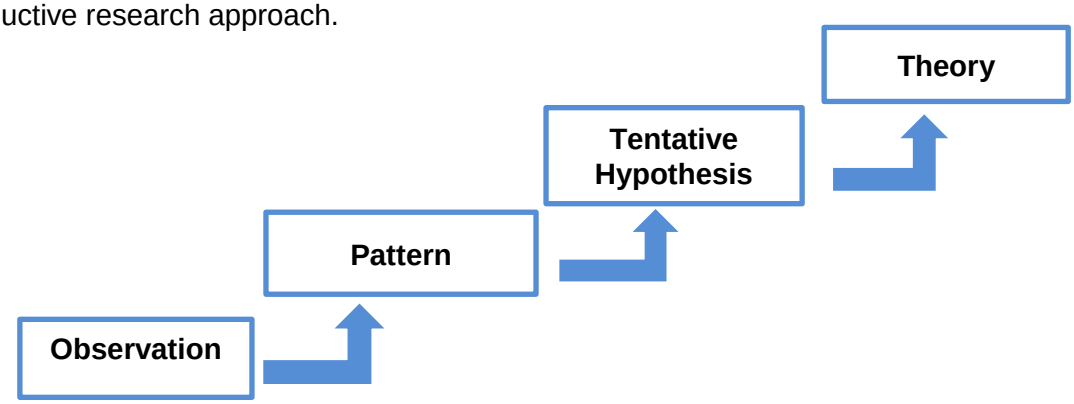

Fig 3.3 Inductive Research Approach (Trochim, 2006)

3.3.2 Deductive

Occasionally a deductive research approach is labeled as a top down approach as the researcher starts off from the most general to a more specific instance and is acknowledged as a theory testing process (Hyde, 2000). Scanning a theory is the starting point for deductive research and from this theory logical assumptions are derived in the form of universal laws. This is presented as a hypothesis which is then empirically tested (Spens *et al.*, 2006). The nature of this particular approach is that it is mostly constricted whereby a hypothesis is either tested or confirmed (Trochim, 2006). **Fig 3.4** depicts Trochim (2006) deductive research approach.

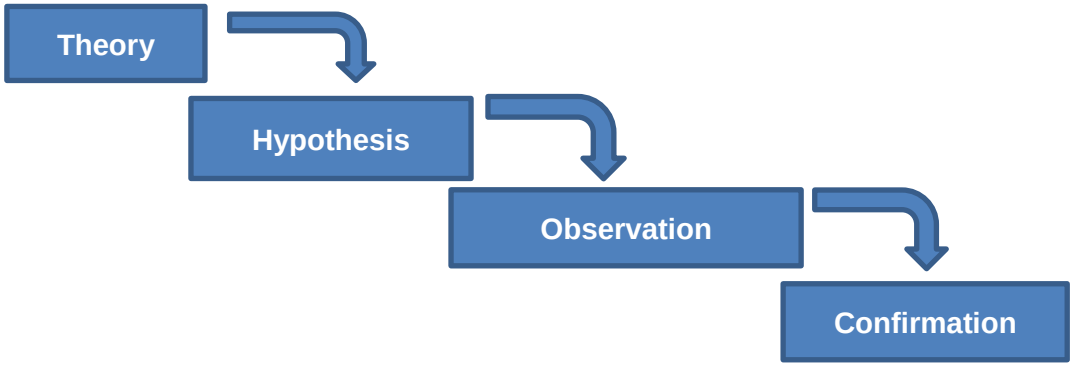

Fig 3.4 Deductive Research Approach (Trochim, 2006)

The most suitable approach for this specific research was the inductive process because it affords the researcher both to be more open ended and exploratory. Firstly the researcher had collected documentation and later on interviewed staff members within the university.

3.4 Qualitative Research Strategies

The following research strategies such as case studies and ethnography will be discussed.

3.4.1 Case study strategy

A case study is defined as *"an empirical enquiry that investigates a contemporary phenomenon within its real-life context especially when the boundaries between phenomenon and context are not clearly evident"* (Yin, 1993)
Myers (1997) stated that the term "case study" has multiple meanings. Furthermore case study research can be applied to explain both a unit of analysis, for instance a case study of a particular organisation, or a research method. In general, case study is by far the most common qualitative method that is being applied in information systems (Myers, 1997).

A case study is proposed as it seems very appropriate for IS research as indicated by Runeson *et al.* (2009). When a proposed research deals with a current phenomenon, a case study is considered to be appropriate provided that the researcher has no influence and the research is mainly exploratory. In addition case study research is also appropriate when research and theory are in the beginning stages. Case study research is developing into one of the most common methodologies in IS research, and this can be related to its ability to please the need of augmenting the importance of IS research findings (Shakir, 2002).

The researcher is allowed to both study information systems in its natural setting and to answer "what", "why" and "how" questions. The researcher gets an interpretive understanding that will add towards knowledge collection following the researcher's interpretation of the participants' subjective understandings. Case studies according to

Walsham (1995) provide the most important vehicle for research in the interpretive tradition. However two drawbacks exist from this type of research method - firstly the fact that there might be insufficient experimental control and secondly information is collected from a small number of entities such as people, groups and organisations. The users' perceptions are important and thus communication is vital to this type of research in order to establish their viewpoints. Different alternatives will also be explored to some extent to address the issues that they are facing in their daily operations. By engaging with people it can become clear what their concerns are and how they interpret the IS issues.

Case studies have been identified by a number of key characteristics namely, phenomenon is examined in a neutral setting and multiple means are applied to collect data. A single or a limited number of entities (person, group or organisation) are studied and the complexity of the unit is studied thoroughly. Case studies are more appropriate for exploring, classifying and hypothesis development stages of the knowledge building process; the investigator should have an approachable attitude towards exploration, no involvement of either experimental controls or manipulations as the spotlight is on current events. Specifying the set of either dependent or independent variables in advance is not allowed by the investigator. The investigators integrative powers are crucial in obtaining results. Furthermore in the event that the investigator develops new hypotheses it could result in changes in site selection and data collection methods.

Depending upon the underlying philosophical theories of the researcher, case studies can be either one of the following: positivist, interpretive or critical (Myers, 1997). With an interpretive case study an attempt is made to understand phenomena through the participants' interpretation of their context (Runeson *et al* 2009).

3.4.2 Ethnography strategy

Babbie *et al* (2009) explain that ethnography is data which is described as anthropology (study of people and their customs) which descends from observing the behavior within a specific culture directly. The researcher is required to become accustomed to the location of the participant in order to experience this culture and to develop a better understanding (Shozi, 2012). This type of strategy predominantly uses interviewing techniques and participant observation as a means of collecting data.

According to Walsham (2006) likely shortcomings of ethnography are that it is a timely process resulting in additional costs being incurred. Another shortcoming is a motion of trustworthiness in the event that field subjects keep information from the researcher where it is alleged that the researcher have vested interest.

Both case study and ethnography strategies were considered based on their suitability to collect the empirical data, however the researcher chose the case study research as a suitable research strategy for this study.

3.5 Data Collection Methods

According to Benbasat *et al* (1987) case research studies can use multiple data collection methods. Yin (1993) went further in identifying various sources of evidence that support case research such as documentation, archival records, interviews, direct observation and physical artifacts.

For this particular research study the primary data techniques were document analysis and unstructured interviews. Documentation such as “The Vice-chancellor quarterly newsletter” was used in the data collection process as this contains a much more holistic overview of the current happenings as they unfold. Additionally the “Self Evaluation Report of 2010” was used to compile some interview questions and to establish some sort of platform of what the challenges were in the respective departments.

According to Walsham (1995) the prime data source for interpretive case studies are interviews. This method affords the researcher the opportunity to gain paramount access pertaining to the participants’ interpretations regarding the actions and events which have occurred or are in process (Atkins *et al*., 2002). The most vital and valuable sources of information included personal interviews.

Many IS researchers were led to the adoption of research approaches which mainly focus on human understanding and meaning due to the social nature of information systems. The use of open-ended questions and inquiring afford participants the chance to respond in their own words instead of compelling them to select from predetermined questions. This is singled out as one of the advantages of qualitative methods in exploratory research. Open-ended questions are meant to encourage answers that are exploratory and rich in nature, surprising to the researcher and important, culturally significant for the participant. In addition qualitative methods allow the researcher the flexibility to explore first hand participant answers.

3.6 Case Study Design

Case study design should be taken into consideration when the focus of the study is to answer ‘how’ and ‘why’ questions. The researcher is not allowed to manipulate the behavior of the participants who are involved in the study. Furthermore the boundaries are ambiguous

amongst the phenomenon and the context (Benbasat *et al.*, 1987; Shakir, 2002; Yin, 2003; *Baxter et al*., 2008).

There are four different types of case studies and each serves a different purpose. Not all purposes are suitable for one type of case study.

- Exploratory: (interpretivist) This case study has several components which interrelate to each other and investigates what is happening, searching for new insights
- Descriptive: Describing a situation or phenomenon
- Explanatory: Generally but not necessarily the researcher adopts a causal relationship in search of an explanation of a problem or a situation.
- Improving: Attempting to enhance a certain aspect of the studied phenomenon.

This specific research adopts an explorative case study as to answer the 'why', 'what' and 'how' questions which are suitable for the nature of this research.

It is nearly a decade since the merger between the former Technikons (Cape Technikon and Peninsula Technikon) had occurred however, the successful integration of systems had not materialised in a positive way to the benefit of staff and students. Even after several upgrades of the institution ERP system incorrect information challenges are still being experienced by users. Incorrect information is being produced by the system and with negative consequences. Users' frustration is increased when handling incorrect information given that they handle large parts of information within an information centric environment. This sentiment is shared by Tanga (2009a) is which it is claimed that "the information from the IS is a nightmare". At this stage it still need to be investigated as to what the origin of the problem is either from a human perspective or from a system perspective. The above refer to the problem that this study attempts to address.

Based on the above facts it needs to be investigated to determine whether the institution requires the intervention of a senior leadership position within the organisation to address the above challenges. These challenges have been prolonged at the expense of the users who are negatively affected by the failure to successfully integrate the various systems of Cape Peninsula University of Technology. This research study will apply a single case scenario. Single cases make provision for in-depth investigation and affluent description (Darke *et al*., 1998; Atkins *et al.,* 2002) and are known for their descriptive power and attention to context (Shakir, 2002).

Various staff members including administrative and academic staff will be interviewed. Case study methodology was at first applied mostly for exploratory purposes. The researcher will apply an exploratory research methodology as to find out what is happening at the institution.

This will allow an opportunity to seek new insights and generating ideas and hypotheses for new research (Runeson *et al.,* 2009).

3.7 Data Analysis and Interpretation

The following data analysis and interpretation methods will be used in this study.

3.7.1 Hermeneutics

Hermeneutics is considered as any activity whereby someone tries to explain and understand the meaning of text through their interpretation. According to Kanellis *et al.* (2009) “Hermeneutics can be seen as a key strand of phenomenology since the act of interpretation of any text or indeed any cultural expression is an important part of the search for meaning and the essence of experience”. Hermeneutics has the capability to play a key part in understanding “textual data.”

Myers (2004) studied the fundamental concepts of hermeneutics in the IS field extensively and provided a summary in the following way:
Historicity: our thoughts are not located in the present context but in a historical context and interpreting any issue in the present or future are by means of previous historical experiences.
The Hermeneutic Circle: The interpreter examines the text in different phases from parts to the whole context and vice versa to have a better understanding of each aspect. Prejudice: Without prior knowledge the interpreter cannot understand the text. Autonomisation and distanciation: Once a text is written down is becomes a separate entity and is not dependent on its author as there is a gap between the author, his text and the readers.
Appropriation and engagement: The deeper underpinnings of the text under study need understanding by the interpreter.

Hermeneutics as an approach to the understanding of reality, is asserting that all knowledge is necessarily a social construction and thus subjective (Kanellis, 2009).

3.7.2 Thematic analysis

This study adopts a thematic analysis method to analyse the interview data. Themes are identified by categorizing and summarizing the collected data.

3.8 Presentation of Results

The results will be presented by means of themes that will be constructed from the interview data.

3.9 Validity of Results

Klein *et al* (1999) recommended a set of criteria for the evaluation of interpretive field research in IS in particular from a hermeneutic nature. Improving the quality of research conducted from an interpretive perspective it is clear that not all the principles will be applied in every situation. The principles are as follows: Hermeneutic circle, contextualisation, interaction between the researchers and subjects, abstraction and generalisation, dialogical reasoning, multiple interpretations and suspicion. This particular study will apply the Klein and Myers set of principles for conducting interpretive research (Klein *et al*., 1999).

3.10 Position of the Researcher:

This research will be conducted at the Cape Peninsula University of Technology where the researcher is also a staff member at the institution. The two main campuses namely Bellville and Cape Town will be included in this study as the issues experienced are not limited to a single campus. The proximity between the campuses hugely has an impact on the overall structure of the IS.

As one of the most fundamental approaches to data collection, participant observation is particularly functional in several ways such as, learning about people's social practices and how they relate to each other and the ideas to which they appeal in order to make sense of their environment (Moore *et al.*, 2002). In addition participant observers' objective is to gain an understanding of people's social environments from an insider opinion.

Initially it might not be possible with qualitative approaches to provide a clear statement to prospective participants about expected outcomes and benefits of the study. Informed consent must be considered as a gradual process and not as a once off event.

With participant observation, researchers repeatedly have to resolve ethical problems on a daily basis in particular with the complex nature of relationships for the duration of fieldwork and the continuous changes that occur in terms of participants and events (Gerrish 1997, Moore *et al.*, 2002). Furthermore, it might be considered an unethical situation in the event that participant observers conceal their research motives (Walsham, 1995).

One of the problems being experienced with this approach is that the researcher can rarely

control who enters their field of observation. In addition clear-cut concerns are raised with participant observation, especially the complexity of establishing a compact boundary around the research field, and secondly to prevent the inclusion of the participants who are insignificant to the study and who haven't provided informed consent (Moore *et al*., 2002).

3.11 Research Design

The research design will be as follows in the following steps:

- Literature Review
- Case Study Research
- Interviews
- Analysis
- Interpretation
- Presentation
- Reflection

3.12 Conclusion

This chapter presented a comprehensive research design and methodology.

The researcher's primary emphasis of this chapter was to describe the research design and process which was adopted to obtain the required data. It was done as a precaution to illustrate that the research study was conducted correctly. Firstly a detailed explanation was provided according to the Saunders *et al* (2003) research onion and all the various layers were discussed excluding the time horizon layer. Secondly a detailed discussion on case study design was presented.

The next chapter will provide the background on how the data was collected for the research purpose.

CHAPTER FOUR
DATA COLLECTION

4.1 Introduction

This chapter specifically deals with the issue of empirical case where the higher education institute is described as well as the actual data collection. The process of how the interviews were setup and the arrangement of the staff that were interviewed during the data collection phase.

The first section in this chapter provides the background of where this study was conducted and gives an overview of the challenges being experienced by both academic and administrative staff. The succeeding section deals with the selection of participants that participated in the interview process and lastly the data collection methods by means of interviews and documentation.

4.2 CPUT background

On the 1st January 2005 the founding of Cape Peninsula University of Technology (CPUT) was announced as a result of the merging of the two former technikons namely Peninsula and Cape Technikon. Kader Asmal then the Minister of Education (2001) publicised the National Plan of Higher Education (NPHE) to restructure the Higher Education landscape in order to redress the inequalities of the past (www.cput.ac.za). Both former institutions had their own institutionalised systems.

CPUT is one of four universities in the Western Cape Province and is the only university of technology. It is also the largest university with more than 30,000 students and offers seventy programs. In addition it is also the only university in the Western Cape that was affected by the merge process and started its operation as a newly merged institution on 1 February 2006. The Bellville campus is the main campus with all the administrative and services done from there. The merged institution was a new institution in name only since the actual merger process of the different structures, systems and operations only started then meaning that for a few years the two previous technikons continued to operate as two separate entities with even the students registering with only one of the “technikons”. The negotiations between the different departments on the respective campuses took a few years to resolve and there are even today in 2014 still departments with total separate structures offering the same program.

As a consequence of the merger the institutions were compelled to integrate their operations including both their IT departments and IT systems. This presented additional challenges to the institutions as there were no benchmarks to measure against how the systems should be

integrated. This directly impacts on the quality of the information that is being generated by the systems. At present both the Bellville campus, previously the main campus of the Penisula Technikon, and the Cape Town campus, previously the main campus of the Cape Technikon, are still regarded as two different infrastructures. There is still today a continuation of merger activities at both campuses each with their own infrastructure which operates as part of the integrated infrastructure but still with elements that are independent of each other. When upgrades are being done at either Cape Town or Bellville campuses communication is sent out that indicates the satellite campuses which link to either campus will also be down. In instances where the institution email application Groupwise or the Internet is down it has an impact on several departments hence the relocation of staff from various campuses. Staff who had been employed at Bellville campus (formerly Peninsula Technikon) before the merger would not be impacted when the server was down in Cape Town but only staff who had been relocated to other campuses and vice versa. This resulted in downtime that staff were unable to perform optimally hence their main source of communication with the campus community were affected. At present CPUT still faces challenges due to a lack of a single integrated system as there is still a continuation of pre-merger practices.

CPUT is currently located in six campuses, two main and four smaller campuses, with two additional buildings and two service points. The plan is to eventually locate the Business and Informatics and Design faculties mostly at the Cape Town campus and the Applied Sciences, Health and Wellness and Engineering faculties mostly at the Bellville campus. The Education and Social Sciences faculty is located at the Mowbray and Wellington campuses. These relocations are done in phases and are still far from complete. For example, the Faculty of Informatics and Design is currently in 2014 located in five buildings at the Cape Town campus with still one Department being on both Cape Town and Bellville campuses. Two of these five buildings are a temporary arrangement resulting in a further move planned to consolidate the faculty to eventually be in four buildings at the Cape Town campus. Even for these temporary arrangements the infrastructure had to be set up to support the academic operation. It is not a case of faculties swapping buildings but rather that buildings have to be redesigned and equipped based on the specific needs of the departments within the faculties. All faculties still have elements of their departments at the original campuses resulting in a situation where some staff members still align themselves to a Bellville or a Cape Town culture based on the previous technikons' respective cultures.

The Computer and Telecommunications (CTS) service department is responsible for the entire IT infrastructure for the university and allocates, amongst other functions, access to the ITS system and permissions are granted according to the specified employment level. Not all staff members are allowed to use the ITS system due to the critical nature of the

information that it contains. According to the Self-Evaluation Report of CPUT (2010) one of the contentious challenges that had been identified with the systems is the fact that there are no dedicated information portals. In addition there is no distinction between the needs of staff members and students which could permit the users to direct access to information based on their needs. Currently the majority of the systems are not yet fully integrated but standalone systems and there is a vast difference on how to gain access and what is the perceived usability of the systems. Furthermore the systems which are available are not user friendly to the majority of staff hence there is limited or no integration between the different systems (Self Evaluation Report, 2010). The majority of CPUT staff is considered as information workers and some departments produce reports for external clients such as the Department of Higher Education and Training (DHET). It is common knowledge that the information that is being produced by the systems needs validation as incorrect and insufficient data has been identified in various instances. The critical value of information is of paramount importance and based on the fact that information allows you to make critical decisions for sustainability.

Currently there are around three different spheres of IT at the institution namely; CTS, MIS and E-learning. All these relevant departments have their own directors who report to different authorities on the executive management. The CTS department is responsible for the IT related matters such as infrastructure, network, facilities, desktop support, printing and helpdesk support. MIS is responsible for institutional data, CPUT for webpage and strategic planning. E-learning is responsible for Blackboard which is the learning management system (LMS) of CPUT. It seems as if these departments mostly operate independently of each other even though the CTS department hosts their servers.

The institution utilises Integrated Tertiary Software (ITS) integrator to capture both staff and student data similar to what was done in the pre-merger phase. Staff members and students can retrieve information from the ITS system including other databases which are populated with data. This is only possible for some staff members who were granted permission to access the ITS from the support departments and CTS. Academic staff members do not have access to student data and use OPA (an online program application) to extract class lists of their students. They use these class lists as spreadsheets to capture assessment marks to then upload at predefined times. These lists only contain the student numbers and names and then provide for capturing assessment marks based on a preloaded formula. Once these marks sheets are uploaded and the ITS being updated with the assessment marks, changes to marks are done through a manual process. Any changes are done directly on the ITS and such changes are not reflected on the OPA lists. There is therefore no mechanism for staff members to verify whether a mark change was in fact affected.

The OPA system was replaced by the Marks Assessment System (MAS) that works in the same way as OPA. Academic staff members do not even have access to additional student data such as contact details, etc. In addition to the OPA or MAS interface to ITS, academic staff members also use Blackboard as a Learner Management System (LMS). In this case the LMS is populated with student data from the ITS and staff members can then use the LMS functions to update the academic student data. Again this does not provide access to other student data than the student number and name. Changes to the student data done on the ITS, such as for example, change of registration details, also do not reflect on the LMS. It is therefore possible for student data to be different on the OPA/MAS, LMS and ITS leading to integrity problems. Academic staff members also do not have access to specific student data or even historical data when using OPA/MAS or the LMS since the data on these systems only provide for the current year. They also need permission to specific student data linked to a subject and class group and can then only access those students' data.

Moreover the proximity of the different campuses contributes to the network challenges of the institution. Currently the longest distance between the six campuses of CPUT is about 70 km, the distance between Mowbray and Wellington where the Education and Social Sciences faculty is located. The networking department staff members are mainly based at the Bellville and Cape Town campuses respectively. When these remote campuses encounter network challenges, they need to contact either one of the main campuses to assist with their network problems. The support technicians are not adequately trained and educated to handle these network challenges resulting from a multi-campus institution as they must support a range of IT functions. The network capacity is not always sufficient and in the event that new network equipment is installed additional challenges emerges. These contribute to the unavailability of the system for a period of time which increases during relocations of departments.

With reference to the above description the situation that informed this study is based on the following: Staff still needs to retrieve information from multiple systems which creates unnecessary challenges. Various projects had been undertaken in an effort to integrate these systems but the challenge still persists. The academic side is encountering problems when student marks are calculated or the incorrect class lists are produced as this information is on multiple systems. The administration side encounters similar challenges and has to use other applications in order to produce sufficient reports. This presents the background to the study as a real-life situation that is suitable for a case study.

Additional background to the case to frame it within a particular context is given and is based on the observations of the researcher who is familiar with the context. Network connectivity remains one of the biggest challenges within the university. Bellville and Cape Town used

different proxy settings as was the case in the previous dispensation. When the network is down users are severely impacted irrespective of their knowledge of technology. In other cases when the proxy is inactive on one campus users normally switch between proxies in order to continue with their normal duties. However some users are not sophisticated with the use of technology and depend on assistance from the CTS department otherwise they have to be without Internet access for hours at a time. This is having an impact on their performances as they cannot render a service without the necessary resources. Business continuity remains an ongoing challenge when network problems are encountered.

In the event that staff and students from the respective campuses need to do cross work at the different campuses the intervention of IT is required as the users passwords is not synchronised. This is causing frustration on the users' side as they have to consult with the IT department to allow them access to utilise the system although the same IS and mail system is being used. Staff needs to log a call by CTS helpdesk to give them privileges to work at alternative campuses. If they don't follow this route they are automatically blocked from using the network.

Furthermore the institution had embarked on a 2010-2020 Strategic Plan and through this plan it is intends to build CPUT into a great university which would require the institution to be positioned as a leading Innovation Academy (Tanga, 2011). An additional element is a student-centred approach that is based on mutual respect.

4.3 Selection of participants

The researcher used purposive or non-random sampling for gathering information in order to explore the situation at CPUT. Participants were identified based on the requirements of the investigation as these participants have extensive knowledge about the situation of the institution. One of the advantages of this sampling technique is that for the duration of the research process the selection standards of participants may be altered depending on the availability of new information.

4.4 Methods of Data Collection

For this study the primary source of data collection was participants as discussed in the preceding chapter. All the interviews were either recorded on a digital recorder or on a smartphone. The data was later transcribed to make meaningful sentences from it and later it was categorised. In this way it was regarded as open code.

Additional sources like documentation were collected over a period such as Vice Chancellor's Quarterly newsletters and the Self Evaluation Report of 2010. These assisted the researcher in the quest for obtaining information which assisted with the compilation of the data.

The interviews were set up in advance by either mailing the respective participants or contacting their subordinates to arrange a suitable date and time. This was done to avoid any clashes with their normal activities due to their prominent role within the university. The preliminary interview was arranged in conjunction with the researcher and the supervisor to ensure that the researcher would be capable for conducting supplementary interviews.

There were also cases where the interviewee had approached some of the interviewers in his personal capacity and explained what the research was all about in order to participate in the study. In some instances staff responded well with the initial arrangement of the interview and provided dates and times that suited their busy schedules. In some instances some of the participants were not very co-operative and a lot of discussions had taken place prior to agreement to a suitable date and time for the interview to materialise. In one particular case one of the participants had stopped the interview and indicated that some of the questions were not relevant in his case. In this case the interviewee had later decided to abscond from the interviewee process due to other commitments. Another interviewee had recommended another person in his department to be interviewed based on his knowledge and expertise of the system. In another case one of the participants had agreed to meet with the interviewer at a certain time and date. However, on the agreed date another meeting was scheduled whereby the interview was unilaterally cancelled by the interviewee. After several consultations it was decided to rather abscond from the interviewee due to substantial capacity.

In total 16 interviews were conducted between the Bellville and Cape Town campuses, however the majority of the interviews were conducted at the Bellville campus. Bellville campus had been identified as the administration nerve centre of the institution. Furthermore the majority of administrative and support departments are stationed at Bellville campus.

In the subsequent chapter the data will be analysed according to themes.

4.5 Conclusions

This chapter introduces the background to where the case study was conducted and further elaborates on the two primary sources of data collection that had been identified for this research namely documentation and interviews.

The larger parts of the interviews were conducted at the main campus of the university. The main campus is considered as the nerve centre of the institution as the majority of core administrative functions are performed here and most of non-academic departments are located on this campus. The participants were selected non-randomly based on their experience and their core responsibility within the institution.

CHAPTER FIVE
DATA ANALYSIS AND RESULTS

5.1 Introduction

The research design and methodology were presented in Chapter 3. In this chapter the analysis of the empirical data is discussed. This chapter is organised according to the interview schedule. The data collected from the semi-structured interviews, informal discussions and relevant documents was analysed using thematic analysis.

5.2 Data Collection

Data was mainly collected by means of documentation, semi-structured interviews and informal discussions. Two faculties were identified for this study in order to obtain relevant data. The two selected faculties were both affected by the merger process. This created an opportunity to provide a broader overview of the challenges experience by the faculty members across the university. The two faculties selected both had departments at both the Cape Town and Bellville campuses.

Composition of Participants	
Academic	4
Support	2
Services	5
IT	3
Coordinators	2

Table 5.1 Composition of participants

The main target was to select respondents who are in a managerial position since they would be the ones who would mostly be exposed to the CIO position or role. The academic operation was represented by associate deans of faculties and heads of academic departments. The support functions represent the administrative support operations, e.g., the faculty office dealing with student applications, registrations, assessments and graduations. Services represent the other service departments such as the library, student affairs, e-learning, etc. The IT respondents were from the CTS department. The coordinators were the people appointed in the faculties to deal with the IT-related aspects and therefore facilitated the IT needs of the faculties with the IT services provided. All the responses were organized according to these categories to try and establish the commonalities and differences between them.

Settings up of appointments were in some instances a daunting task and presented a number of challenges. A number of participants occupy senior management positions and had time constraints coupled with other important commitments pertaining to the university operation. In such cases meetings were arranged with their subordinates to schedule a suitable place and time without impacting their normal schedules. Some of the participants requested to have the interview questions before the scheduled interview but due to the exploratory nature of the interviews this was not possible. .

All the participants were informed about the purpose of the research prior to the actual interview as several participants were unfamiliar about the role of the Chief Information Officer (CIO). In most cases all the answers were provided but some participants refrained from answering certain questions because they felt that their opinions were not necessarily favorable. The interview sought to elicit opinions of the challenges that the participants encounter at CPUT whilst using the ITS, LMS and MAS of the institution. Furthermore additional discussions occur pertaining to network connectivity and IT related challenges. The majority of the interview questions followed the same pattern, however there were instances where additional questions were added based on the Self Evaluation Report of 2010. Strategic questions were specifically formulated for certain participants in order to gain a better understanding of the challenges and how they thought these would be addressed in future strategies.

One of the participants was interviewed in his last week of employment at CPUT. Irrespective of the short notice of the request of the interview the afore-mentioned participant was fully cooperative during the interview process and his opinions forms part of the outcome of this research. The majority of the interviews were conducted over the registration period where certain participants had busy schedules and in these cases the interviews were postponed for a couple of days. Another participant had requested to read the questions personally and only provide answers as to what was relevant to him and his department and in this particular case some interview questions were omitted. Staff members were reluctant to be interviewed for fear of victimisation or reprisals and informed the interviewer not to divulge their names but rather keep them anonymous. These persons were assured that the sources of all the data and the sources will be anonymous. In some instances staff had only to divulge into more detail once the digital recorder was switched off and the interviewer was reprimanded not to mention or pen this down in the interview. The interviewed staff members in general were careful to raise their own opinions.

5.3 Analysis

An analytic method namely thematic network was used to highlight key elements which are frequently used in numerous approaches to qualitative analysis. The aim of thematic

networks is to explore the meaning of an idea other than the understanding of a subject. The difference between thematic analysis and thematic networks is that the former search for uncovering themes which are prominent in text at contrasting levels while the latter intends to facilitate the representation and structuring of these themes. According to Attride-Strirling (2001) “the process of deriving themes from textual data and illustrating these with some representational tool is well established in qualitative research.” Thematic networks shares important features of hermeneutic analysis and is not a new method. In hermeneutic analysis meaning is attached to the data based on the social construction of the situation by the interviewees as represented by the empirical data.

The extraction of the different themes, namely basic, organising and global themes, are arranged by thematic networks which are than denoted as web-like maps as depicted in **Fig 5.1**. At all three levels the relationship between the prominent themes are depicted and illustrated. A technique is provided by thematic networks for the breakdown of text and to discover unambiguous explanations within it. Finding either the start or conclusion of arguments and explanations is neither the aim nor sham of the thematic networks process. Developing a thematic network is to begin from the Basic Themes working inward to an Organizing Theme and ultimately towards a Global Theme. The Basic Theme emanates from the textual data and is the lowest order theme. The purpose of the Organising Theme is to organize the basic Themes into groups of the same issues and is a middle-order theme. Lastly the Global theme is where the leading metaphors in the data is involved as a whole and is a super-ordinate theme (Attride-Strirling, 2001).

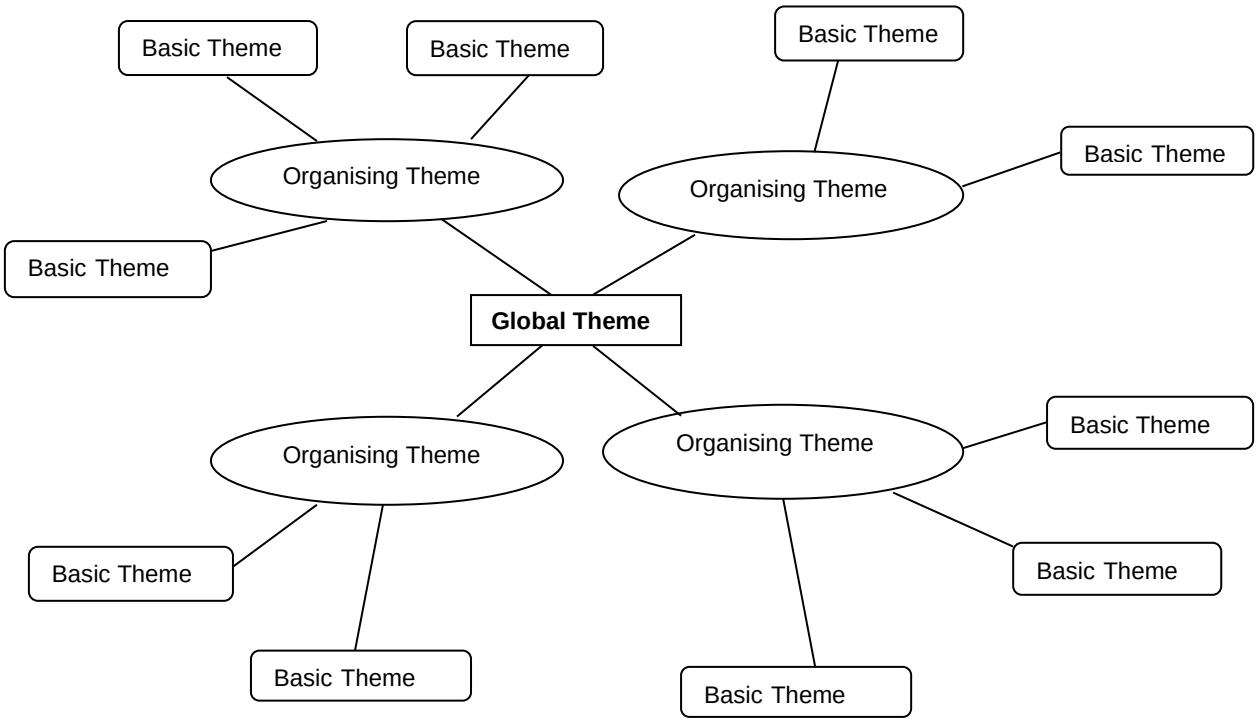

Fig 5.1 Structure of a Thematic Network (Attride-Stirling, 2001)

5.4 Themes

The following organising themes were identified as: Information retrieval; insufficient or incorrect information; feelings when experiencing information problems; information system; training; quality of data; ease of use; network downtime; and CIO appointment. Each theme is discussed next with a summary of the different groups' responses. All the responses were captured on a spreadsheet and then derived codes were generated from the responses. By grouping all the themes together all the related themes were categorised and global themes were identified such as user perspective, system perspective and management perspective.

5.4.1 Information Retrieval

Theme statement: Do you remember an occasion where you personally encountered any problems with the information that has been retrieved from our ITS system (IS)?	
Domain	**Interview Summary**
Academics	Agree that there are constant problems when retrieving information.
Support	Different opinions as there are disagreements. System can't be liable for incorrect information. Data input is a problem.
Services	Some participants are more knowledgeable about the system and have no problem in contrast to other participants who encounter problems when extracting information that is not readily available and question the ITS system.
Co-ordinators	Information retrieval problematic as mistakes are not rectified when data is captured and the consolidation process is also a contributing factor to this problem.
IT	Agrees as the amount of data and lecturer information is problematic on the ITS system.

According to the participants all the academics are in agreement that there are constant hindrances when retrieving information from the ITS system. They have indicated that staff members report on this all the time.

> "*Attempted to get current expenditure information of the budget it was non-existent. Secondly Constantly confronted with similar ways of staff members in other units that claim against IT budget code"*

> *"A lot of incorrect information because information is loaded incorrectly"*

From a support perspective there is somewhat disagreement on the retrieval of information. One of the participants indicated that the ITS system can't produce incorrect information but it is rather the capturing of the data which is incorrect. Interviewee 13 stated that the reports are incorrect

> "*The reports are not always correct as the report takes students out."*

According to services it seems that certain participants are more knowledgeable about the system than others and have no problem to retrieve information and this could be attributed to their long affiliation to the institution. This is in contrast with other participants who have different opinions and provide reasons as to why information retrieval is a challenge to them.

> "*Merging procedure within an organisation especially in this section is problematic. Pentech was doing continuous evaluation for a substantial number of years. Cape Tech had done things in another and have used Year mark DP compute = final mark. Cause of data to be incorrectly captured on system*"

> "*HR to clean up their data and then we will be able to run their budget which is meaningful to all staff members within CPUT but this was not the case, still not the case. Still can't extract anything and have to manually produce something where we were actually looking at certain things and often found with any manual system there is room for errors creeping in."*

The co-ordinators share the same sentiment that information retrieval is problematic. For example, they had an incident during the 2012 registration period where it was identified that 2010 details were missing. The consolidation process is partly to be blamed for this particular instance where old and new codes were used during the merger. Another concern is that the respective departments do not necessarily correct the data when it is captured and this cycle is repeated with serious consequences.

All the participants from the IT domain acknowledged that information retrieval is a problem however one of the participants indicated that in the event that someone brought it to their attention, there are various ways to resolve these issues. It is noted that there is a constant struggle for the institution to keep up with all the data on the ITS system. One particular area that had been identified on the ITS system is the lecturer information.

> *"In ITS system there would be lecturer information so we have a subject where we will find that there are 2 or 3 class groups defining a subject and perhaps 2 offering types such as part time and full time. Extracting that information from ITS is problematic because it is incorrect."*

Finding:

From the above it is clear that most staff members indicated that they encounter challenges when retrieving information from the ITS system. These challenges can be summarised as:

difficult to retrieve as well as not having sufficient access to retrieve the required information. These challenges were experienced by all the groups.

The merger finding is that the merger had contributed to the problem of retrieving information from the ITS system.

Some staff members from the services side who are more experienced and knowledgeable about the system and have no problems in comparison to the others when it comes to handling the system. These staff members have a long association with the institution and have more than sixty years of service amongst themselves. Furthermore these staff members are well connected with the user groups of ITS and annually attend the ITS conferences. Other staff members who have had a long affiliation with the institution and who had a decent knowledge on how to utilise the system optimally have parted ways with the institution after the merger or either having retired or have found other employment opportunities. On the contrary not all the relevant departments are using the data like in the case of the services departments. Different reports are generated by different departments for various sub commitees and this is where the problems of incorrect data are highlighted.

The following problems contribute towards the difficulty that staff members encounter when retrieving information such as: the amount of data on the ITS, the consolidation status of the institution's integration project and how information is captured on the system. Furthermore one of the participants questions the actual functionality of the ITS system.

One interviewee is of the opinion that generally a system will produce according to its input.

5.4.2 Insufficient or incorrect information

Theme statement: Has/have any of your staff members complaint about insufficient or incorrect information that was retrieved from ITS and what was your response	
Domain	**Interview Summary**
Academics	In agreement that incorrect information is a concern especially during budget processes and registration periods. Uploading of marks is another matter that raised concerns. Furthermore the human element is also partly blamed.
Support	Agrees that there is incorrect data but this is attributed to the input of data at the various main sources.
Services	In agreement that incorrect information does exist such as the identification of academic structure which is not up to date and the human

	element which is partially to be blamed. This issue has been highlighted in various meetings as well as during registrations.
Co-ordinators	Agree that information is incorrect but it directly links to the merger where old and new codes were used. There are many misunderstandings about the information and it is easy to make mistakes in extracting the incorrect codes when someone is not very knowledgeable about these things.
IT	All in agreement that information challenges exist but this problem is not specific to a single department but rather institutionally. They identified information inadequacies and sent it to data owners for rectification.

The academics are all in agreement that there are problems when data is being uploaded and when again extracted. Several areas are affected such as budget processes, registration and uploading of marks and there are a lot of discrepancies.

> "*Budget processes - concern when staff uploads information and when they download the information it is not the same. Human element is also a cause of problem, Case study of registration problems. Also suspect when updating records - changes are done cosmetically and not deeply enough onto the root of the problem. Changes done as symptoms and not as a cause. No fundamental change only quick fix and it will reappear."*

> *"Staff members often complain about insecurity around marks. Need a single comprehensive integrated system across all functions of the academic project."*

The support section agrees that this is a problem but it is mostly related to the main source of input of data at registration, from faculties and during admissions. This incorrect data is than filtered through the system with sporadic problems. However an improvement mechanism has been put in place like MIS Discoverer and the Quality Audit has shown an improvement of the data. The cleanup of the ITS database is in process but it is timely exercise.

The services side indicates the human element and the academic structure is a cause of incorrect information.

The co-ordinators section highlights the combination of the old and new codes of the previous institutions and indicated that this is one of the causes for incorrect reports.

The IT respondents acknowledged data problems but indicated that contingency plans had been in place to deal with incorrect data.

Finding:

The insufficient or incorrect information finding indicates that human involvement plays a major role in capturing data that leads to insufficient or incorrect information and this applies to all the groups of the institution.

The merger finding indicates that the integration of the data from different sources leads to incorrect or insufficient information in terms of the merged institution.

5.4.3 Feelings when information is incorrect

Feelings statement: A description of the respondents' feelings when handling information that were incorrect or insufficient.	
Domain	**Interview Summary**
Academics	All agree that this causes frustration and one of the interviewees mentioned that this is common at CPUT.
Support	One of the participants mentioned that this was never experienced while another interviewee mentioned frustration and waste of time.
Services	Disagreement as the majority of this section is frustrated and indicated that this is time consuming. One of the participants had no problem.
Co-ordinators	In agreement that this problem challenges your time and it also depends on how easy it is to retrieve the data.
IT	Agrees that it is problematic as it is sad and drives people crazy

The academics share the sentiment that frustration grows in the event that you realised your information is incorrect. One of the participants mentioned that this is a common scenario at the institution and that staff had become accustomed to these types of services.

> "*Alarmed and immediately thinking of every wrong pick up how many not picked up. Panicked state which is horrible because data is not secured."*

The support staff members differ from each other as one of the participants had never experienced this problem while another interviewer is utterly frustrated and exacerbated that it results in a waste of time.

The services section is split as the majority is in agreement that this intensifies frustration and a waste of time. A lot of unhappiness is experienced. Additionally another interviewee is opposing their views and mentioned the following:

"*No problem with ITS as you need to build processes around ITS system. You can't have an ITS system and have different processes. Happens in Faculties that they can't find information from the system and then face problems. It is the way staff is doing things and then the processes don't talk to each other. There is a better way of doing things.*"

The coordinators perspective is that this issue causes frustration and that it challenges your time. In addition it also depends on how easy it is to get the data and to ensure that you rectify it irrespective how minimal the inaccuracies are.

"Ability to extract information in the easiest possible way is what we need to work towards and this challenges your time."

The IT stance is that there may be reasons for this although it is sad and drives people crazy.

"*Sad, generally it doesn't happen like that as the ITS system is being used by a lot of other institutions so it is just not a system for us. Probably this would have happened in the beginning stages of ITS but I don't think it will be a problem 10 years down the line because of the amount of time that goes into developing the system as well as the amount of users on the ITS system. We are not the only people using ITS. If people complained when there was anything seriously wrong in ITS we would have heard about it, so the problem is that they don't follow the same business rules. Say for instance I come to a meeting and I have a set of information that I extract from ITS and I use my interpretation of what fulltime equivalent students is of the institution, somebody else might have used a different source some information from the ITS but more from a Discoverer point of view and we come there and our figures don't add up*"

Finding:

The information finding relating to the respondents' feelings when they have to deal with insufficient or incorrect information indicates that most participants from all the groups feel frustrated when handling information that is incorrect or insufficient and that this problem wastes their time.

5.4.4 Information System

Information system statement: The type of information they use and whether the IS supports their tasks?	
Domain	**Interview Summary**
Academics	In agreement that the IS is problematic in various ways.
Support	Agrees that not too much reliance can put be on ITS system as there are program errors and MIS data is more reliable.

Services	Disagreement as some participants' has no problems and indicated that the system is friendly. Other participants differs in that ITS is not the easiest system to work on due to its lack of flexibility and that the systems do not talk to each other.
Coordinators	Agree that the system is O.K but due to multiple systems being used this creates problems. Output queries cannot be dealt with and other alternative systems are then used.
IT	Agrees that ITS doing a reasonable job but due to its limited functionality additional sources are being used. More data problems than system problems are experienced.

The academic's perspective is that the IS systems are problematic and several reasons are highlighted. One of participants is of the opinion that the ITS system is based on old technology that predates windows. Other arguments are that the system is not fully matured and lacks confidence and is mildly poor as we encounter too many anomalies.

> *"The ITS system is a system that is constantly under construction"*

The service side has different perspectives as there are those who claim that the ITS is user friendly and provides easy access. This is contrary to other participants who indicated that the system is too inflexible and it is not an easy application to work with.

> *"Getting our data in line and the data on the ITS system and actually the functionality of the ITS system is largely questionable, often told that it is the integrity of the data behind the information that we are dealing with."*

The co-ordinators agree that staff struggle to extract information from the multiple systems and this is not easy and creates problems. Additionally the output queries of ITS are problematic.

> *"ITS services are good, output queries are difficult – output format is the difficult part which is text files which can be run but you are unable to sort them. MIS is good as it is customisable."*

The IT respondents agree that the ITS system serves a reasonable purpose but somehow it does not cover all the aspects and it is not user friendly. In addition one of the participants indicated the ITS system is complex as there are many different components. The problems on the ITS system are mostly data problems and not system problems.

Finding:

There was agreement across all the groups with a few exceptions that the multiple information systems do not support them. This then is problematic since it is not easy to extract information from the different sources because of a lack of flexibility and functionality. They referred to this IS support problem by concluding that it applies more to data than the system.

5.4.5 Training

Training statement: The participants opinions about the relevancy of training opportunities and whether these are sufficient.	
Domain	**Interview Summary**
Academics	In agreement that the institution is committed to training and development. A challenge in this specific area is insufficient capacity to allow staff to go for training.
Support	Disagreement because of the amount of training to new employees of the institution. The one interviewee is of the opinion that the training is ineffective and not maintained and recommends that training should be repeated every six months
Services	Agrees that sufficient training opportunities are provided. The institution always arranges for ITS to assist with implementation of upgrades.
Coordinators	Agrees that ample opportunities are given in terms of training needs
IT	Agrees that a lot of training had happened and some staff members are sufficiently skilled. They emphasized that it is important for staff members to regularly interact with the system otherwise they will not be able to build their knowledge and the training will not be beneficial.

In terms of training the academics are all in agreement that this area is well covered. The institution is committed to staff training and development and adequate opportunities are presented. However the academic side is sitting with a conundrum as there is not sufficient capacity to allow staff to go on training. The following statement substantiates that the institution is serious in its endeavor to provide adequate training opportunities for its staff.

> "*CPUT committed to staff training and development*"

> "*Problem with academic side is that there is not sufficient capacity to allow staff to go on training. The training which is provided is outstanding. Not a CPUT problem as this comes from departments."*

The support side differs on this issue and one of the participants is not in favor of the current setup of training at the institution.

> "*Amount of training for new employees at CPUT is a problem as there is a much greater need than what is currently being offered. Another problem is that the training is not effective and it is not maintained. Need to repeat training every 6 months"*

Additionally another concern is raised in terms of training and that is that some staff are not eager to go for training.

> "*Agree, as it helps a lot. Some people are reluctant to go for training. Staff choose whether they want to attend training or not."*

From the services point of view training is an area that is well covered. One of the participants mentioned that when a new version or upgrade is released the institution must made provision that ITS assists with the implementation.

The co-ordinators agree that ample training opportunities are presented to staff. However one issue is raised about staff willingness to attend training sessions.

> "*We use different information systems throughout the institution and training is offered with regards to that but whether staff responds to this request is another story"*

IT is in agreement that sufficient training has been provided and that staff should interact more frequently with the systems to enhance their application of knowledge.

Findings:

Overall the participants from all the groups are in agreement that the institution is committed to staff development and training providing several training opportunities but it may be insufficient and without enough follow-up opportunities as well as that there may not be enough capacity for using these opportunities.

It seems as if the merger aspect is not relevant to the training since it was not mentioned.

The institution is not liable if staff refrains from attending training courses as they are doing this on their own discretion.

Alternative mechanism should be put in place to accommodate those who require additional training.

5.4.6 Quality of data

Quality of data theme: The respondents' perceptions of the quality of the IS, information and service.	
Domain	**Interview Summary**
Academics	In agreement that data is not clean and accurate but it had improved significantly. Higher levels of reliability exist as MIS trends are sophisticated.
Support	One of the participants had no answer due to limited involvement in this regard in conjunction to the other interviewee who indicated that the quality had improved and this is supported by an audit that was conducted on MIS.
Services	Some sort of slight disagreement as one interviewee highlights that the quality of data is not too bad. Other participants expressed their dissatisfaction as duplicates records exist and data quality problems are noted by the Data Quality Committee.
Co-ordinators	In agreement that quality of data is difficult due to different operations and bits of data in different places or sources however there is an improvement.
IT	Agrees that data quality problem persists as a result of some checks not done as rigorously on ITS but there is improvement.

The academic side acknowledged that there has been improvement of the quality of data as higher levels of reliability exists. MIS trends are sophisticated.

The Support respondents mentioned that the audit revealed that quality of data had improved.

> "*Main purpose of Data Quality Committee is to improve the quality of data of the Institution over time*"

Finding:

All the participants indicated that the quality of data is important and has improved but there are still quality problems relating to data not being clean and being inaccurate.

5.4.7 Ease of use

Ease of use theme: The ease of using the IS of the institution and the ease to learn the functionality of the system	
Domain	**Interview Summary**
Academics	Disagreement as some participants agree that it is easy to use the system and others indicated that it is not easy and a bit tricky.
Support	Disagree as for some it is easy and others it is the opposite.
Services	Disagreement as some perceive the system as easy while others provide opposing views.
Co-ordinators	Agrees that extracting information is not easy due to the amount of data on the systems and this complicates matters.
IT	One interviewee indicated that the system is not user friendly.

Academics have different opinions as there are those who indicated that it is easy as staff is fully computer and IT literate. Their counterparts mentioned that it is not easy and a bit tricky and make the following comment:

> *"People who run the ITS system not even fully understand the system themselves and what we can get out of this system."*

The support side disagrees and share opposite views.

The services section is divided as some indicated that the system is easy to use as it is straightforward and user friendly. Others are in contrast to this and view their opinions that the system is not easy and it is not user friendly and needs improvements especially the I-enabler.

> "*Limiting factors that we have with ITS is that we not on iEnabler the way it should be as our institution is probably one of the few institutions that doesn't have the integrating system setup the way it should be setup."*

The co-ordinators viewpoint is that the institution has multiple systems and the amount of data on these systems is not always easy to extract and this complicates matters.

IT indicated that ITS system is not user friendly and that the reports are not great.

Finding:

There are opposing responses where some participants experience challenges with ITS whilst others indicate that it is easy to use since it is user friendly.

5.4.8 Network Downtime

Network downtime theme: In the event that the CPUT network is down and the system is off line whether it is possible to continue with their normal tasks.	
Domain	**Interview Summary**
Academics	In agreement that network downtime at the institution is disastrous as there is a lot of dependence on the network. Backup planning is problematic and online assessments are compromised.
Support	No
Services	Agree that this area is pivotal to the functioning of the institution and that staff is very limited when network is down.
Co-ordinators	Agree that network outages are problematic and there is very little to do and specifically during registration it is catastrophic. Some staff has greater needs and is using their personal stuff to connect.
IT	Agree that the network is down too often especially at the remote campuses.

The academics agree that network downtime is problematic and recommend that it should be prioritised to get systems up and running immediately. Additionally it hampers the workflow as online assessments are compromised and students are affected.

> "*Catastrophic as many online assessments are often rescheduled and this is having a ripple effect especially for part time students who have taken off from work for assessments. Rescheduling is a major problem. Online assessments are compromised and there is no explanation to it which is traumatic. Had an incident where online test were printed in case the system went down we can issue paper. "*

The support side indicated that nothing is possible.

The services side emphasized the importance of network stability as network downtime is detrimental for the institution. Their operation is largely dependent on the IS and minimal output is subsequently achieved as there are limited things to be done.

"Network problem is serious. Main restraining factors – Academics not using LMS because of network problems instead using private network at home in their personal time after hours because institution is not working. Major mass- massive hindering factor for all of us"

"We have purchased extra bandwidth for example in the Seacom cabling side of things where we have bigger bandwidth capacity for Internet usage than most corporates, but why do we find we have constant networking issues happening?"

The co-ordinators agree that network downtime is problematic as there is very little to be done without access to the IS. Online registration is seriously impacted and as a result students are affected. Any delay of the network has a ripple effect. Staff members are using other alternatives to connect.

"*Number of staff who has greater needs and they are using their own means to connect."*

IT indicated that network downtime is problematic but sometimes it is beyond their control in terms of technical problems or power outages.

"*All CPUT networks down to many times to be a productive system. Network problem is serious. Main restraining factors – Academics not using LMS because of network problems instead use private network at home in their personal time after hours because institution is not working. Major mass- massive hindering factor for all of us*."

Finding:

All the participants indicated that network downtime is disastrous since they are then unable to continue with their normal tasks resulting in the normal operation being compromised affecting both staff members and students negatively.

5.4.9 CIO appointment

CIO appointment theme: Whether CPUT will benefit from a CIO appointment	
Domain	**Interview Summary**
Academic	Disagreement and various reasons are provided. One of the participants indicated that there is already an IT director while another warned about the over corporatisation of universities. Additionally one of the participants wants guarantees that the CIO will indeed affect changes and make improvements as adding an additional manager won't make a real difference.
Support	Disagreement as one of the participants is not in favor to support a CIO

	appointment. Argues that this won't necessarily improve the IT situation at CPUT but increase bureaucracy.
Services	Disagreement as some participants are in favor of the CIO appointment while others are not sure what the impact of this position will entail. The institution needs a dedicated person for IT who is able to educate the executive management (EM) regarding the value of IT.
Co-ordinators	In agreement that the institution needs a dedicated IT person who is technology savvy, someone who understands technology and have the influence in decision making.
IT	All in agreement that the institution needs to appoint a CIO. They referred to the King III report which deals with the appointment of a CIO. The institution needs someone like this on EM level with authority to take decisions and implement strategy.

The academic side is not in full support of the appointment of a CIO and multiple reasons are provided. One of the participants mentioned that the institution already has a similar position but a different name is attached to it. Furthermore the one interviewee indicated that leadership within the CTS department is the problem. Another interviewee mentioned the route of the corporate sector which is not beneficial to our students.

> "*Caution of over corporatization of universities. Universities are different from the corporate world which is driven by singular concepts and agenda of profit making which is easy to understand. As a university we do extremely important work and have an economy to support."*

The support side is split on the CIO position as there are different arguments raised. One such argument is:

> *"Not support position to bring in CIO and increase bureaucracy which increases problems. This is not going to improve anything."*

The perspective of the services side is that some of the participants are not sure or rather have no suggestions. The rest of the group support the CIO appointment and indicated that a dedicated person is required.

The co-ordinators fully approve the appointment of a CIO and recommend a technology person with authority who can influence decision making.

"*This is what has been missing up to now from a day to day point of view and future technology and integrating technology in the classroom. Rather a technology person than a manager. Someone who understands technology and uses technology"*

"Someone to look at strategy and holistically view technology but this need to be a very senior position within the organisation who needs to have influence in decision making. Needs to be in a position where they can make recommendations and decisions are being heard."

IT is all in agreement that the institution needs to appoint a CIO based on the recommendation from the King III report.

"A lot of what institutions are supposed to be doing from a point of view from King 3 report is the first report where he specifically deals with IT. There is one chapter on IT and his recommendations for institutions especially complex organisations required to have a CIO that is his recommendation."

Finding:

Participants who are knowledgeable about IT are all in agreement that the institution needs to appoint a CIO for such a person to have the authority for decision making. Participants who disagree are skeptical whether such a person will be able to improve the IT situation and that in fact it could lead to over corporatisation of universities.

5.5 Perspectives of IT management

5.5.1 User involvement

Question: What is the involvement of the user (level of user) in your IS strategy. Do you use the experiences of the participating faculties?.
Various forums and committees exist that deal with policies, strategies etc. User involvement had been limited because of communication problems. The CTS strategy is evolving and there is a lot of input from the departments. Previously the focus was on the infrastructure but it has been expanded to obtain more user responses. The interaction between the users has been prioritised.

Several forums and committees have been established to deal with policies and strategies, etc. Communication problems between departments cause user involvement limitations. Input from departments is used within the CTS strategy.

"We do have one forum which is the operational workgroup forum that should be represented by everybody but I do believe the body is not functioning well strategically as it is more operational"

"*Very limited as there is a problem of communication strategy which is probably not one of the best."*

"Our focus has been more on Infrastructure service and we must expand it now, more seriously to get user responses on what our performance is on that level and build it into our strategy. Interactions with users are much more serious now."

Finding

User involvement has been prioritised since the CTS strategy also contains their input and the various forums and committees should optimally use these opportunities to engage with CTS about their concerns and problems. A strategic approach is required in order to provide direction where academics will use technology to their advantage.

5.5.2 IT Challenges

Question: What according to you are the current IT challenges within CPUT.
There is a lack of collaboration and knowledge sharing between departments. Delivering services which include IT services is a challenge as there is a perception that IT hardly responds to ensure that the IS's are up and running. Additionally there are communication and information challenges.

Accordingly there is a lack of collaboration and knowledge sharing between departments.

"*We find that the number of people doing the same thing all trying to do similar things instead of putting our heads together and as a team or group try to solve these problems and this almost lead to a lot of reinventing the wheel concept due to a lack of collaboration."*

Delivering proper service to the users is challenging as there is a perception that IT is renowned for not responding timeously to resolve issues such as getting systems up and running. Communication and information challenges still exist between the relevant departments.

"Key problem is how we deliver services and this includes IT services. Reviewing services that are problematic need to be addressed. Most of the challenges fall into the information space making sure systems are up and running."

Finding

Communication and information problems continued to be a challenge at the institution. Alternatively a process was being implemented to address these issues. The lack of

collaboration and knowledge sharing is contributing to the enormous problem of non-co-operation.

5.5.3 IS integration

Question: Is the IS integrated or are you in the process of integration and secondly is there a continuation process in place to integrate the IS?
Large institutions with multiple systems find that integration is a complex activity. The challenge is to ensure that integration is handled smoothly whereby an authoritative source is identified, e.g., an ITS database to extract, transfer and load (ETL) thereby transferring information between systems. Integration is a gradual process and it will be phased in over time.

Integration is a complex activity and because this is such a big institution it makes it even more difficult. Certain methods are being used to extract, transfer and load information from authoritative sources such as ITS system and to transfer information to other systems to ensure information is integrated. This is one way to deal with the aspect of integration in the future.

> *"The issue with integration is that it is always an ongoing thing. Different methods you use to deal with it."*

Finding:

Integration remains a complex issue at the institution and some mechanism has been identified to overcome this hindrance but it will be a gradual process.

5.5.4 Role of CIO

Question: What role should the CIO have within the higher education sector?
Consolidate all the IT services and functions within the university. CIO has a more effective and strategic role to play as it will be part of top management with decision making authority. There is gap between the academic and administration to deal with effective use of technology and the CIO will be able to close the gap.

The CIO will be able to bring the relevant departments such as CTS, MIS and E-learning together as all of them have different reporting lines. The CIO should be able to close the gap between academics and administration in order to deal with technology effectively.

"*Deals with issues that are fairly complex for the institution as there are lots of activities that academic institutions are involved with and we not dealing with it very well"*

Finding:

IT is not well represented on executive management level and the reporting lines of the different aspects of IT are a concern. Closer co-operation is required amongst academics and administration to ensure the effective utilisation of technology at the institution to benefit staff and students holistically.

5.6 Conclusion

The case study results were discussed in this chapter with an indication about how the data was analysed. All the findings were listed according to thematic networks where sentences were formulated from the interview data.

CHAPTER SIX
DISCUSSION AND RECOMMENDATIONS

This chapter will briefly discuss the findings from the preceding chapter and the discussion will later on shed some more input on these issues.

6.1 Summary of findings

The input of data at the main sources of input including Registration, Faculties and Admissions is one of the main transgressions of how data is captured. The human element is partially blamed for a number of problems. It was highlighted that the Registration department is employing student assistants and outsource contractors for almost half of the year to capture information. No indication was provided of how frequently the data is checked and validated. Secondly it was never mentioned if these students and outside contractors were given proper training and who is actually accountable to ensure that they are knowledgeable about the system.

There was agreement across all the groups with a few exceptions that the multiple information systems do not support them and it is problematic since it is not easy to extract information from the different sources because of a lack of flexibility and functionality and they referred to this IS support problem that it applies more to data than the system. Different systems such as ITS, MAS and OPA are being used to retrieve information to compile reports and evidence prove there are cases as previously mentioned that the outputs do not correspond although the same criteria had been utilised. Another matter is that staff who is well equipped with knowledge of the ITS system iterated that the same business rules are not applied and this is one of the deciding factors why information is incorrect.

From the interviews it was established that users are indeed frustrated when realising the information that they have used is incorrect. This exacerbates the situation as staff indicates that this challenges their time. This again is also about the same business rules not being applied but staff also revealed that should the information be easy available to retrieve it should assist them greatly.

	Finding theme	Academics IT users	Non-academic IT users	IT service providers
1	Information retrieval	Problems with retrieving information due to: • Insufficient access • Difficult to retrieve	Mixed responses based on knowledge of system and problem rather with information at the point of entry. Specific problems are: • Large amount of data on the system • Consolidation status of integration • Functionality of the system questioned	Incorrect data on system, e.g., lecturer as well as large amount of data stored on the system
2	Insufficient or incorrect information	Concerned with incorrect information such as: information needed for budgeting; marks. They feel the human element contributes towards this problem	Agree that incorrect information exists due to incorrect data entered; due to the merger and problems with the academic structure. They also agree that the human factor contributes towards this problem	Agree that this is a problem and that it is institutional. They attempt to correct this by identifying inadequacies and request data owners to rectify.
3	Feelings when information is incorrect	This causes frustration and it is a common feeling and perceived as common in the institution	Some experienced frustration and a waste of time was mentioned since the workarounds are time consuming	Agree that this is a problem and they feel sad that this is the case
4	Information system	The IS is problematic in many ways, e.g. based on old technology; not yet fully matured	Some indicate that the IS is difficult to use; that it is not flexible and the different systems are not sufficiently integrated. Others indicated that it is easy to use	Additional sources are required to meet the user requirements not met by the ITS. They indicated that the problems are more data than system related. The ITS is complex with insufficient functionality and not very user friendly
5	Training	There are sufficient training opportunities but these cannot always be utilized since the sessions cannot fit in the academic schedules	Different views on training with some indicating that the training is ineffective and not repeated	Sufficient training opportunities but staff need to interact regularly with the system to enhance their own knowledge of the system
6	Quality of data	Data quality not good but did improve	Data quality has improved but there are still duplication	Agree that data quality problems persist but there is improvement
7	Ease of use	There were mixed responses with some indicating that it is easy to use and others the opposite	Different opposing views on the ease of use of the system	The system may not be user friendly to all and the reports are not sufficient
8	Network downtime	Network down time is disastrous since the academic programme depends on the network, e.g. online assessments	It is impossible to function if the network is down and this is a problem	
9	CIO appointment	Disagreement amongst academics because some indicated that there is already an IT Director and some cautioned about the possible over corporisation of universities. They were not convinced that a CIO will indeed affect changes and result in improvements	Opposing views with the possibility that a CIO position will increase bureaucracy. Some were not sure what such a position would entail and others felt that this person should be part of the executive management	They agreed that the institution needs a CIO to comply to the King III report

Table 6.1: Summary of findings

6.2 A users' perspective

Presently the majority of CPUT employees are regarded as information workers due to their interaction with the various systems of the institution. Both the academics and administrative departments retrieve various forms of information from the multiple systems to compile reports of staff, student, budgets and requisitions. Based on these it is then necessary for the users to have access to accurate information however this is not the case as supported by the finding about information retrieval where users indicated that retrieving of accurate information from the systems remains a challenge.

6.2.1 Using information systems

There was agreement across all the groups with a few exceptions that the multiple information systems do not support them in their work. It is not easy to extract information from the different sources because of a lack of flexibility and functionality. They also referred to this IS support problem that it applies more to data than the system. This confirms the challenge indicated by Whyte et al. (1997) that there is a range and variety attached to user satisfaction.

According to the finding about the types of information systems, the respondents indicated that the multiple information systems do not support their work practices. The respondents mostly experienced data problems on the ITS, LMS and MAS systems that are the typical information systems used in higher education. This supports the comment of Meenankumari *et al.* (2011) that change transpires at a non-level pace and the increase in student numbers and technology advances have an impact on IS performance. Data problems such as incorrect student information, budget reports and staff who claim against other departments budget codes.

An additional challenge is the amount of data and level of duplication on the IT systems. The institution had merged the two coding structures of the previous institutions instead of selecting the most suitable structure in an effort to accommodate everybody which have caused that a lot of overlap was created. This had resulted in that the coding was just joined together with no clean codes. One of the respondents mentioned that

> "*Unclean data sets that were joined together just too make the system work.*"

Furthermore a new set of codes was developed for new students who enrolled after the merger. This resulted in the institution handling three set of codes which is a maintenance nightmare.

Based on this it is no coincidence that staff who is not fully knowledgeable about the ITS system can easily encounter problems when extracting information. The consequence of this might lead to incorrect reports or information.

> *"Recently had a case when a staff member within the IT department needed to print class lists and not getting parts of students on the list. IT academic program have many different groupings and got repeating and part time students. The faculty officer was contacted and an investigation was done. It was then discovered that the information was there but the wrong codes were used – This is a case of person not well informed on how to extract information."*

Certain staff members have extensive knowledge and skills regarding the ITS system which include some of the respondents and has no difficulty to retrieve the correct information quickly and efficiently. Some of the staff members annually participate in the ITS workgroup forums

> "*Staff who knows the system can get information quickly and efficiently*."

Paterson (2005) is of the opinion that the implementation of IT solutions in HE is hampered by the shortages of resources. These are furthermore supported by Lineman (2007) where it is emphasized that higher education is disadvantaged which is attributed to having lesser resources available in terms of finance and personnel. The majority of the respondents are of the opinion that the CTS department is understaffed and these exacerbate the situation.
In conclusion to summarise the general low level of satisfaction in using the information system is supported by the following views: one of the respondents questions the actual functionality of the ITS system and another one is of the opinion that generally a system will produce according to its input.

6.2.2 Using information

According to the data from the interviews the ITS system produces inaccurate information when retrieving information. These are attributed to a number of reasons such as the amount of data on the system, the consolidation project of the institution, the use of old and new codes on the ITS system. Furthermore the human element is one of the biggest transgressors as the input of data is problematic at the different input sources. This confirms Strong et al. (1997) intrinsic data quality problem pattern that judgment involved in data production will result in questionable believability and data then not being used.

The input of data at the respective departments such as during registration at the faculties remains a critical challenge and several respondents had point out this particular area. Respondents is in agreement that urgent attention is needed to resolve this key challenge as this is having an impact on the entire institution. The human element is also partly blamed for

mistakes during the capturing of information. The registration department in particular employs student assistants and contractors for almost half of the year to capture data and it is important to rigorously validate the data otherwise the data will be corrupted.

> "*Incorrect input from main source of data such as Faculties, Admissions and Registration. Without clean data coming in through them manipulate the system all the way down the process. You automatically use corrupt data."*

The respondents feel frustrated when handling inaccurate information as this leads to duplication of tasks and blames the system. Problems such as incorrect academic structure, student information, budget reports and staff who claim against other departments' budget codes are the dominant data challenges. However certain respondents highlighted that the data quality problems may not necessarily be system related but could be the result of the decisions that were taken when the two institutions merged. Knight states(2011:6) that irrespective of how well a system function the important part is if it produces inaccurate information it hampers users perceptions of the quality of the system.

The information finding indicates that most respondents from all the groups feel frustrated when handling information that is incorrect or insufficient and that it wastes their time.
Even though user involvement had been prioritised as CTS strategy to obtain the users' input it is essential that the various forums and committees must optimally use these opportunities to engage with CTS about their concerns and problems. This doesn't yet seem to be the case. A strategic approach is required in order to provide direction where academics will use technology to their advantage.

6.2.2.1 Information Retrieval

From the above it is clear that most staff members indicated that they encounter challenges when retrieving information from the ITS system. These challenges can be summarised as: difficult to retrieve as well as not having sufficient access to retrieve the required information. These challenges were experienced by all the groups. Furthermore it was found that the merger had contributed to the problem of retrieving information from the ITS system.

There are also those staff members who are more experienced and knowledgeable about the system and have no problems in comparison to the others when it comes to handling the system. These staff members have a long association with the institution with more than a combined sixty years of service. Furthermore these staff members are well connected with the user groups of ITS and annually attend the ITS conferences. Other staff members who have had a long affiliation with the institution and who have a decent knowledge on how to

operate79the system optimally have parted ways with the institution after the merger or either have retired or have found other employment opportunities.

6.2.2.2 Amount of information

The amount of data on the ITS system makes it even more cumbersome as the system currently accommodates three different data sets. This is a maintenance nightmare and inherent of why the codes are not clean. In addition it was mentioned not much effort had been done in the process to clean the data. It had happened that a staff member had used the incorrect codes when retrieving information and that the reports were questioned. It was later revealed that the incorrect codes had been used and this contributed to the problem of too much information on a system. The amount of information available and stored on the different systems needs to be considered to assist the users with suitable mechanisms to retrieve and use the information relevant to the purpose for which they need it.

6.2.2.3 Information Quality

All the respondents indicated that the quality of data is important and has improved but there are still quality problems relating to data not being clean and being inaccurate.

Unclean data sets that were joined together just to make the system operational which is not conducive or sustainable as problems will resurface and quick fixes will be reapplied. The origin of the problems has not really been resolved as a result of decisions that were taken during the merger. This issue is that the problem is not being handled effectively as changes are done cosmetically and not as a root cause.

Two of the respondents had indicated that the quality of the data had improved over the last couple of years. Several mechanisms were established such as the ICT and Data Quality committees which had contributed to the improvement of the data. The MIS department had been mandated too encourage better management of institutional data. One of the respondents mentioned that the quality of the data is definitely getting better and this had been confirmed by a recent audit that was conducted at the institution.

> "*Main purpose of Data Quality Committee is to improve the quality of the Institution data over time. Secondly to bring people across the various computer sub systems together so that They can have an understanding of the data issues in their areas. The Data Quality committee should over time be able to help resolve that*."

According to Gorla *et al.* (2010) the creation of inaccurate information by IS does not conform to the requirements of its users that then causing disruption of operations, substantial

maintenance expenses and high cost to organisations. The findings also supported the intrinsic data quality problem pattern of Strong et al. (1997) that multiple sources of data result in data not being used since it of questionable believability, poor application and little value-add.

Unless attention is given to improving the quality of the current information the university will not be in a position to utilise its information as a valued product for success and development as indicated by Shafique *et al.* (2010). Sound business decisions are dependent on accurate and sufficient information from several sources and include IS, customers and competitors. Currently at CPUT the CTS department does not take on the role of custodian of institutional data. This supports what Edwards *et al.* (2009) indicate that organisations with IT directors are most likely not strategically dependent on information but rather focus on supporting operational processes. Even in the cases where the CTS Department takes on the role of data custodian they are not permitted to verify or amend the institutional data. Each data owner had been mandated with the responsibility to amend data that is applicable to their department but do not seem to take this role seriously.

Even though the Data Quality Committee (DQC) that was established in September 2009 in a response to address the data problems, the perceptions of poor data quality as reported by the respondents remain. The DQC had to respond to the challenge given the amount of information on the system and their efforts have been fruitful. To a certain degree they have been successful as confirmed by an audit that was conducted at the institution. Yet as indicated by the respondents, data problems are still eminent. One of the respondents mentioned that you still get anomalies too often but the improvements are also evident. The second objective of the committee is to bring staff across the various computer subsystems closer in order for them to have a better understanding of the data issues in their respective areas. Both these objectives will not be accomplished instantaneously but it is a gradual process and a difference is not yet experienced by the users as indicated in the responses.

Various data owners had been identified within the respective departments and faculties however it remains unclear whether they have a clear knowledge of what to do with the information that the DQC sent to them. The DQC is not by means to correct any incorrect data but will rather send it to the data owners for rectification purposes. One of the respondents is adamant that the data owners does not know a lot about their data but would rather consult with their subordinates should they encounter problems with the data. There still seems to be a gap between what the institution through the DQC attempts to achieve and what the users experience.

6.3 A systems perspective

6.3.1 Integration

Integration remains a complex issue at the institution and some mechanism has been identified to overcome this hindrance but it will be a gradual process. This confirms what was found in the literature review that it is a complex process and especially challenging in a merger (Alaranta *et al.*, 2008). The problems associated with the integration of the information systems into a merged information system are causing the information quality problems reported by the respondents. No best practices were found in the literature and therefore the problems remain. It is clear that the lack of a fully integrated information system influences its use with the users who are not satisfied with how the information system supports their work practices.

According to one of the respondents HE institutions have complex structures so the issue with integration is that it is always an ongoing thing. Based on the literature review Fielden (1997) indicated that one of the recommendations from the learning lessons from mergers in HE is that the cost and time involved should not be underestimated especially in the integration of administrative IT systems. Paterson (2005) further based this on the fact that various education institutions globally had been reluctant to respond to the desire to integrate IS with higher education business models and it remains a serious ongoing challenge. Paterson (2005) substantiates this by claiming IS is still regarded a support function by several higher education management.

Success in post-merger IS integration has been recommended by the following components: the ability to both exploit opportunities and avoid problems which arise from the merger, end-user satisfaction by means of the integration process and integrated system, support the underlying aim of the merger by improving IS capabilities, utilising resources efficiently and effectively during the integration process (Robbins & Stylianou, 1999; Alaranta, 2005).

6.3.2 Network

All the respondents indicated that network downtime is disastrous since they are then unable to continue with their normal tasks resulting in being compromised affecting students negatively. Network downtime is considered a serious challenge as the unavailability of e-mail and Internet access hampers performance. However from the literature in Chapter 2 it is evident that safeguarding the institution had to a large extend become synonymous to the role of the CIO. The CIO devotes a lot of time to address business continuity and emergency planning and when the campus e-mail or web services are unavailable pressure is put on the CIO (Lambert, 2008).

Unless the problems associated with the network are addressed the network will continue to influence the use of the information systems and the access to information when needed.

6.4 A management perspective

According to certain respondents IT is underrepresented on executive management level and the reporting lines of the different aspects of IT are a concern. Closer cooperation is required amongst academics and administration to ensure the effective utilisation of technology at the institution to benefit staff and students holistically.

6.4.1 CIO role

Participants who are knowledgeable about IT are all in agreement that the institution needs to appoint a CIO for such a person to have the authority for decision making. Other respondents disagreed since they are skeptical whether such a person will be able to improve the IT situation and that in fact it could lead to over corporatisation of universities. The appointment of a Chief Information Officer (CIO) is supported by most of the respondents and only two of the respondents disagreed. It must be noted that the respondents who primarily deals with Information Technology (IT) at the institution supports the need to appoint a CIO.

> "*Need a dedicated person – because IT is so fundamental in what we do for instance when the network's down there is virtually nothing you can do. This is what has been missing up to now from a day to day point of view and future technology and integrating technology in the classroom. Rather a technology person than a manager. Someone who understands technology and uses technology. From a CTS point of view you got to know when bringing in a new Document Management System you got to know how to use it. Position had been suggested before. Definitely approve this position".*

> *"Think so, some institutions have a deputy vice chancellor for IT. Because systems are evolving so fast that we are relying more and more on technology. We have become dependent on IT and it disables us when systems go down. Someone to look at strategy and holistically view technology but this need to be a very senior position within the organisation who need to have influence in decision making. Future planning and vision of the organisation and implement those decisions. Need to be in a position where they can make recommendations and decisions are being heard".*

On the contrary one of the participants who are not in support of the appointment of a CIO made the following statement:

> "*No, Increase bureaucracy which increase problems. Right attitude and believe in what they do. Power doesn't go with position, not right attitude at CPUT. Not support position to bring in CIO as this is not going to improve anything, but rather people do that.*

Additionally another participant pointed to the IT management problem as a reason for not supporting the appointment of CIO.

> "*Disagree; already have position called Senior IT Director. IT management is the problem. Not the right people to run IT at the institution. Institution is poorer due to poor IT management. Leadership is the problem.*

According to Penrod *et al* (1990), one of the most preferred qualities for the CIO position is leadership. Results from a questionnaire which was conducted by Lane *et al* (2007) highlighted that leadership is regarded as the favored competency required for the CIO role and one of the comments from a respondent "Leadership is the primary responsibility of the CIO".

However the IT Director is in full support of the appointment of a CIO at CPUT and referred to the King III report which states the following: "Boards should be responsible for IT governance and should appoint a Chief Information Officer (CIO) who is responsible for the management of IT". According to the IT director research had shown that fewer IT problems had been experienced where a CIO was appointed. Nelson (2003) is of the opinion that a strategic advantage is gained by higher education institutions with actual IT leaders which adopt c-level positions as CIO's. Furthermore Nelson (2003) highlight that the "Success of IT in higher education will depend on effective strategic and operational leadership."

IT is not well represented on executive management level and the reporting lines of the different aspects of IT are a concern. Closer cooperation is required amongst academics and administration to ensure the effective utilisation of technology at the institution to benefit staff and students holistically.

From the literature it is clear that safeguarding the institution had become synonymous to the role of the CIO. Protecting the interest of the institution have become more substantially central to the CIO and is clearly evident on how much time the CIO invest in addressing business continuity. In the event that campus e-mail or web services become unavailable the CIO is under pressure to get things back to normality (Lambert, 2008).

6.4.2 Training

Overall the respondents from all the groups are in agreement that the institution is committed to staff development and training by providing several training opportunities. However these may be insufficient and without enough follow-up opportunities as well as that there may not be enough capacity for using these opportunities. Alternative mechanism should be put in place to accommodate those who require additional training. This might be accomplished by delegating other staff members who have more experience and knowledge to assist those staff members with difficulties.

The majority of participants indicated that according to their experience they haven't encountered any problem with the training aspect at the institution. According to the respondents CPUT provides sufficient training according to the needs of the departments. One respondent indicated that the university is committed to staff training and development and it depends on staff to identify areas of training. Furthermore another respondent pointed out that there have been a lot of training and staff attends training according to their needs.

> *"Training is good. No difficulty with it. Problem with academic side – not sufficient capacity to allow staff to go on training. The training which is provided is outstanding. Not a CPUT problem as this comes from departments."*

However, not all the respondents share this sentiment that training is effective at the institution as one of the comments of one of the respondents particularly highlights two particular problems with the training aspect.

> *"The amount of training required for new employees at CPUT is much greater than they currently needed. A lot of people have given up on the LMS system not because they want to or because the platform is unstable or all the complaints that come up, but because they were insufficiently trained to be able to use the system efficiently and effectively. Another problem with training is that fact that it is not maintained. Need to repeat training every 6 months or every year to make sure that you bring in different parts of the community into that training program."*

The latter respondent recommended a different approach on how the current setup of training is conducted within the institution. The respondent mentioned that several staff is from other provinces and had not utilise the same applications at other universities. This complicates the matter and the respondent feels that additional training should be provided to these staff members in order to make them more competent on the system. This coincides with another respondent who mentioned that they have experienced an incident where the

lack of knowledge of the system had caused a class list to be printed incorrectly by a new staff member.

It must be noted that during most training sessions respondents are mainly thought the basics on how to deal with a system or an application. Staff is supposed to apply this knowledge practically and practice the outstanding functionality. In addition relevant staff members within their respective departments need to assist these new employees to feel confident when using the system. Some staff members however is not eager to share their knowledge with new staff members and this creates a lot of uncertainty as staff want to protect their domain. It seems as if the merger aspect is not relevant to the training since it was not mentioned. The institution is not liable if staff refrained from attending training courses as they are doing this at their own discretion.

6.5 A Contextual perspective of a merged higher education institution

It is not clear how the reasons for the merger that were based on a political agenda rather an attempt to streamline higher education institutions, influence the integration of the two institutions. The effects of the merger seem to be consistent with the findings from the literature review where the complexities of such a process were indicated. The different structures of the information and systems and different cultures of the users influenced the integration of not only the information systems, but also the business processes and systems. It therefore seems that the contextual factors relevant to the political position of the previous and new merged institution could add another dimension of complexity but the findings do not provide an indication of the extent of such a complexity. It may be interesting to investigate these in a further study with a focus specifically on the wider context than the use of the IS and information.

Furthermore the management styles of the previous institutions versus the merged institution were not specifically considered and the extent to which this factor could influence the findings is also not clear. The findings, however, are consistent with the findings of the literature review which could be an indication that a merger with integrated information systems is influenced by factors relating to the merger rather than to the management style. There was a strong indication that management should play a much more prominent role in managing the process of integrating the information systems and the problems experienced during the use of the systems. The role of a CIO is important and a person in that role needs to be appointed.

The aspect that was found to be important is the integration of the different academic structures which was not simple. One of the major factors contributing to the data quality

problems is the merger issue where old and new codes were merged. Arguably this is one of the primary reasons why staff encounter problems when retrieving information. Given the fact that universities are regarded as information centric environments and the processing of information is mission central the retrieving of information should be made easier. However from the interviews this is not the case at the institution and staff is complaining about this element.

Another important aspect indicated by the findings is the lack of sufficient resources. Again this aspect is indicated by the literature reviewed as a general problem and it is not clear to what extent the context contributes towards this aspect. During the interview one of the respondents highlighted two very important issues that could be seen as representative of the general response. Firstly, the CTS department has limited resources hence they are currently understaffed and secondly the CTS department is focusing more on operational stuff. This is supported by Edwards *et al.* (2009) statement. Edwards *et al.* (2009) state that "organisations with IT directors are most likely not strategically dependent on information, rather they are more likely to use IT to support operational processes. Presently at CPUT a large amount of time is dedicated to projects to look into mechanism to enhance the current operation of IT initiatives and how these projects can be used to benefit staff and students.

6.6 Challenges

User involvement has been prioritised since the CTS strategy also contains their input and the various forums and committees must optimally use these opportunities to engage with CTS about their concerns and problems. A strategic approach is required in order to provide direction where academics will use technology to their advantage.

Communication and information problems continue to be a challenge at the institution as the respondents are in agreement that there is a lack of communication from the CTS department. This creates a platform of distrust and anxiety as staff feel that this channel should be optimally used in order to keep the users up to date of the developments of their concerns and problems. Although the Self Evaluation Report (2010) highlighted communication as one of the IT challenges it is understood that little had thus far been done to improve communication. Kelly *et al.* (2005) provide a definition for a higher education role which is to develop a vision for the role of technology systems which is dependable with organisational mission and goals to accomplish the vision by means of effective and complete stewardship of resources and communication with all constituencies.

> "*CTS department need to communicate (Silence is the biggest killer). This shows anxiety, distrust and suspicion*"

The IT director acknowledged the challenge of communication and is committed to address this aspect.
The quality of data is at the point of entry and unless the problems, which are mainly human, are addressed, the quality of data for the institution will remain poor. The frustration levels of the users due to this quality problem need to be recognised and addressed.

> "*Very frustrated, hampers job done efficiently. Time limit factors – especially if a lecturer wants something quickly*."

> "*Alarmed, immediately thinking of every wrong pick up how many not picked up. Panicked state which is horrible, because data is not secured*."

> "*Worse thing that can happen and it grows frustration if you work on data and relied on that data for something else only to find that the information was incorrect. IT department downloaded results to calculate student average only too found out it is the wrong year. Ability to extract information in the easiest possible way is what we need to work towards and this challenges your time."*

The finding about the role of the CIO supports Knight's statement that because of a lack of flexibility and functionality and they referred to this IS support problem that it applies more to data than the system. The lack of collaboration and knowledge sharing is contributing to the enormous problem of non-cooperation.

An additional challenge that respondents indicated is the level of access on the ITS system. Staff mentioned that their privileges had been unilaterally removed which is hampering their work output as they become dependent on other departments to provide them with information that was previously accessible to them. This creates a platform of uncertainty as it takes some time before the relevant information is sent to them.

> *"Direct access to data had been removed by managers from IT. Limited access result in delivery not timeless and relying on other people."*

> *"People not having access to what they need are the key thing – People struggle to get information from ITS as they are not having access to these menus"*

Contrary to the above another interviewee provides reasons as to why particular access to ITS should be limited.

"Access menus on ITS is tightly controlled. Data managers sign off that it is ok for you to have particular access on ITS. Important to control who have access on ITS."

With regard to the integration of information systems during a merge the challenge is to ensure that integration is handled smoothly whereby an authoritative source is identified. For example, ITS database to extract, transfer and load (ETL) thereby transferring information between systems. Alaranta *et al.* (2008:317) state that no best practice method exists as there are many different ways to achieve effective post-merger IS integration through planning. Moreover it is recommended that the planning of IS integration needs to adapt to the characteristics of the merger.

The different views of the aspects identified in this study between the academic IT users, non-academic IT users and IT service providers remain a challenge that need to be addressed. Someone with sufficient understanding of the higher education environment and the users' needs on the executive management level needs to be appointed to address the different views. Furthermore such a person needs to have experience and a good understanding of the challenges experienced due to a merger. The appointment of a CIO should benefit the university. In order to address the lack of understanding of the CIO role by the academic IT users, specific attention should be given to this aspect during training sessions. Alternative mechanism should be put in place to accommodate those who require additional training.

6.7 CIO Role at CPUT

According to one of the participants the biggest problem is that the IT department is playing catch up. Additional participants support this statement and indicated that the history of the IT department is that they always fixing problems and looking in problem matters. The participant suggests that the IT department need to reach the stage where they are innovative, stage forward thinking and implement things proactively. Another participant indicated that over the last five years the IT department had been responding to the technical issues of IT. The IT department is attempting to get the platform functional but emphasized that this practice is unsuitable and does not necessarily lead to a visionary perspective. The interviewee is of the opinion that the outward looking integration and the visionary perspective from the IT department is currently lacking.

Some of the participants acknowledged the commitment from the IT staff in that they work extremely hard in fixing technical problems. Another interviewee highlights that staff in the IT department are doing three jobs and warns that if additional staff is not appointed the situation will deteriorate and the IT department will not be able to rise above this challenge.

Furthermore some of the participants indicated that the attitude of CTS staff needs to change.

CPUT spent large amount of its capital on IT and purchased extra bandwidth in the Seacom cable. CPUT have bigger bandwidth capacity for Internet usages than most corporates but the question is are we using it effectively? Why do we found we have constant networking issues if CPUT spend large sums of money in order to limit network connectivity challenges? These are some questions which were left unanswered. The IT budget takes a considerable amount of money and the institution is not getting the returns on investment. The underlying statement is supported by Meeker *et al* (2007) and Burton-Jones *et al* (2008) who currently hint that more than 50% of capital expenditure of a large number of organisations is spend on IT systems.

> "*If you look at the IT budget in some cases it is more than a couple of faculties put together. If you look at IT capital budget annually it is more than the faculties received together as a whole. In fact it is more that 50% of the entire CPUT's budget towards IT. We are talking about millions going into projects.*"

The situation at the institution is that interim fixes are done in order to get the system up and running but that the real causes of problems is never resolved. The symptoms are being threated but not the origin.

6.8 Research questions and objectives revisited

The primary research question which had been highlighted in Chapter 1 namely "What is the role of the CIO to facilitate the users experiences interacting with IS in a post-merger environment?" formed the main question of this research. The literature review which was conducted in Chapter 2 coupled with the data collection methods such as documentation and interviews highlighted the aspects of how to address and answer the research question. Subsequently the sub research questions and objectives will be discussed to provide an indication how each question were address and answered.

6.8.1 Primary research question and objective

Research question	Research objective
What is the role of the CIO to facilitate the users experiences interacting with IS in a post-merger environment?	Determine the role of the CIO to facilitate the users experiences with IS in a post-merger environment.

Table 6.2 Primary research question and objective

A literature review was conducted with the aim of determining the role of the CIO within HE and how this role can facilitate the users experience. Through this review it was established that CIO do indeed assist users to achieve better results. The CIO is by means to effectively contribute to the overall success of an organisation and can assist users directly to achieve better results by encouraging them to utilise technology successfully (Remenyi *et al*, 2005). Furthermore the CIO is responsible for users actions although they are not subordinates.

The CIO in higher education is a complicated role based on the fact that several attributes are required such as technical knowledge, communication skills and higher education experience. The CIO should be able to communicate and present information to the users without using any technical terms. However, the role of the CIO to facilitate the users' experiences interacting with IS in a post-merger environment is indicated by the findings of this study as essential as long as such a person has the necessary background and expertise. This should include the CIO competencies with a thorough understanding of the higher education context. Since the integration of systems is already complex it not clear whether experience of mergers per se is essential.

6.8.2 Sub-Research question and objective 1

Research question	Research objective
What should the role be of the CIO in higher education?	Establish the role of the CIO in universities versus private sector.

Table 6.3 Sub-Research question and objective 1

The research objective was addressed through a literature review and interviews which was conducted at the university and its focus was to investigate the role of CIO within the higher education domain. Through this review it was established that a strategic advantage is gained by institutions with actual IT leaders who assume c-level positions as CIO's (Nelson, 2003).

The CIO role is very broad in Higher education in comparison to a corporate CIO. The higher education CIO needs to deal with multiple issues ranging from academic to students. Protecting the interest of the institution have become more substantially central to the CIO and is clearly evident on how much time the CIO invest addressing business continuity and simultaneously the CIO needs to take advantage of new opportunities and give an indication of how technology can be used to add value to future strategies of the institution (Lambert,

2008). According to Hawkins (2004) “the inclusion of IT in the campus executive decision-making body helps the CIO in understanding competing priorities, strategic issues, and the campus mission and in making technology investments accordingly”.

One of the findings is to consolidate all the IT services and functions within the university. The CIO has a more effective and strategic role to play as it will be part of top management with decision making authority.

6.8.3 Sub-Research question and objective 2

Research question	Research objective
What are the issues around information availability and usability?	Identify the issues around information availability and usability.

Table 6.4 Sub-Research question and objective 2

This objective was met by conducting a literature review, documentation and interviews in a case study environment at CPUT. The purpose was to identify the challenges that users experienced in their interaction when using the IS of the institution. Various information challenges were identified such as unclean data sets, the amount of data on the ITS system and the input of information at several sources.

The importance of information / data for any organisation is highlighted in this section. In today’s economic climate an advantage is created by those who control the value of information (Leavey, 2008). Demands for information provision had dramatically increased in modern times. Universities and other large organisations are immensely challenged to produce accurate information hence it is information centric environments with lots of dependencies. The processing of information at institutions of Higher Education is mission central as it is not easy to identify other enterprises that deals with information on such a large scale (Stuckey, 2007). Stuckey (2007) goes further and says that “Information is our product, our currency, our medium. The CIO is regarded as the custodian of the data and need to ensure that information will be readily available in the event should stakeholders require access.

6.8.4 Sub-Research question and objective 3

Research question	Research objective
What are the IS issues experienced by users interacting with the IS?	Establish the IS issues experienced by users interacting with the IS.

Table 6.5 Sub-Research question and objective 3

This research objective was addressed by means of conducting a literature review and data collected during the interview process. Through the interviews it was established that the non-integration of the various systems creates problems as the users need to retrieve information from multiple sources. Subsequently this creates problems when reports are produced as there is inconsistency about the information. Additionally there are new staff members who are not well knowledgeable about the system and they encounter problems when retrieving information.

The creation of inaccurate information by IS does not conform to the requirements of its users cause disruption of operations, substantial maintenance expenses and high cost to organisations (Gorla *et al*, 2010). The IS issues experienced by users interacting with the IS are related to complex academic information structures and the lack of flexibility of the information systems.

6.8.5 Sub-Research question and objective 4

Research question	Research objective
What are the components and relationships between academic and administrative staff at a university IS that support the academic and administrative support?	Uncovering the components and relationships between academic and administrative staff at a university IS that support the academic and administrative support.

Table 6.6 Sub-Research question and objective 4

In order for CIO's to be effective they need to have working knowledge of multiple areas to support both administrative and academic systems (Hawkins, 2004). From the interviews it were established that a lack of cooperation exist between the academics and administrative staff.

6.8.6 Sub-Research question and objective 5

Research question	Research objective
How does the post-merger environment influence the operation of a university?	Establish the influence of the operation of a university in a post-merger environment.

Table 6.7 Sub-Research question and objective 5

The post-merger environment is still affected by not only the lack of integration of the information systems, but also the lack of a single organisational culture, process and systems.

6.9 Recommendations

The recommendation for appointing a CIO is based on the following reasons:
This CIO should to be part of the top hierarchy to be part of the decision making process and advice executive management of the benefits of IT projects for the institution. Preston *et al* (2008:606) cited by (Karahanna *et al*, 2006) indicate the need for the CIO to have decision making authority in order to control strategic IT initiatives. It is highly unlikely that IT projects will have top management backing and commitment if the CIO is not part of the top management team (Applegate *et al.*, 1992; Khallaf *et al.*, 2007). Providing economic justification and allocating resources to strategic IT projects it is deemed that the CIO position needs to be integrated with top management. This recommendation is supported by the findings of this study.

Furthermore leadership and communication skills are currently regarded as some of the problems that are experience by the CPUT as was mentioned by some of the respondents and the Self Evaluation Report. As recommended by the King III commission the appointment of CIO's at complex organisations should be instituted.

It is recommended that the University need to work towards a sustainable plan to integrate all the different heritage systems. In the end it will culminate towards a better proficient system which will benefit both staff and students at the institution. The integration of the different systems is an ongoing challenge and is to some extent being addressed by the CTS department as a continuation process is in place to address this challenge. As highlighted by several of the respondents the retrieving of information from multiple systems creates an environment where errors can easily creep in. However the CIO possessed diverse skills and knowledge to integrate these heritage systems in optimal time. The CIO is widely renowned

with the integration of different systems in a relative short space of time. Fast integration of IS during mergers is of paramount importance to the role of CIO.

The amount of data on the ITS system is causing major problems so it would be recommended that a cleanup process is required to clean the data within the system. Data cleanup need to be prioritised on the ITS system to ensure that clean and accurate data reside on the ITS system thereby eliminating the retrieving of insufficient data. The problem of incorrect data will be reduced whereby users will be able to extract correct and sufficient information. Currently no individual is taking ownership of the information and it is left to the data owners to decide what route they will follow. A substantial amount of energy and time had been dedicated to address these issues however it lacks ownership. A dedicated person with leadership authority and communication skills should lead this project in order to ensure that this process is adhered to in order to achieve the desired outcome. Based on the literature it is clear that both these challenges are part of the roles and responsibilities of the CIO.

The human element in particular is mainly singled out as the main transgressor of incorrect input of data. Capturing of incorrect information is happening at several sources which made it difficult to determine who actually is to be blamed. The registration department and faculties should identify suitable and qualified individuals to capture data on the ITS system. A training process should be implemented in order to minimize errors. This will assist the MIS department to shift their focus on other issues which also need their intervention.

Subsequently all the different IT related entities namely CTS, Institutional Research (previously MIS) and E-learning to collectively report to a single authority to enhance the lines of communication and delegation of roles and responsibilities.

6.10 CIO framework in Higher Education

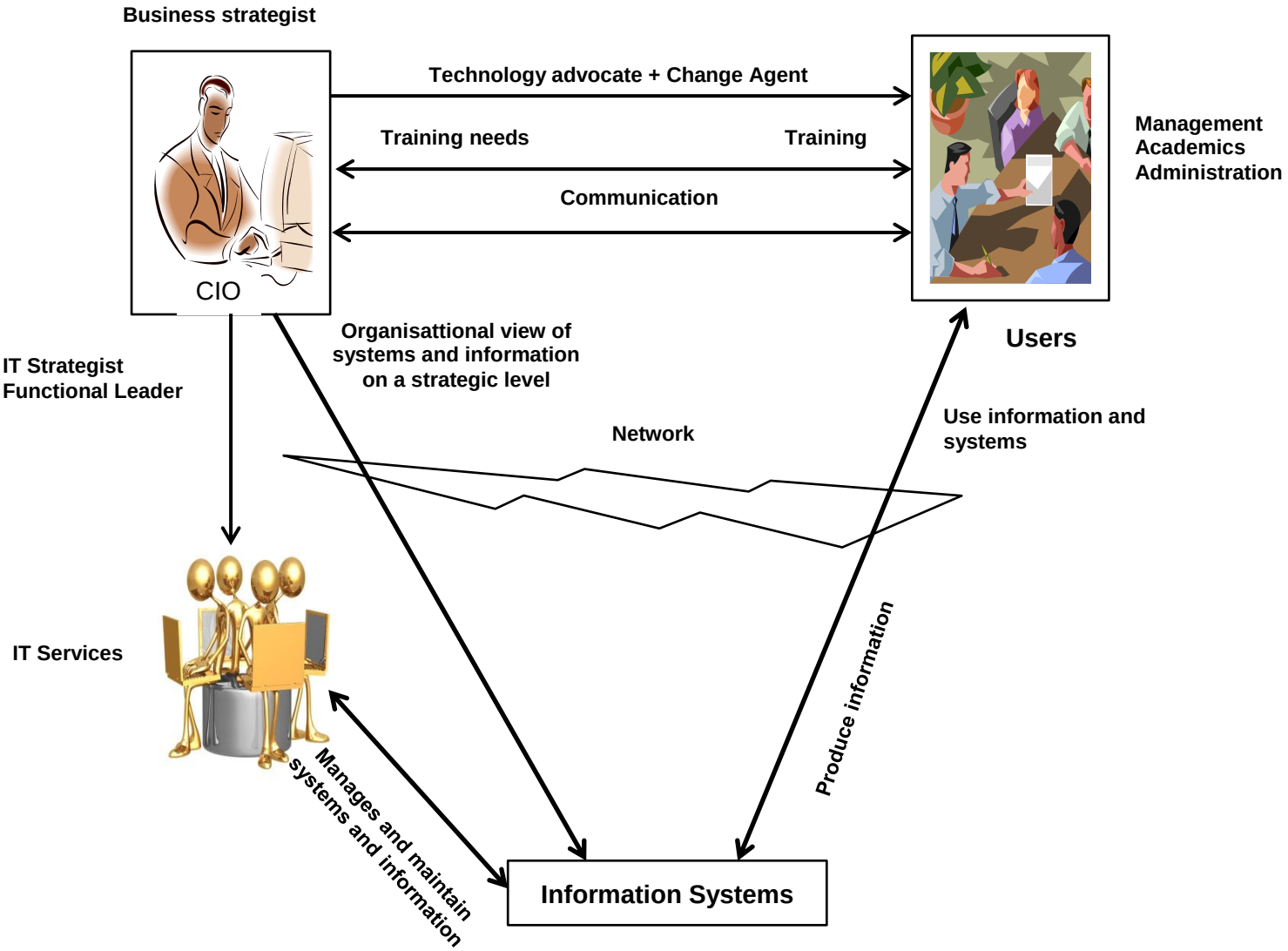

Fig 6.1 Proposed CIO framework in higher education

This framework is derived from the above discussion in summary of the role of the CIO on a strategic level to manage the operational aspect of the institution. There are needs of the users that need to be addressed.

Strengthening the two way communication between the users and the CIO and IT services in particular. Training needs to be identify by the users and the CIO to ensure that relevant training is provided in order to ensure optimal utilisation of the systems.

CHAPTER SEVEN
CONCLUSION

7.1 Introduction

The research study is concluded in this chapter. This chapter broadly provides a summary of all the chapters of the research study. Furthermore the validity of the research in evaluating and interpreting the findings is discussed. In conclusion problems, limitations, future research opportunities and recommendations are discussed.

7.2 Summary of the study

The aim of this study was to understand the role of the CIO in higher education by investigating the issues around IS integration and information availability, data quality and usability in terms of the user's perceptions in a post-merger university. The role of the CIO was considered to determine how this position can enhance better utilisation of the IS.

Chapter 1

This chapter provided the background to the study and highlighted several issues within the literature review. In order to provide accountability to this research, research questions and objectives were compiled to address the identified research problem. The focus is on information availability, data quality, usability and Information Systems within higher education. The role of the CIO was discussed in detail based on the fact that the CIO deals extensively with all the aforementioned issues.

Chapter 2

The focus of this chapter was on the current literature that addresses the status of this respective area of research. The imperativeness of information is explained and subsequently the consequences of incorrect information on the users, stakeholders and organisations and CPUT in particular indicated. The processing of information at institutions of Higher Education is mission central as it is not easy to identify other enterprises that deals with information on such a large scale (Stuckey, 2007). Information demands had increase rapidly in modern times. An IS that produces information which does not conform to the needs of its users is subject to heavy maintenance costs and disruption of operations in the organisation, with serious consequences including high costs to the organisation (Gorla *et al.*, 2010).

The roles and responsibilities of the CIO are explained jointly from a corporate and a higher education perspective and the distinctions between them are also indicated. The CIO contributes to the overall success of an organisation and can assist to address the needs of

users to achieve better results by encouraging them to utilise technology successfully (Remenyi *et al.*, 2005).

Chapter 3

This chapter's primary purpose is the explanation of the research methodology that was applied for this specific study. This research adopted a qualitative approach and the primary objective in deploying this particular approach is defining an understanding instead of explaining human behavior (Babbie *et al.*, 2009). The research onion suggested by Saunders *et al.* (2003) was used to outline the research philosophy, approach, strategy and data collection methods. Moreover a case study was proposed as a suitable research strategy and the data were analysed by applying the thematic analysis method.

Chapter 4

This chapter introduces the background of CPUT and highlights the challenges. Subsequently the process of how the data was collected and what methods had been used to transcribe the data is explained. Interviews were the primary source of data collection for this study as the users perceptions were revealed about the issues that they experienced when interacting with the IS. Unstructured questions were posed to the participants and these were recorded on multiple recording devices and later on transcribed. In addition relevant documentation was used to support and assist the researcher to acquire additional information which was used in some of the interviews.

Chapter 5

This chapter broadly discusses the outcome of the case study and the issues that were raised by the participants based on the interview questions. Thematic networks were applied as a data analysis instrument to analyse the data by identifying themes from the corresponding answers from the participants. The transcribed data was compiled into sentences and was regarded as open code. In cases where common themes were identified these were grouped in order to construct concepts.

Chapter 6

The findings and discussions are listed in this chapter based on what was discussed during the interviews and how the data was analysed to give it more meaning and understanding. The research questions and objectives as indicated in Chapter 1 are addressed in this chapter.

7.3 Validity of the study

The proposed seven principles of hermeneutics (Klein and Myers, 1999) was use to conduct and evaluate the interpretive case research of this project. This is based on the philosophical viewpoint of hermeneutics that mainly applies to studies of this nature. According to De Vries (2005) the word principles have been used and the motive behind this is to emphasize that it is mandatory for additional individuals to choose how these principles are applied in this research project. In Chapter 3, Section 3.10, the validity of the study was stated and now it will be discussed in detail to confirm that the data that was collected for this research study complied of a high quality and was correctly interpreted.

Principle 1: The fundamental principle of the hermeneutic circle

The hermeneutic circle is the most predominant principle of hermeneutics and appears as the basis to all interpretive studies and is considered an underlying superior principle which the other principles is built upon. Human understanding as suggested by this principle is accomplished through constant interaction between the parts and the whole to get a better understanding.

According to the hermeneutic circle the process of human understanding begins with the "parts" which are regarded as the researcher understanding of the CPUT environment. Several primary sources which include literature review, documentation and interviews broaden the researcher understanding and being actively involved within the university. Additionally the participants understanding were gained through their extensive knowledge and experience of being part of the institution for an extended period. The whole is interpreted as the shared meaning and understanding of both the researcher and the participants and the outcome of issues being highlighted when interacting with the IS when retrieving information.

Principle 2: The principle of contextualization

According to this principle a historical distance among the interpreter and the researcher is created as a result of a predictable difference to understand the text. Furthermore the intended audience is able to identify how the existing circumstances which is under investigation had materialised as this principle entails that the subject matter need to put its historical and social context.

At the beginning of Chapter 4 this principle was applied whereby a brief background of the Cape Peninsula University of Technology was described to provide a basis for this case study research. This was done prior to the research outcomes being disclosed and it identified the setting of where the information was collected.

Principle 3: The principle of interaction between the researchers and the subjects

This principle necessitates the researchers to position themselves and the subject matters into a historical perspective, in contrast to the principle of contextualization which places the object of study in context.

The research methodology was discussed in detail in Chapter 3 whereby this principle was applied. The interaction between the researcher and the participants is described in detail and illustrates how data was gathered during the interview process. Different roles are adopted by the researcher and the participants but somehow these roles need to cooperate in order to produce outcomes. These outcomes had been scrutinised to identify certain sentences and later on themes emerged from these sentences.

Principle 4: The principle of abstraction and generalization

The principle of abstraction and generalization allows readers the opportunity to use available data in order to understand and determine whether it will come to the same conclusion as the researcher.

Through the themes which were identified it was possible to categorise the data and the purpose was not to generalize the data although some of it can be generalised.

Principle 5: The principle of dialogical reasoning

The researcher is required to challenge the data that transpire through the research process with their preconceptions that directed the original research process. The most fundamental fact is that historical intellectual foundation of the research should be made as transparent as possible by the researcher to its readers. The lenses through which field data are interpreted, documented and organised are being provided by the intellectual foundation of the research design. The possibility exist that the research findings may not support these preconceptions and may have to be either modified or totally abandoned. Prior knowledge plays a pivotal part in our understanding as indicated by the above process which is one instance of the hermeneutic rule.

Sensitivity is required based on the researcher's theoretical preconception which is based on documentation and literature review in Chapters 2 and 3. The researcher's theoretical preconception and the data that had transpired from the research confront each other.

Principle 6: the principle of multiple interpretations

The principle of multiple interpretations, the researcher is required to examine the influences of the social background under study. In this instance it will be achieved through exploring and documenting multiple perspectives and providing the necessary reasons. Furthermore the researcher should revise their understanding accordingly in terms of confronting the contradictions inherent in the multiple perspectives with one another. Although there are similarities with the principle of dialogical reasoning with the exception of that this principle applies the confrontation of conflicting interpretations of the participants within the research environment.

This principle required sensitivity due to participants having different interpretations during the interview process. During the examining of the data it was established that certain participants interpretations conflicted with each other.

Principle 7: The principle of suspicion

Generally all the aforementioned principles are primarily concerned with the interpretation of meanings in contrast to the principle of suspicion which is concerned with the uncovering of false preconceptions.

During the research partiality was eluded as multiple participants from the university participated in the interviews process. Secondly multiple data collection analysis methods were utilised thus eliminating the opportunity of any inaccuracies of the data that was collected.

7.4 Problems and limitations of study

The researcher was not previously aware that several data owners had been identified to look into data problems within their respective departments. The DQC identified these individuals and the purpose is to correct incorrect data which that had been identified on the system. In essence these would have provided an opportunity to establish as to what are being done with the data that had been identified by the DQC. The researcher could not determine whether the incorrect information is corrected and who is responsible to ensure that the process is implemented. The rationale is that one of participants revealed that some of the data owners have insufficient knowledge pertaining to their data and would liaise with their subordinates when data problems arise.

The sensitivity of the nature of this case study impacted on the participants and some were reluctant not to divulge too much information. In this way some problems remain concealed

and staff would not disclose it during the recording process of the interviews. The issue of the code of conduct of employees should also be taken into consideration as employees are expected not to disclose too much information about the university in the open domain. In some way this can be interpreted as derogatory and defaming the institution with legal implications.

The researcher did not interview one of the members of executive management who perhaps would have provided key answers on some of the literature. A matter such as the level of IT decision making and their input regarding the support of IS at the institution.

7.5 Conclusions

Generating accurate information is unquestionably one of the biggest challenges that higher education institutions encounter. Universities and other large institutions are immensely challenged to produce accurate information hence it is information centric environments. Identifying other enterprises that deals with information on such a large scale is a difficult process coupled with the fact that demand for information provision had dramatically increased in modern times.

Even though no best practice exists for the integration of systems it is eminent that several positive outcomes are achieved by having organisations who had accomplished this complex activity. The provision of quality, accurate and useful information and sufficient end-user support is contributing to an effective reliable and responsive system.

The rise of the CIO emanates from the fast growth of IT and its holistic integration into entire academic operations. Subsequently the increased dependence on ICT by higher education institutions had led to the growth of the CIO position to ensure that technology and information is optimally utilised. The advancement of technology planning to strategic planning resulted in the success of the CIO mainly due to the recognition of knowledge management as the principal element of strategic planning.

REFERENCES

Alaranta, M. 2005. Evaluating Success in Post-Merger IS Integration : A Case Study. *Electronic Journal of Information Systems Evaluation,* 8(3):143–150.

Alaranta, M. & Henningsson, S. 2008. An approach to analyzing and planning post-merger IS integration: Insights from two field studies. *Information Systems Frontiers*, 10(3):307–319.

Alaranta, M. & Kautz, K. 2012. A Framework for Understanding Post-Merger Information Systems Integration, *Journal of Information Technology Theory and Application (JITTA)*: 13(1).

Applegate, L.M. & Elam, J.J. 1992. New information system leaders: A changing role in a changing world. *MIS Quarterly*, 16(4):469-490.

Atkins, C. & Sampson, J. 2002. Critical Appraisal Guidelines for Single Case Study Research, ECIS. Poland 6 – 8 June

Attride-Stirling, J. 2001. Thematic networks: an analytic tool for qualitative research. *Qualitative Research*. 1(3):385-405.

Babbie, E. & Mouton, J. 2009. The practice of social research. Oxford University Press

Bailey, J.E. & Pearson, S.A. 1983. Development of a tool for measuring and analyzing computer satisfaction. *Management Science*, 29(5):530-545.

Baty, 2010. Can African Universities Compete? *Times Higher Education*. September. [Available at http://ghanaweb.com/GhanaHomePage/features/artikel.php/ID=202606

Baxter, P. & Jack, S. 2008. Qualitative Case Study Methodology : Study Design and Implementation for Novice Researchers. *The Qualitative Report*, 13(4):544–559. Retrieved from http://www.nova.edu/ssss/QR/QR13-4/baxter.pdf

Benbasat, B.I., Goldstein, D.K. & Mead, M. 1987. The case research strategy in studies of information systems: case research strategies: *MIS Quarterly*, September. 11(3):369-386.

Black, R. 2009. The Higher Education Chief Information Officer. April. [Available at http://www.phoenix.edu/profiles/faculty/ronald-black/articles

Black, R. 2006. The Chief Information Officer in Higher Education.

Bowen, G.A. 2005. Preparing a Qualitative Research-Based Dissertation : Lessons Learned. *The Qualitative Report*, 10(2):208–222. June

Brandel, M. 2006. Are you M&A ready. *Computerworld*, 49-53.

Branin, J. 2009. The Rise of the CIO*. College & Research Libraries,* 70(6):512 – 513.

Brennan, J. 2008. Higher Education and social change. *Higher Education*, 56:381-393.

Brown, W.A. 2007. 2007 Higher Education CIO effectiveness study.

Bulfin, M.P. 2009. Perspectives on higher education in Africa: Fieldnotes on trends, themes, challenges and opportunities. Ufahamu: *A Journal of African Studies*, 36(1).

Burton-Jones, A. & Grange, C. 2008. Using Information Systems Effectively: A Representational Perspective, Proceedings of JAIS Theory Development Workshop. *Sprouts: Working Papers on Information Systems,* 8(21). http://sprouts.aisnet.org/8-21

Byrd, T.A., Thrasher, E.H., Lang, T. & Davidson, N.W. 2006. A process-oriented perspective of IS success: examining the impact of IS on operational cost. *Omega: The International Journal of Management Science,* 34:448-460.

Cash, J.I. & Pearlson, K.E. 2004. The Future CIO. *Information Week*. 28-29.

Chun, M. & Mooney, J. 2009. Information & Management CIO roles and responsibilities : Twenty-five years of evolution and change. , 46:323–334.

Collis, J. & Hussey R. 2009. Business research: A practical guide for undergraduate and postgraduate students (3rd ed.) UK: Palgrave Macmillan

Corkill, H. 2008. Learning for work and working to learn: Challenges within a changing UK higher education system. *US-China Education Review*. 5(1).

Cossey, B. 1991. Systems assessment in acquired subsidiaries. *Accountancy*, 107(1169):98-99.

Darke, P., Shanks, G & Broadbent, M. 1998. Successfully completing case study research: Combining rigour, relevance and pragmatism. *Information Systems Journal*, 8:273-289.

Department of Education (DoE). (2004) Draft white paper on e-Education. Transforming learning and teaching through Information and Communication Technologies (ICTs) Government Gazette. No. 26734.

De Clercq, F. 2002. Education Policy implementation and the bureaucratic struggle for efficiency, equity, quality and democracy. *Journal of Education*. 27:81-102

Department of Education (DoE). 2004. Draft white paper on e-Education Online Accessed at: http://www.policy.org.za/html/govdocs/misc/higheredu

De Vries, E.J. 2005. Espitemology and Methodology in Case Research : A Comparison Between European and American IS Journals. *ECIS 2005 Proceedings.* 145.

Dudas, M. & Tobisson, P. 2007. Information Systems Integration in Mergers and Acquisitions. M.A thesis, Lund University,

Du Pré, R. 2009. The place and role of universities of technology in South Africa. Bloemfontein: DUT: South African Technology Network.

Dutta, R. & Burgess, T.F., 2003. Prioritising information systems projects in higher education. *Campus-Wide Information Systems*, 20(4):152–158.

Earl, M.J. & Feeny, D.F. 1994. Is your CIO adding value? *Sloan Management Review*, 11-20. Spring

Edwards, C., Lambert, R. & Peppard, J. 2009. Clarifying the confused role of the Chief Information Officer. *Harvard Business Review.*

Enns, H.G., Huff, S.L. & Golden, B.R., 2003. CIO influence behaviors: the impact of technical background. *Information & Management*, 40(5):467–485.

Enns, H.G., Huff, S.L. & Higgins, C.A. 2003. CIO lateral influence behaviors: Gaining peers commitment to strategic information systems. *MIS Quarterly*, 27(1):155-176.

Enns, H.G., Huff, S.L. & Golden, B.R. 2001. How CIOs obtain peer commitment to strategic IS proposals: barriers and facilitators. *The Journal of Strategic Information Systems*, 10(1):3–14.

Evans, N. 2006. Leading information technology in South Africa: a unique challenge. *SIGMIS-CPR,* 13-15 April.

Fielden, J. & Markham, L. 1997. CHEMS Paper No 17 LEARNING LESSONS FROM MERGERS IN HIGHER EDUCATION, 17:1–8.

Flyvbjerg, B. 2006. Five Misunderstandings about Case-Study Research. *Qualitative Inquiry*, 12(2):219–245. April

Gerrish, K. 1997. Being a 'marginal native': dilemmas of the participant observer. *Nurse Researcher*, 5(1):25-34.

Giacomazzi, F., Panella, C., Pernici, B. & Sansoni, M . 1997. Information systems integration in mergers and acquisitions: A normative model. *Information & Management*, 32(6):289–302.

Gorla, N., Somers, T.M. & Wong, B. 2010. Organizational impact of system quality, information quality, and service quality. *The Journal of Strategic Information Systems*, 19(3):207–228.

Gottschalk, P. 1999. Strategic management of IS/IT functions: the role of the CIO in Norwegian organisations. *International Journal of Information Management*, 19(5):389–399.

Gottschalk, P. 2007. *CIO and Corporate Strategic Management: Changing Role of CIO to CEO*. Hershey, PA: Idea Group Publishing.

Griffiths, J. 2003a. CIO in Universities. *Encyclopedia of Library and Information,* Pennsylvania.

Griffiths, J. 2003b. The evolving role of Chief Information Officers in higher education. *Advances in library administration and organisation*, 20:17-36.

Guo, Z. & Sheffield, J. 2008. A paradigmatic and methodological examination of knowledge management research: 2000 to 2004. *Decision Support Systems*. 44:673-688.

Hawkins, B.L. 2004. A Framework for the CIO position. *EDUCAUSE Review*, 39(6)):94–103. November/December

Henningsson, S. 2008. *Managing Information Systems Integration in Corporate Mergers and Acquisitions.* PhD Thesis, Lund University.

Huang, E. & Chuang, M.H. 2007. Extending the theory of planned behaviour as a model to explain post-merger employee behavior of IS use. *Computers in Human Behavior*, 23(1):240–257.

Huh, Y.U., Keller, F.R., Redman, T.C. & Watkins, A.R. 1990. Data quality. *Information and Software Technology*, 32:559-565.

Hyde, K.F. 2000. Recognising deductive processes in qualitative research. *Qualitative Market Research: An International Journal*, 3(2):82-90.

ITS holdings. n.d. www.its.co.za [13 July 2008].

Jaffer, S., Ng'ambi, D. & Czerniewics, L. 2007. The role of ICTs in higher education in South Africa: One strategy for addressing teaching and learning challenges. *International Journal of Education and Development using Information and Communication Technology.* 3(4):131-142.

Jansen, J.D.(ed). 2002. *Mergers in higher education: lessons learned in transitional contexts.* Pretoria. University of South Africa.

Johnson, G., Scholes, K. & Whittington, R. 2006. Exploring corporate strategy: Text and cases, FT/Prentice-Hall, Harlow.

Kanellis, P & Papadopoulos, T. 2009. Conducting research in information systems: an epistemological journey. In Cater-Steel *et al*., eds. *Information Systems Research Methods, Epistemology and Applications.* Information Science Reference (IGI Global), Hershey PA, USA. 1-34.

Karahanna, E. & Watson, R.T. 2006. Information Systems leadership. *IEEE Transactions on Engineering Management,* 53(2):171-176

Kavanagh, M.H. & Ashkanasy N.M. 2006. The impact of leadership and change management strategy on organisational culture and individual acceptance of change during a merger. *British Journal of Management,*17:S81-S103.

Kelly, T.D. & Sharif, N.M. 2005. Understanding the mindset of higher education CIOs. *EDUCAUSE Quarterly,* 4:33-43

Khallaf, A. & Skantz, T. 2011. Does long term performance improve following the appointment of a CIO? *International Journal of Accounting Information Systems*, 12(1):57–78.

Khallaf, A. & Skantz, T. 2007. The effects of IT expertise on the market value of a firm. *Journal of Information Systems*, 21(1):83-105.

Kim, S. 2003. Research Paradigms in Organisational Learning and Performance: Competing Modes of Inquiry, *Information Technology, Learning, and Performance Journal*, 21(1).

Kirkeby, O.F. & Anderson, H.(Eds) 1990. *Vetenskapsteori och metodlara. Introduktion,* Studentlitteratuur, Lund, Translated from Danish by Carl G. Liungman: 1994.

Kistan, C. 2002. Recognition to prior learning: a challenge to higher education. *South African Journal of Higher Education,* 16(1):169-173.

Klein, H.K. Myers, M.D. 1999 A Set of Principles for Conducting and Evaluating Interpretive Field studies in Information Systems, *MIS Quarterly*, 23(1).

Krishnaveni, R. & Meenakumari, J. 2010. Usage of ICT for information administration in higher education institutions – A study. *International Journal of Environmental Science and Development.* 1(3):282-286. (www.ijesd.org/papers/55-D461.pdf)

Knight, S. 2011. The combined conceptual life-cycle model of information quality: part 1, an investigative framework*, International Journal of Information Quality*, 2(3).

Lambert, H.D. 2008. Managing Risk and Exploiting Opportunity. *EDUCAUSE Review*, 43(6) (November/December)

Lane, M.S & Koronios, A. 2007. Critical Competencies Required for the Role of the Modern CIO. *18th Australasian Conference on Information Systems*, 5-7 December 2007, Toowoomba, Australia, 1099-1109.

Laplante, P.A & Bain, D.M. 2005. The changing role of the CIO: Why IT still matters. *Journal IT Professional,* 7(3):45-49. May

Lawry, R. & Waddell, D. 2008. CIOs in the Public Sector : Their Roles, Responsibilities and Future. *International Review of Business Research Papers*. 4(2):163–175.

Lawry, R., Waddell, D. & Singh, M. 2007. Roles, responsibilities and futures of chief information officers (CIOs) in the public sector. *Proceedings of European and Mediterranean Conference on Information Systems(EMCIS)*. 24 -26 June, The Information Institute, Washington, USA.

Leavey, J. 2008. Realising value from a Chief Information Officer. 1 December, www.deloitte.com

Leverman, A. 2008. 'The role of leadership in job requirements and responsibilities of the CIO'. M.A. thesis, University of Oregon, Portland.

Lineman, J.P. 2007. The Corporate CIO Model and the Higher Education CIO. EDUCAUSE Quarterly, 1:4-5. January.

Lucey, M. 2009. The Higher Education CIO's Year Ahead. Available http://ondemandhigheredu.wordpress.com/2009/12/08/the-higher-education-cio%E2%80%99s-year-ahead/

Meeker, M., Joseph, D., & Ji, R. 2007. "Technology/Internet Trends," Presentation by Morgan Stanley Research at the Web 2.0 Summit, San Francisco, October 18

Melone, N.P.1990. A theoretical assessment of the user-satisfaction construct in information systems research. *Management Science*, 36(1):76-91.

Merali, Y. & McKiernan, P. 1993. The strategic positioning of information systems in post-acquisition management. *The Journal of Strategic Information Systems*, 2(2):105–124.

Moore, L. & Savage, J. 2002. Participant observation, informed consent and ethical approval. *Nurse Researcher,* 9(4):58-69.

Myers, M.D. 1997. Qualitative Research in Information Systems, *MIS Quarterly.* 21(2):241-242. *MISQ Discovery*, archival version, June, http://www.misq.org/supplements/. *Association for Information Systems (AISWorld) Section on Qualitative Research in Information Systems,* updated version, last modified: March 21, 2013 www.qual.auckland.ac.za

Myers, M.D. 2004. Hermeneutics in information systems research. *Social theory and philosophy for information systems,* 28-103. Chichester: Wiley Publications.

Naidoo, A. 2009. A slice of management in merged institutions: Some deans' perspectives. *South African Journal of Higher Education*, 23(1):127-141.

Nelson, M.R. 2003. The CIO in Higher Education: Leadership, Competencies, Effectiveness. Centre for Applied Research: Research Bulletin, 22:1-13. www.educause.edu./ecar/

Nestor, P.G. & Schutt, R.K. 2012. Research Methods in Psychology – Investigating human behavior. Boston: SAGE Publications.

Nzimande, B. 2009. Some challenges facing the South African Higher Education system. Politicsweb. August 17.

Omona, W., Van der Weide, T. & Lubega, J. 2010. Using ICT to enhance knowledge management in higher education: A conceptual framework and research agenda. *International Journal of Education and Development using Information and Communication Technology*, 6(4):83-101.

Okoli, C. & Schabram, K. 2010. Working Papers on Information Systems A Guide to Conducting a Systematic Literature Review of Information Systems Research. 10.

Passino Jr, J.H. & Severance, D.G. 1998. The changing role of the Chief Information Officer. *Planning Review*. 16(5):38-42.

Paterson, A. 2005. Information systems and institutional mergers in South African higher education. *South African Journal on Higher Education,* 19(1):113–128.

Peirce, C.S. 1931. In Harsthorne, C. & Weiss, P. (Eds), *Collected Papers of Charles Sanders Peirce*. 1. Cambridge, MA. Harvard University Press.

Petter, S., DeLone, W. & McLean, E. 2008. Measuring information systems success: models, dimensions, measures, and interrelationships. *European Journal of Information Systems*, 17(3):236–263.

Preston, D.S., Chen, D., & Leidner, D.E. 2008. Examining the Antecedents and Consequences of CIO Strategic Decision-making Authority: An Empirical Study. *Decisions Sciences*. 39(4).

Punch, K.F. 1998. Introduction to social research: quantitative and qualitative approaches (2nd ed.). Thousand Oaks, London: SAGE Publications.

Qualitative Research Methods: A Data Collector's Field Guide. 2005. Module 1 Qualitative Research Methods Overview, *Family Health International*. Date access: 31 July 2010 http://www.fhi360.org/resource/

Reddy, T. 2007. Staff perceptions of the merger between two South African regional Technikons. ,*South African Journal on Higher Education*, 21(3):485–502.

Remenyi, D., Grant, K. & Pather, S. 2005. The chameleon: a metaphor for the Chief Information Officer. *Journal of General Management*, 30(3):1-11, Spring.

Robbins, S.S. & Stylianou, A.C. 1999. Post-merger systems integration: the impact on IS capabilities. *Information & Management*, 36(4):205–212.

Runeson, P. & Höst, M. 2009. Guidelines for conducting and reporting case study research in software engineering. *Empirical Software Engineering*, 14:131–164.

Sabry, K. & AlShawi, S. 2009. Information systems for higher education: interactive design perspective. *Information Systems for Higher Education*, 3(2):163–180.

Saunders, M., Lewis, P. & Thornhill, A. 2003. Research methods for business students (3rd ed.) England: Prentice Hall.

Seddon, P.B. 1997. A Respecification and Extension of the DeLone and McLean Model of IS Success. *Information Systems Research.* 8(3), (September)

SELF – EVALUATION REPORT. 2010. Cape Peninsula University of Technology

Shakir, M. 2002. The selection of case studies : Strategies and their applications to IS Case Study Design : A Focus on Case Selection. 3:191–198.
http://www.massey.ac.za/~wwiims/research/letters

Sharif, N.M. 2005. Understanding the mindset of higher education CIOs. 4:33–43.

Smith, J.K. 1983. Quantitative versus qualitative research: An attempt to clarify the issue. Educational Researcher, 12(3):6-13.

Sobol, M.G. & Klein, G. 2009. Relation of CIO background, IT infrastructure and economic performance. *Information & Management*, 46(5):271–278.

Spens, K.M & Kovacs, G. 2006. A content analysis of research approaches in logistic research. *International Journal of Physical Distribution & Logistics Management*. 36(5):374-390.

Stair, R.M. & Reynolds, G.W. 2003. Principles of Information Systems: a managerial approach. Boston, MA: Thomson/Course Technology.

Stephens, C. & Loughman, T. 1994. The CIO's chief concern: Communication, *Information and Management*, 27:129-137.

Steyn, H.J & van der Walt, J.L. 2005 Samestelling tussen twee hoeronderwysinstellings: n gevallestudie vanuit bestuurder-deelnemer-perspektief. Tydskrif vir Geestewetenskappe, 45(1):55-67.

Stockley, D. 2011. GLOBAL TRENDS IN HIGHER EDUCATION. , (May).

Strong, D.M., Lee, Y.W., Wang, R.Y. 1997. Data Quality in context. Communication of the ACM, 40(5), May

Stuckley, J. 2007. Why the heck does higher education need chief information/technology officers?. http://ubiquity.acm.org/article.cfm?id=1295284 August

Stylianou, A.C., Jeffries, C.J., & Robbins, S.S. 1996. Corporate mergers and the problem of IS integration. *Information & Management*, 31:203-213.

Tagliavini, M., Moro, J., Ravarini, A. & Guimaraes, T. 2003. Shaping CIO competencies and activities to improve company performance: an empirical study.

Tanga, V. L. 2009a. Consolidation Update. *Vice-Chancellor's Quarterly,* 1(1). April.

Tanga, V. L. 2009b. Dreaming and planning about CPUT: 2010-2020. *Vice–Chancellor's Quarterly*. 1(4). November-December

Tanga, V. L. 2011. Shelley Point break-away. Vice-Chancellor's Quarterly. 3(1). March-April

Trochim, W.M.K. 2006. Research Methods Knowledge Base. http://www.socialresearchmethods.net/kb/dedind.php

Universities of Technology. 2008. Position, role and function of Universities of Technology in South Africa. *South African Technology Network*. March, http://www.satn.co.za

Uys, P. 2007. Enterprise-wide technological transformation in higher education: The LASO model. International Journal of Educational Management. (http://www.globe-online.com/philip.uys 08 uysLASOmodel.htm)

Varon, E. 2010. 2010: The Future of the CIO. http://www.cio.com/article/32032/2010_The_Future_Of_The_CIO?page=1&taxonomyId=3174

Villiano, M. 2008. Rise of the CIO, Electric Perspectives, 33(4):18-31

Walsham, G. 1995. Interpretative case studies in IS research: nature and method. *European Journal of Information Systems,* 4(2):74-81.

Walsham, G. 2006. Doing interpretive research. *European Journal of Information Systems*, 15(3):320–330.

Wan, Y. & Peterson, M.W. 2007. A case study of a merger in Chinese higher education: The motives, processes, and outcomes. *International Journal of Educational Development*, 27(6):683–696.

Wang, R.Y & Strong, D.M. 1996. Beyond accuracy: what data quality means to data consumers. Journal of Management Information Systems. 12(4):5-34.

Webb, A.C.M. 2006. Moving towards an African identity: a personal vision for the future of Rhodes University.

Weber, R. 2004. The Rhetoric of Positivism Versus Interpretivism. *MIS Quarterly*. 28(1):iii-xii. March

Wijnhoven, F., Spil, T., Stegwee, R. & Tjang A Fa, R. 2006. Post-merger IT integration strategies: an IT alignment perspective. *The Journal of Strategic Information Systems*, 15(1):5–28.

Usluel, Y.K., Askar, P. & Bas, T. 2008. A structural equation model for ICT usage in higher education. Educational Technology & Society. 11(2):262-273. www.ifets.info/journals/11_2/19.pdf)

Yin, R.K. 2003. Case study research: Design and methods (3rd ed.). Thousand Oaks, CA: SAGE Publications.

Yin, R.K. 1993. Applications of case study research. Beverly Hills, CA: SAGE Publications

Zhuang, L. 2011. Is it the more the merrier ? An exploratory study into the growing problem of information overload. , 6(1):69–83.

APPENDIX A: INTERVIEW QUESTIONS

I am conducting research in order to develop an understanding of why the institution currently still faces the challenges of insufficient information which is being produced by the IS. Integration of systems during mergers is regarded as a critical factor for successful mergers.

Interview Questions

Your background and experience in Higher education. Would you please tell me more about your role and responsibilities.

Prof. Tanga statement in 2009 “The information within the information systems was becoming a nightmare”. Do you perhaps share this experience and if possible provide reasons?

Do you remember an occasion where you personally encounter any problem with the information that has been retrieved from our ITS system (IS). What happened in this particular instance? Please explain.

Have one of your staff members ever complain about insufficient or incorrect information that were retrieved from ITS and what was your response?

Describe your feelings when handling information and you later on realized or discover that it was incorrect or insufficient? What is your reaction?

What type of information is you working / dealing with and does the IS support your tasks?

Who needs information from you and how critical is these information? (Staff, dean, EM)

Given your position, how dependent are other staff members on information that you generate or produce in sharing it with them?

What information is important for your work?

What will you regard as the biggest challenge that hinders the successful retrieving of information from our ITS “IS” system.

In addition to the previous question, how is the quality of the IS, quality of information and quality of service in your own experience.

In your opinion does CPUT have the necessary resources to respond to the rapid growth of IT in higher education? Any possible recommendation.

In your opinion, did staff receive the required training and skill to use the IS sufficiently. Please explain.

Is it easy to use the IS of the institution and is it easy to learn the functionality of the system?

In the event that CPUT network is down and the system is off line is there any means to continue with your normal tasks? This relates to business continuity.

CPUT vision is “To be at the heart of Technology education” but how well does the institution utilise technology within the institution?

One of the recommendations from the Quality Audit Report is that the University has to ensure that all technology used takes account of the requirements that equipment and software are up to date and meet industry standards. Who in your opinion will ideally be responsible for this task?

Prof Tanga highlighted the fact that institutions have become such complex organizations that it had to adopt practices of the corporate sector. Strategic Planning is one such practice. In the corporate sector when mergers materialized the CIO is responsible for the holistic integration of Information Systems. Currently we don’t have a Chief Information Officer (CIO) at CPUT, do you think this individual might be able to produce the desired impact to the institution if being part of EM?

Closing: I would like to thank you for granting me this opportunity out of your busy schedule.
I will send transcripts via e-mail, plus an additional copy of my final thesis.

Interview Questions: Senior IT Management

I am conducting research in order to develop an understanding of why the institution currently still faces similar challenges of insufficient information when retrieving information from the Information system.

Your background and experience in IT.

Would you please tell me more about your role and responsibilities as IT director within CPUT.

What according to you are the current IT challenges within CPUT.

What contribution have you made thus far in resolving some of the IT challenges which hamper the workflow of the institution?

Based on literature it is understood that insufficient attention has been dedicated to the role of IS in organisations that had engaged in merger activities, What was CPUT position, similar or not? Please explain.

Prof. Tanga made the following statement in 2009 “The data within the information systems was becoming a nightmare”. Do you perhaps share this experience?

What Information Architecture are you using?

What is the involvement of the user (level of user) in your IS strategy. Do you use the experiences of the Faculties of Engineering and FID.

Are you aware or did you ever encounter any problem with the information that has been retrieved from our ITS system (IS).

Have one of your staff members ever complain about insufficient or incorrect information that were retrieved from ITS and how do you managed these complaints?

Is the IS integrated or are you in the process of integration and secondly is there a continuation process in place to integrate the IS?

Is sufficient resources allocated to the IT department?

In your opinion does CPUT have the necessary resources to respond to the rapid growth of IT in higher education?

How close does the IT director interact with the academic IT coordinators within the respective faculties?

Who is the custodian of the information at CPUT?

What is the vision of the CTS department over the next couple of years?

Prof Tanga highlighted the fact that institutions have become such complex organizations that it had to adopt practices of the corporate sector. Strategic Planning is one such practice. In the corporate sector when mergers materialized the CIO is responsible for the holistic integration of Information Systems. Currently we don't have a Chief Information Officer (CIO) at CPUT, do you think this individual might be able to produce the desired impact to the institution if being part of EM?

What role should the CIO have within the higher education sector?

Closing: I would like to thank you for granting me this opportunity out of your busy schedule. I will send transcripts via e-mail, plus an additional copy of my final thesis.