THE EFFECTS OF INFORMATION SYSTEMS ON END-USERS AND THE ORGANISATIONAL PROCESSES AT A UNIVERSITY OF TECHNOLOGY

by

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ABSTRACT

The aim of this research was to describe the effects of information systems on staff performance and institutional business process performance at a selected University of Technology (UoT); as an indicative example of a University of Technology. This research was also to investigate different end-users' experience of the use of certain information systems/processes and performance thereof. This led to the determination of what caused different role players to perceive a varying range of problems in the use of organisational information systems and internal business processes at the selected UoT. The unit of analysis was   selected integrated information systems at the UoT and the object of analysis was the staff of the Faculty of Engineering.

The research adopted a quantitative approach in order to investigate verifiable data which was amassed using a questionnaire. This research was undertaken ethically in order to protect all participants, as well as the integrity of the University.

Statistical Package for Social Software (SPSS 22.0) was used for data capturing and analysis. The output was a general framework to guide the determination and effects of information systems on end-users and on institutional processes at a University of Technology. Furthermore, it will guide the design and modelling of institutional business processes to improve operational efficiency.

Key words: Information Systems, Business Process, Higher Education, University of Technology, End-Users, Perception.

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DEDICATION

This research project is dedicated to Lyse, Joy, David and Peace Irakoze as a great inspiration in their respective future careers.

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GLOSSARY

Term	Definition
Integrated Tertiary Software (ITS)	Integrated Tertiary Software is an ERP system which incorporates all operational units and functions into a single integrated system that serves the entire institution.
IS	Information System
CELCAT Timetabling System (CTS)	Online system used to arrange timetables
Electronic Requisitioning System (ERS)	Online system used for processing requisitions
Leave Application System (LAS)	Online system used for leave application
Leave Application Process (LAP)	Process involved when applying for leave
Learner Management System (LMS)	Online software used to teach and assess students
Management Information System (MIS)	Online web portal to access statistical data such as student enrolments, pass rates, and throughput rates.
Marks Administration System (MAS)	Web based software that enables staff to upload student's assessment marks, as well as to draw class lists.
Marks Administration Process (MAP)	Process involved while administering students' results
Marks Alteration Process (MAIP)	Process involved while changing students' results on the MAS
SPSS	Statistical Package for Social Software

CHAPTER ONE

INTRODUCTION

"The first rule of any technology used in a business is that automation applied to an efficient operation will magnify the efficiency. The second is that automation applied to an inefficient operation will magnify the inefficiency."
- Bill Gates.

1.1   RESEARCH BACKGROUND

Institutions of Higher Learning such as the selected University of Technology (UoT) have embarked on the computerisation of their business activities; mainly introducing integrated application systems such as Integrated Tertiary Software (ITS) and Microsoft office packages, which are being updated frequently to ensure delivery of good quality services and products to their stakeholders. Drawing from the above quote from Bill Gates, this technology is also employed to allow automation of institutional business operations in order to improve efficiency at the selected UoT. However, very limited studies have been conducted to investigate the effects of information systems and processes on end-users at a University of Technology. In this study, the main focus is on some information systems or modules that constitute an integral part of the ITS as an Enterprise Resource Planning (ERP) system and the corresponding business processes at the selected UoT.

The selected UoT is the largest public institution of higher learning in the Western Cape Province formed from the merger of two institutions in 2005. It is 7th largest university in South Africa with close to 34,000 students. The university is well-positioned to play a vital role in response to a number of national research and development initiatives within the higher education sector as well as to respond to the relevant millennium development goals aimed at addressing scarce skills.

The research attempted to study the effects of these information systems or modules on end-users and organisational processes. Integrated systems enable Higher Education Institutions (HEIs) to gather data and legacy systems that were disparate into a single, central point and to adopt modern technology. Remote end-users of information systems are enabled to access real time information from the institutional integrated database containing data from different departments (Seo, 2013:15).

The selected UoT makes use of the Integrated Tertiary Software as an ERP system which integrates various key operational units onto a central integrated system in use

by the university. ITS Tertiary Software is an international vendor that offers an ERP software solution used by institutions of higher learning. This integrated solution brings together functional units such as the MIS as well as the personnel, student, finance, payroll and facility managerial units. According to ITS (online), the ITS system operates on an Oracle database that can be accessed via any browser through either Intranet or Internet. The information systems that are subjects of this study are components or modules of ITS[1]. This research provided a review of the literature around the field of study in order to achieve a conceptual model that will guide the collection and analysis of data to determine the effects of information systems on end-users and organisational processes at a University of Technology. The questionnaire was compiled and distributed in order to elicit the perceptions around the information systems and processes by different end-users within the selected organisation. An analysis was performed on the collected data and the results were then presented. This research reports on the findings and concludes with a number of recommendations. The results were used to establish whether these information systems were in line with existing processes. It is crucial for an institution of higher learning to align their business processes and information systems so as to ensure efficiency within the organisation.

The next section discusses the background of the research problem that was intended to be solved in this thesis. Notably, the research problem posed in this study had its roots in the impact of the merger between educational institutions and the continuous automation of existing internal business activities at the selected UoT.

1.2   THE RESEARCH PROBLEM

1.2.1 Background to the research problem

The research problem posed in this study is that different role players perceive a widely varying range of problems in the use of organisational information systems and internal business processes at the selected UoT. This problem stems from the impact of the merger between the educational institutions that make up the selected UoT, as well as the continuous automation of existing internal business activities/processes.

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[1] ITS. Retrieved from: 'http://www.itstertiarysoftware.co.za/index.php'

The merging of institutions such as the selected UoT has created an additional challenge of non-alignment of internal institutional processes, systems, and the duplication of organisational resources (Evans, 2010:13). The experiences and perceptions of different end-users of the information systems and processes within the organisation should be investigated at an early stage, so as to locate the origin of the problems, areas of difficulty in implementation, and to establish an appropriate course of action. Very limited studies have been done to establish the effects of information systems and processes at a UoT.

The South African government via its Department of Education (DoE) has joined other countries in implementing high education mergers so as to achieve a certain number of objectives (Utley, 2002). Substantial savings were achieved as a result of a merged and consolidated administration whereby student services, facility management, purchasing and other operational units were merged (Light 2002). The South African DoE (2002:35) reported that the direct costs of the mergers would be covered by the national Department of Education so as to ensure the financial sustainability of the merged institutions. The National Finance Department (2003) reported in its fourth chapter of the annual report regarding education that support in the form of R800 million was allocated to these mergers. Presumably, the cost of the information technology systems would be incurred from this fund.

Universities of Technology in South Africa were also targeted for mergers, with six UoTs undergoing this process. This research centres on one of these universities situated in the Western Cape Province. The unit of study is the Engineering Faculty, and Chapter 3 of this thesis provides more details about the case and the unit of analysis. During the merger at the selected UoT, even though the merged institutions had both used ITS as an ERP, the selected UoT automated the existing business operations and consolidated them on ITS integrated information systems. The development of information systems in the newly merged institutions should consider a way to facilitate the uploading of required institutional data into the Higher Education Management Information Systems (HEMIS), on which the department of higher education relies for decision making. To this end, HEIs need to ensure that existing systems and corresponding processes are not in conflict to enable the uploading of reliable data into the HEMIS.

Abugabah and Sanzogni (2010) reported that as institutions of higher learning continue to adopt and implement ERP systems there is a need to evaluate their benefits and the impacts on end-users and institutions (ibid.). The use information

systems in this higher education sector is critical to its success, as well as for the efficiency and quality of services and outcomes (ibid.). Previous research emphasises that information systems play a significant role in increasing key benefits expected from the merger of institutions of higher learning (Light, 2002).

Since the selected UoT has made substantial progress in terms of the merger and since information systems play a crucial role in facilitating smooth information flow, it was of an utmost importance to determine the effects of these information systems on end-users and institutional business processes. In a detailed examination of the history of information systems at the selected UoT, Evans (2010:12) argues that the use of technology within an institution has progressed from being a specialised technological function with only a small number of highly trained end-users, to being an indispensable part of the job description for the great majority of staff members, with a strong emphasis on the use of technology to ensure automation of institutional manual processes.

The description of the research problem is followed by the objectives set for this study, as well as the research questions. The purpose and significance of the study are also described.

1.2.2 Statement of the research problem

Based on the work of Evans (Evans, 2010:13) and subsequent anecdotal evidence, the research problem can be stated as: *Different role players perceive a widely varying range of problems in the use of organisational information systems/processes at the selected UoT and the origin of these perceptions and problems should be investigated in order to adequately propose a course of action.*

1.3   OBJECTIVES

Given the research background and the problem statement, the specific research objectives were to:

a) Investigate to determine different end-user experience of the use of certain information systems/processes and the performance thereof;

b) Propose general business process models that will improve internal operations at the selected UoT;

c) Propose a general framework for effective use of IS and business processes at the selected UoT.

The next subsection describes the research questions that helped to achieve the stated objectives.

1.4 RESEARCH QUESTIONS

1.4.1 Main research question

What are the different end-users experiences of the use of the selected information systems and processes within the organisation?

1.4.2 Investigative sub-questions

a) What processes and activities are critical to user experience?

b) Which systems are critical to support user experience and business processes?

c) What effects do these systems/processes have on end-user experience and the organisation?

1.5 PURPOSE AND SIGNIFICANCE OF STUDY

This research was conducted within a higher education environment and as indicated in the introductory section, it is a case study of a UoT Information system where the unit of analysis was a selected integrated information system in the Engineering Faculty. According to Yizengaw (2008:4), institutions of higher learning support economic growth strategies and the reduction of poverty by bringing in new knowledge, capacity building so as to access existing pools of global knowledge, and finally adapting that knowledge to local use. Economic growth is very important to the future of African countries, not least to South Africa.

The research was conducted to understand the issues arising from information systems and internal business processes that constitute obstacles to the end-users productivity and performance. This research investigated the perceptions of information systems and processes by end-users with the hope that the outcome could be used by management. According to the selected UoT's Research, Technology and Innovation (RTI) strategy, one of the key principles and objectives to support achieving its vision is to promote excellence by developing cutting-edge facilities, RTI capabilities and outputs that gain recognition (the selected UoT: Online).

The selected UoT's information systems constitute one of these cutting-edge facilities that support the institution to achieve its vision and promote excellence. The selected UoT provides its staff with information systems comprising information technology and software applications, for example "Integrated Tertiary Software" (ITS) and "Microsoft Office". As in the case of any investment, management needs to be

assured that the investment is worthwhile and is achieving the objectives that were set forth.

Prior studies have emphasised the importance of discerning the cognition of users and information systems (IS) professionals. These studies agreed that institutional cognition was far too critical to be overlooked as it could negatively affect IS outcomes (Tan & Hunter, 2002:1). The researcher has investigated different end-users' perceptions of information systems and their effects on performance. Abugabah & Sanzogni (2010) indicate that the effects and benefits provided by integrated systems need thorough evaluation. A number of existing evaluation studies on information systems focus on the technical side of the implementation processes, without providing any information on the type of effects of these systems produce. It is therefore important to gain clarity on the impact of these systems, looking at benefits to end-users and institutions. These would provide valuable insights into educational outcomes and service delivery (ibid).

As has been stressed in the beginning, very limited work has been done to investigate the effects of information systems and processes on end-users at a University of Technology.

1.6 OVERVIEW OF RESEARCH DESIGN

The research design, discussed in chapter three of this thesis, focused on the details of research philosophy (positivism), research perspective (quantitative research), and data collection technique and analysis.

1.7 DELINEATION OF THE RESEARCH

This research focused on the perceptions of a selected UoT information system by different end-users within the organisation. The study identified processes and activities that were critical to institutional performance, systems which were critical to the support of these processes and activities, and how end-users' perceptions of performance related to performance. The research was mainly conducted in the Engineering Faculty with the intention of considering this as a sample representation or research motivation for other faculties across the institution.

The management of the Faculty as well as a selected department where substantial progress has been made in terms of the merger were considered in the study of the affected systems/processes.

1.8 OVERVIEW OF THE THESIS STRUCTURE

Chapter Two: Literature Review

The second chapter reviews literature relating to institutional information systems, processes and end-user satisfaction. A discussion with regard to the emergence of systems in higher education, the information systems and processes in use at the selected UoT, the needs of modern universities of technologies, users of information systems in an academic environment, and the use of information systems and user satisfaction were provided.

Chapter Three: Research Design

This chapter discusses the research design, methodology and methods of research. The objective of this chapter was to systematically explain steps required to elicit adequate evidence that enabled the author to meet the objectives set in this research study. In this section the author also described the research environment, the research instrument and research paradigm before discussing in detail the research design.

Chapter Four: Data Analysis

In this section, a presentation of results from the questionnaire was made after having statistically analysed data received from completed and submitted questionnaires. The SPSS was employed for data capturing and analysis.

Chapter Five: Findings and Interpretation

This chapter deals with the research findings and discussions. These findings were articulated based on results drawn in the fourth chapter and the conceptual framework illustrated in the second chapter. The resultant model designed was one of the objectives set in the first chapter.

Chapter Six: Conclusion and Recommendations

A conclusion and recommendations were made at the end of this research. This section succinctly revisited all chapters and demonstrated how each chapter contributed in meeting the objectives set in the first chapter. Based on the research results and findings, valuable recommendations were made, thus reiterating the importance and significance of this thesis.

1.9 CHAPTER SUMMARY

SCOPE OF THE RESEARCH STUDY		
1	Introduction of the chapter	The main items that were discussed in this chapter were introduced. The history of the selected UoT was reviewed to enable the reader to gain a preliminary understanding of the research environment.
2	Background to the research problem	The origin of the research problem was provided.
3	Statement of the research problem	Based on the work of Evans (2011:13) and subsequent anecdotal evidence, the research problem was stated: "Different role players perceive a widely varying range of problems regarding the use of organisational information systems/processes at the selected UoT and the origin of these perceptions and problems should be investigated."
4	Research objectives	These were provided in section 1.3
5	Research questions	These were provided in section 1.4
6	Purpose and significance of the study	These were provided in section 1.5
7	Overview of research design	This was provided in section 1.6
8	Delineation of the research	This was provided in section 1.7
9	Overview of the thesis structure	This was provided in section 1.8

Table 1.1 Summary of chapter one

LITERATURE REVIEW

*"Organise around business functions, not people. Build
systems within each business function. Let systems run the
business and people run the systems. People come and go
but the systems remain constant"*
- Michael Gerber.

2.1 INTRODUCTION

In the previous chapter it was emphasised that the perceptions of information systems and processes by different end-users within the organisation should be investigated at an early stage in order to properly locate problems, to uncover difficulties in implementation and to establish an appropriate course of action. Deducing from the above quote of Michael Gerber, business functions are carried out because there are business processes that underpin the business of the institutions. Information systems are to be built in a manner that ensures alignment with existing organisational business processes. Therefore, it was important to review literature in order to determine the statu quo around IS and business processes in organisations and for that matter, the selected UoT.

In this chapter, the relevant existing literature has been reviewed to establish whether previous research of this nature has been carried out. It is evident from a survey of the literature that there is a paucity of research information on information systems and processes in higher education, especially at UoTs (Ahed & Sanzogni, 2010:1). A review of the literature on information systems was undertaken to gain a general understanding of the phenomenon under study.

One of the tools for measurement of IS perception, according to Whyte, Bytheway and Edwards (1997) is an understanding of end-user perceptions of information system success. Current literature indicates that research information on information systems emerged in the early 1980s. Delone and McLean's (1992) contributed significantly to the literature by imposing a certain order on information systems researcher's options of success measures (Seddon et al., 1999).

Delone and McLean (1992) developed a model, which was updated later in 2003. Whyte, Bytheway and Edwards (1997) argue that the information systems success model needed further development and validation so as to serve as a basis for the

selection of adequate measures of IS perception. To close the gap in current literature particularly with UoTs, a conceptual model that will determine the effects of information systems on end-users at a UoT was developed (see section 2.8).

According to Gable et al. (2008), it is important to run an evaluation of Information Systems and their impacts on both the institution and end-users in order to justify their value and how they contribute to institutional productivity, quality, performance, and competitiveness. In view of this, it was logical to begin with the review of literature focusing on the needs of modern UoTs and the key concepts of this study in order to provide the reader with a solid basis from which to work. Following that, the chapter provides a review of existing literature relating to work done on institutional information systems, business processes and end-user satisfaction. A discussion on the emergence of systems in various institutions in South African institutions of higher learning, as well as the information systems and processes in use at the selected UoT were reviewed. A review was also done on IS user satisfaction.

The gaps identified as a result of the reviewed literature and the understanding thereof led to the development of a proposed conceptual framework as mentioned in section 1.4 of chapter one.

This chapter also provides a general discussion around the concept and purpose of information systems and business processes and how the conceptual framework helped frame the data collection, analysis instrument and interpretation.

The next section begins with the review of literature about the needs of modern UoTs and the key concepts of this study in order to provide the reader with solid bases for review of literature.

2.2   THE NEEDS OF MODERN UNIVERSITIES OF TECHNOLOGY

Since the researcher has chosen a case study of a University of Technology, it was crucial to elaborate on the needs and the context of modern Universities of Technology. According to Southafrica.info [Online], many universities in South Africa are considered world-class academic institutions of higher learning, performing well in research in different fields of study.

It was also reported that these institutions offer a wide range of study programmes and research options for both South African and international students. Six of these twenty three institutions of higher learning are considered Universities of Technology

due to their focus on vocationally oriented education, fulfilling the intentions of the National Research and Development Strategy (2002) which requires institutions of higher learning to ensure that the majority of students master modern technologies and apply them in their social endeavours.

The South African UoTs include: the Cape Peninsula University of Technology (CPUT); the Central University of Technology (CUT); the Durban University of Technology (DUT); the Mangosuthu University of Technology (MUT); the Tshwane University of Technology (TUT); and the Vaal University of Technology (VUT).These UoTs should be equipped with information systems that are **accessible** to allow all authorised users to access the information system to carry out their activities. In addition, these UoTs should also be equipped with information systems which are **accurate** since inaccurate data or misinformation generated by an information system will result in poor decision making by managers who rely on data generated by information systems. Another characteristic of information systems is **usability/simplicity**. End-users are looking for simple, easy-to-use systems which simply simplify business activities. System users need an information system that is well designed and efficiently developed to enable them to easily manipulate and use data and information. The **flexibility** of an information system is also essential to allow all remote end-users to view and access valuable information essential for decision making purposes. UoTs should make sure that their information systems are **secure** and that systems such as the Marks Administration System can only accessed by authorised users. The input and manipulation of students' results by unauthorised users can lead to administrative disasters with a UoT (Characteristics of a good information system: Online).

For Universities of Technology to reflect their denominations these institutions of higher learning need to ensure that effective information systems and processes are in place in order to satisfy their stakeholders. Universities of Technology need to take the lead in streamlining their existing processes and in employing cutting edge information and communication technologies in order to attract, develop and maintain students who graduate with both theoretical and technological knowledge.

As vocationally orientated institutions, Universities of Technology such as the selected UoT need to ensure that internal work processes are refined in a manner that allow them to speak directly to existing business systems. Institutional Information systems and processes need to be utilised in a manner that quickens administrative information flow and timely throughput rates. Since the competition in

the work place becomes more and more fierce, Universities of Technology need to prepare young graduates who meet with industry requirements to ensure socio-economic development of the country. In examining the effects of IS on end-users and institutional processes, the researcher opted to discuss the information systems and business processes in order to provide the reader with a solid basis for review of the literature.

2.3 INFORMATION SYSTEMS AND BUSINESS PROCESSES

Since institutional information systems and business processes constitute the main components of this study, this section provides a general understanding of these key concepts.

2.3.1 Information system

(a) Definition and purpose of an information system

An information system is a set of interrelated components that retrieve, process, store, and distribute information in order to support decision making, coordination and control in an organisation (Laudon & Laudon, 2006:6).

The purpose of implementing information systems within an organisation is to improve the effectiveness and efficiency of that organisation. The extent to which this purpose is achieved is determined by the utility of the information system and characteristics of the organisation, its work systems, its people, and its development and implementation methodologies (Hevner et al, 2010:10).

The rationale behind developing information systems is to provide organisations with a facility to be used by individual end-users, bringing additional value to the organisation. The views of these individual end-users will be taken into account in order to ascertain the IS performance. Components of an information system are discussed below.

(b) Components of information systems

The table below illustrates, according to Stair, Reynolds, & Reynolds (2008:102), different components of an information system. One of these components constitutes one of the key points of this research, the human component referred to as an end-user.

INFORMATION SYSTEM'S COMPONENTS	DEFINITIONS
Data	Input the system takes to produce information
Hardware	A computer and its peripheral equipment: input, output and storage devices; hardware also includes data communication equipment
Software	Sets of instructions that tell the computer how to take data in, how to process it, how to display information, and how to store data and information
Telecommunications	Hardware and software that facilitates fast transmission and reception of text, pictures, sound, and animation in the form of electronic data
People (human)	Information systems professionals and users who analyse organisational information needs, design and construct information systems, write computer programs, operate the hardware, and maintain software
Procedures	Rules for achieving optimal and secure operations in data processing; procedures include priorities in dispensing software applications and security measures

Table 2.1: Components of an information system

(Source: Stair, Reynolds, & Reynolds, 2008:102)

This research intended to determine the effects of IS on one of the above components – the end-users. Different end-users of IS at various levels of the organisation make use of different types of IS depending on the positions they occupy within the organisation.

It was stressed in the background of this thesis that the main focus is on some of the information systems or modules that constitute an integral part of the ITS-Enterprise Resource Planning (ERP) systems and corresponding business processes at the selected UoT. In view of this, it is crucial to elaborate on the notion of ERP systems to allow the reader a better understanding of how various information systems can connect to one another to improve information flow within an organisation.

The notion of ERP systems

The selected UoT makes use of ITS which encompasses all academic and administrative units. The strategy requires a central database which places all organisational information into a unified format so that it serves as a resource in meeting the data needs of managers, stakeholders, customers, employees, and suppliers both in a local and a global context (Davenport, 1998).

A more general aim of integrated systems such as ERPs in higher education institutions was to integrate their core administrative systems, including personnel, student, and financial management systems, functions historically supported by disparate legacy systems (Zornada and Velkavrh, 2005). Allan & Kern (2001) and Pollock & Cornford (2004) argue that the implementation of ES systems in the higher education sector were a response to both external and internal influences which required more efficient management processes.

These influences include a decrease in government funding and support, the impact of globalisation, the increase in student numbers, changes in the nature of academic work, increasing competition between universities, pressure from government to improve operational efficiency, and the growing diversity of expectations amongst all stakeholders. These factors have created the need for academic institutions to improve their administrative operations (Allen and Kern, 2001).

In response to the pressure to create efficient administrative systems, many institutions have implemented ES. According to Nielsen, J (2002) cited by Abugabah & Sanzogni (2010), research relating to ERPs has largely overlooked the sector of higher education worldwide, even though a number of higher education institutions have implemented or are in the process of implementing higher education related ERPs. Watson and Schneider (1999) cited by Ahed & Sanzogni (2010) state that staff training is a very important process when implementing ERP in higher education in order to reap more benefits from these systems. Murphy (2004) argues that universities that are still reluctant to switch to ERP solutions will face challenges regarding the retention of their student market share, and that students will eventually request services that are available in other institutions. Even institutions that have embraced integrated systems need to ensure that these systems are improving end-users' performance, which can be done by investigating end-user experience of information systems in general, which is one of the aims of this research.

Since information systems and business processes constitute the main components of this study, the section provides a general understanding of these key concepts. The following discussion covers business processes within an organisational setting.

2.3.2 Institutional business process

One of the objectives of this research is to determine end-users experiences of certain institutional business processes at a selected UoT. It is vital to highlight the definition of a business process in the context of this research to allow for a better understanding of one of the main components of this study.

A business process describes the steps followed by a company or organisation to produce a particular product or service (Windnagle, 2012:1). A business process is a logically related set of activities that define how specific business tasks are performed. Business processes are the ways in which organisations coordinate and organise work activities, information, and knowledge to produce their valuable products or services (ibid).

Business entities or universities find it difficult to successfully deliver good quality products or services if their internal business processes are not well defined. In addition, it is costly to operate without well-defined processes. The institutional business processes are to be clearly defined and designed in a manner that can be understood by all stakeholders of the organisation. This necessitates the mapping of organisational business processes in a standardised way at the outset to allow all staff to speak the same business process related language.

The Business Process Modelling languages are the Event-driven Process Chain (EPC), The Business Process Model and Notation (BPMN), Petri Nets, and the UML activity diagrams. For the purpose of this study, the EPC will be employed in modelling certain institutional business processes. The EPC is well known as a standard way to visually depict a business process. It provides an internationally recognised common language to visually express an institutional business process. The EPC allows institutional stakeholders to view a graphical notation for specifying organisational business processes within a Business Process Diagram (BPD).

Business processes need to be well designed and coordinated in order to ensure a competitive edge and good performance within an institution. Universities of Technology such as the selected UoT are equipped with information systems that emerged as a result of manual business process automation. These information

systems were introduced as an attempt to ensure efficiency, effectiveness and user satisfaction within the university. According to Cousins and Tony (2002:8), an institution or a company has to formulate common terminology, aims and expectations, and eliminate misunderstandings in order to properly define processes. It is crucial for institutions of higher learning to put together a set of processes in order to communicate best practice and to provide each stakeholder with an understanding of the common goal towards which each operational unit is working (ibid).

As vocationally orientated institutions, Universities of Technology such as the selected UoT need to ensure that internal work processes are refined in a manner that allow them to speak directly to existing business systems.

2.3.3 Re-engineering business processes and system's customisation

The introductory section of the previous chapter indicates that Institutions of Higher Learning such as the selected UoT have embarked on the computerisation of their business activities to ensure delivery of good quality services to their stakeholders. Stakeholders at UoTs, especially those directly involved in internal business processes, need to provide their perceptions and suggestions in order to ascertain whether a business process re-engineering is needed.

As business processes are essential to business entities, it is important to highlight the importance of these processes to the institutions of higher learning. Also, as it is assumed that providing a business with an information system will yield immediate results, it is crucial for a business or a university to totally redesign the business process to truly benefit from an information system (Windnagle, 2012:3).

When an institution chooses to maintain its existing processes using an ERP system, it can customise ERP functions. However, it is crucial to determine end-users' perceptions of information systems and processes after a merger has taken place to establish whether business process re-engineering at the selected UoT was necessary or not.

2.4 EMERGENCE OF INFORMATION SYSTEMS IN VARIOUS INSTITUTIONS

2.4.1 Introduction

The same purpose served by information systems and processes in government and in business entities can be argued to be similar to that of Higher Education institutions, the research opted for firstly discussing generally information systems in government and business before discussing their emergence and applicability in institutions of Higher Learning. Since there is limited literature on the topic of information systems and processes within a university setting, I needed to draw heavily on research carried out in the realm of business and government.

This section covers the use of information systems and processes in government, in the corporate sector, in the in higher educational institutions.

2.4.2 Use of information systems and processes in government

According to Zornada and Velkavrh (2005), with the ubiquitous presence of computers worldwide, the opportunity for making a profit from ICT was first embraced by manufacturing enterprises. These opportunities were later embraced by the state and its various institutions (ibid).

If civil servants are to be effective in their work, it is necessary to make use of integrated systems with clear channels of communication. Information systems provide real time access to data which allows for more efficient decision making.

2.4.3 Information systems in the corporate sector

In the corporate sector ERP is defined as the set of principles which integrate the entire supply chain from sales to orders, supply replenishment to scheduling, as well as manufacturing and distribution (Mushavhanamadi and Mbowa, 2013:64). An integrated system allows orders to be made more efficiently, aligns sales with production, and integrates customer orders and delivery data with plant-floor scheduling and production process (Kruger and Ramphal, 2009:257) cited by Mushavhanamadi and Mbowa (2013:64).

In spite of the challenges of implementing integrated systems, business entities, which typically operate in a financially competitive environment, have reaped many benefits from the use of ERP systems during the last two decades (Seo, 2013:12).

2.4.4 Information systems in higher educational institutions

According to Rabaa'l et al (2009:456), as is the case for large corporations, institutions of higher learning are continuously reviewing and improving their management and administration systems. The challenges institutions of higher learning face are similar to those of many other organisations. Pollock and Cornford (2004), argue that universities are not unique organisations, but share needs similar to those of manufacturing organisations. These needs include personnel, finance, operations and logistics, and sales and marketing applications. Institutions of higher learning have additional needs for systems covering Facility Management, Student Administration, Course Administration, as well as other applications that are not available in traditional Enterprise Systems. Mehlinger (2006) states that institutions of higher learning are making significant investments in integrated systems to improve institutional business processes. Abugabah & Sanzogni (2010) indicate that although they lag behind other industries in the use of IS, the demand for IS within universities is increasing.

2.5 EMERGENCE OF SYSTEMS IN SOUTH AFRICAN HIGHER EDUCATION

In order to understand the status quo regarding information systems in South African institutions of higher learning, it is helpful to look at the emergence of these systems. Taylor (2001) argues that since the end of the cold war, technological innovation has modified the fabric of life in the very social, political, economic, and cultural sector. South African institutions of higher learning have also readily embraced technological innovation. More established higher education institutions in South Africa have shifted rapidly from a culturally conservative approach to a new entrepreneurial approach (Mlitwa, 2006; Gutlig, 1999). Morrison (1999), cited in Mlitwa (2006), observes the change in education as necessary since society is moving away from industrial economy to an information/knowledge based economy.

Former President Thabo Mbeki, in his 2001 State of the Nation Address recommended that institutions of higher learning should play a pivotal role in the development of an Information Society enabling South Africa to remain on the information super-highway (Mlitwa, 2005). Institutions of higher learning were equally expected by the National Plan for Higher Education (2001) to provide the foundation for an information-based society in the country. Consequently, the 2001 National Plan proposed that institutions of higher learning ensure that all graduates are equipped with the necessary skills and competencies to adequately function in the modern information age. In particular, skills such as computer literacy, information

management, communication and analytical skills are highlighted as key competencies to be developed.

The Durban University of Technology (Online)[2] indicates that it makes use of an ITS system and ensures that its practices remain current, thus enabling the institution to take advantage of the latest software to promote greater efficiency within the institution. The ITS integrator was implemented by the FET colleges in Eastern Cape to improve organisational management and efficiency (Eastern Cape FET colleges, online)[3]. The Mangosuthu University of Technology (online) notes that it has implemented a new solution called ITS infoslip in order to reduce costs, to keep its staff informed and to remain environmentally friendly. This solution allows the elimination of paper-based documentation by enabling employees to receive their payslips as a secure e-mail attachment. TUT (online: 2013) reported that it uses a corporate SMS solution to allow users in various departments within the institutions to send out alerts to all students whenever required.

Although existing literature does not extensively address the challenges associated with the use of information systems in higher education, Whyte and Bytheway (1999) do note some instances in which challenges may arise. These are:

➢ When the systems have technical limitations and are unfriendly or when they are inflexible;

➢ When there is poor communication between users and development staff;

➢ When users are not committed to the project and system;

➢ When inexperienced system developers are used; and

➢ When organisational business needs to be met are unclear, leading to poor definition of the objective of the information system project.

Abugabah & Sanzogni (2010) suggest the need for researchers to shift their attention from technical and organisational perspective to end-user perspectives. In spite of an increase in IS investment and the success of IS research, there are still many unresolved issues when dealing with the assessment and evaluation of IS impacts

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[2] Press release issued by Communikay. Johannesburg. Available from: http://www.itweb.co.za/index.php. Retrieved on 24 October 2013.

[3] Eastern Cape FET colleges implement ITS Integrator for improved management and efficiency. Press release issued by Watt Communications 13 October 2011
http://www.itweb.co.za/index.php?option=com_content&view=article&id=48154&catid=144&Itemid=92

and outcomes. One of the objectives of this research is to examine the experience of the end-user with regard to the performance of the IS.

The next section discusses information systems user satisfaction and behavior as a substitute measure of IS performance.

2.6   INFORMATION SYSTEMS USER SATISFACTION AND BEHAVIOUR

According to DeLone & McLean (1992), user satisfaction serves as a substitute measure of IS performance, and IS evaluation cannot be done without taking into account the opinions of end-users. The concept of user satisfaction has frequently been used as an indicator of the performance of an IS (Leclerc, 2007:27), although it cannot be relied upon as the only indicator (Ward & Daniel, 2005). According to Leclerc (2007), the amount of money companies invest in the development and implementation of information systems necessitates continuous performance evaluation of the IS.

This research study hopes to provide an analysis based on the perceptions of information systems/processes end-users which could in turn be used by management of UoTs in decision making. The satisfaction factor in UoTs can be met after having established what the needs of modern UoTs in South Africa are. Abugabah & Sanzogni (2010) report a lack of research regarding conceptual frameworks and make a call for validated measures in this area.

2.7   CONCEPTUAL FRAMEWORK

2.7.1   Introduction

The lack of a comprehensive model that facilitates the evaluation of the impact of IS on end-users' performance remains an existing problem in the IS field. Abugabah & Sanzogni (2010:4) recommend that institutions of higher learning initiate research studies designed to evaluate the performance of their systems in order to continually improve upon them. Abugabah & Sanzogni (2010) note, however, that information systems cannot by themselves affect productivity, and maintain that the key efficiency factor is how people make use of these systems. The study intended to establish the perceptions of some of the selected UoT information systems and processes by different end-users within the organisation.

In section 1.1 of the first chapter, it was indicated that this research would provide a conceptual framework that would guide the collection and analysis of data to determine the effects of information systems on end-users and on institutional

processes at a University of Technology. This study argues that the status of the outcome of IS use will determine the user satisfaction or dissatisfaction. Since the role of the IS is to ensure that an activity is carried out efficiently and yields good results, in instances of negative outcome, remedial alternatives should be selected to maintain smooth running of the organisational activity.

Given the literature reviewed relating to information systems and processes, and end-user satisfaction, a conceptual framework is proposed to guide the collection and analysis of data to determine the effects of information systems on end-users and on institutional processes at a University of Technology in the Western Cape.

The following figure illustrates the conceptual framework.
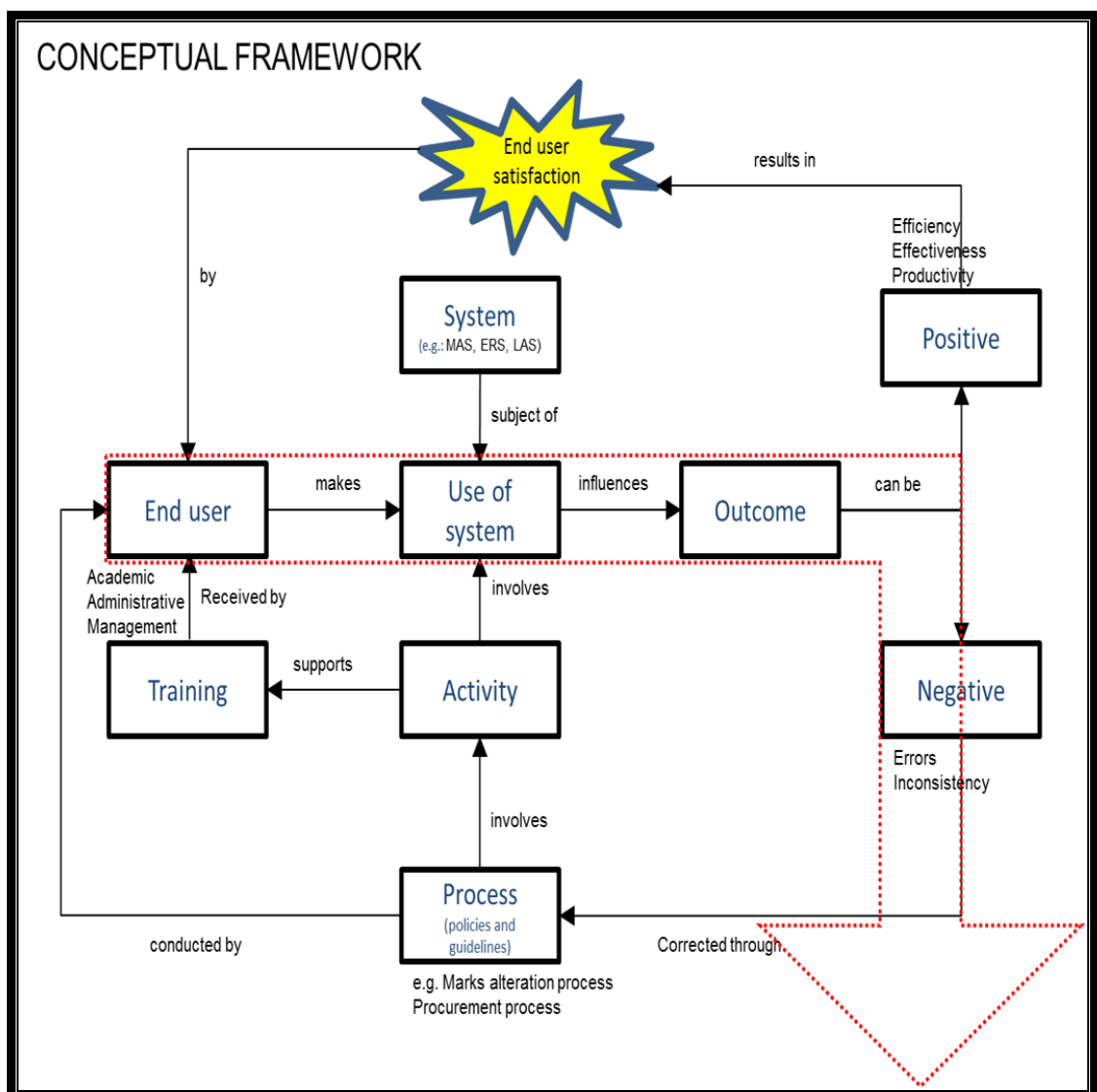
Figure 2. 1: Conceptual framework

If the use of information system results in the direction shown by the red dotted arrow (see figure 2.1), this indicates a problem. The outcome of the use of the system should not be negative and this is addressed as a problem in the problem statement

of this research study. The full interpretation of the above conceptual model is discussed in the next section.

2.7.2 Interpretation of the framework

(a) From left to right:

An end-user makes use of an information system in order to generate an outcome or result. In HEIs such as UoTs, an end-user may be a lecturing staff member, an administrative staff member, a technician or any member of the management of the institution. A system in the above framework refers to the institutional integrated information system that constitutes an object of study as illustrated in section 3.4.3 of the next chapter. The definition of an information system as suggested by Laudon & Laudon, (2006:6) in section 2.3.1 of this chapter is aligned with the institutional information systems that constitute an object of this study.

The use of an information system by a selected UoT end-user referred to as a person or a role player generates an outcome that can be either positive or negative.

(b) From right to top

Looking from right to top on the above model, one can see that when a positive outcome is generated by the use of an information system, the experience is one of efficiency, effectiveness and productivity which results in user satisfaction in the end-user. The concept of user satisfaction has frequently been used as an indicator of the performance of an information system. This is reinforced by Leclercq (2007:27) in the last part of section 2.6 of this chapter.

An initial review of the literature concerning user perceptions and attitudes to information systems has revealed that the purpose of implementing information systems within an institution is to improve the organisational effectiveness and efficiency. Klein and Myers (1999:82) argue that 'the concepts such as user satisfaction should be interpreted and analysed as such.' Gelderman (1998) explains that the two common measures of success of an Information System are use and satisfaction:

"When a positive outcome is generated by the use of an information system, it is in most cases certain to experience efficiency, effectiveness and productivity which result in user satisfaction."

(c) From right to bottom

As per the above model, a negative outcome can result from the use of an information system when erratum is noticed in a report generated by an information system. Inaccurate information resulting from the use of an information system can be caused by an end-user or by the system itself due to the inflexibility of the system or simply because of the system's technical limitations as illustrated by Lyytinen (1988), and Galloway and Whyte (1989). To remedy this, a manural process was devised which involves an extra activity, thus wasting time, energy and money. It is therefore advisable to provide support in the form of training for end-users who struggle to effectively make use of the system, especially when a negative outcome is consistently caused by an end-user. At the same time, a recommendation will be sent to the information system developer or technician in order to fix the problem in case a negative outcome is caused by the system.

"A negative outcome can be generated from the use of an information system and this is experienced when erratum is noticed in a report generated by an information system. Inaccurate information resulting from the use of an information system can be caused by an end-user or by the system itself. To solve this, a remedial strategy is sometimes concretized through a manual process which involves an extra activity, thus wasting time, energy and money."

Over the years organisations such as universities have been investing in information systems to facilitate and improve their effectiveness (Nomdoe, 2007:1). As part of this research, It was decided to investigate the perceptions of internal business processes by end-users to establish whether or not these processes need to be streamlined. This is supported by Zviran & Erlich (2003:3), who state that the change of processes or the introduction of new work procedures results in organisational improvement. Reix (2002:409) highlights the connectivity of the IS effectiveness to the unfolding of processes inside the organisational structure and the individual behaviour. The conceptual framework will be revised after processing the research findings. Existing literature with regard to information systems in sectors other than UoTs has been reviewed. The gaps identified as a result of the reviewed literature led to the development of a preliminary conceptual framework as mentioned in section 1.1 of chapter one. The interpretation of this conceptual framework is summarised in the following paragraph.The use of an information system by an end-user generates an outcome that can be either positive or negative. When a positive outcome is generated by the use of an information system, it is in most cases an experience of efficiency, effectiveness and productivity which results in user satisfaction. A negative outcome can be generated from the use of an information system and this is

experienced when erratum is noticed in a report generated by an information system. Inaccurate information resulting from the use of an information system can be caused by an end-user or by the system itself. To solve this, a remedial strategy is concretised through a manual process which involves an extra activity, thus wasting time, energy and money.

2.8   CHAPTER SUMMARY

LITERATURE REVIEW		
1	Introduction of the chapter	This was provided in section 2.1. The main items that were reviewed in this chapter were introduced in this section.
2	The needs of modern UoTs, IS and business processes	Sections 2.2 & 2.3 provide the review of literature as relates to the needs of modern UoTs and the key concepts of this study in order to provide the reader with a solid basis for review of literature. Since institutional information systems and business processes constitute the main components of this study, this section provides a general understanding of these key concepts.
3	Emergence of IS in various institutions	The research discussed information systems in government and business before discussing their emergence and applicability in institutions of Higher Learning. This approach was to improve logical thinking around complete information systems that could be introduced in a University of Technology since there is limited literature regarding information systems and processes at universities.
4	Emergence of systems in South African higher education	It is important to note the initial emergence of information systems in order to be able to understand the current state of affairs regarding information systems in the South African institutions of higher learning
5	Information systems, user satisfaction and behaviour	One of the objectives of this research is to determine different end-user experiences of the use of certain information systems/processes and the performance thereof. The section 2.6 discusses information systems user satisfaction and behavior as a substitute measure of IS performance.
6	Conceptual framework	The gaps identified as a result of the reviewed literature and the understanding thereof led to the development of a preliminary conceptual framework as mentioned in section 1.1 of chapter one

Table 2. 1: Summary of chapter two

CHAPTER THREE

RESEARCH DESIGN

"One machine can do the work of fifty ordinary men. No machine can do the work of one extraordinary man."
- Elbert Hubbard.

3.1 INTRODUCTION

This chapter aims to provide an understanding of the research design employed to address the research problem stated in Chapter 1 as: "Different role players perceive a widely varying range of problems in the use of organisational information systems at CPUT and the origin of these perceptions and problems should be investigated."

A research design is defined as a structured framework or a plan as to how a researcher intends undertaking the research process in order to solve the problem (Babbie and Mouton, 2004).

Elbert Hubbard's quote in this chapter affirms Babbie and Mouton's argument in that it requires more than just a machine or an ordinary man to well structure a research design that will systematically guide in solving the research problem. It definitely requires an extraordinary man with critical thinking to provide the adequate philosophical underpinning of the research study.

The objective of this chapter is to systematically elaborate on steps taken to collect evidence that enabled the research objectives to be met. Each step in this research process contributed to the achievement of the objective of this research.

3.2 RESEARCH PROCESS

In view of the above introduction, this chapter focuses on the research process and includes details of the research paradigm, the rationale for the research paradigm, the research perspective, the rationale for the research perspective, the survey environment, the target population, the instrument design, data validity, objectivity and reliability.

The following figure 3.1 illustrates the steps taken to collect reliable evidence.
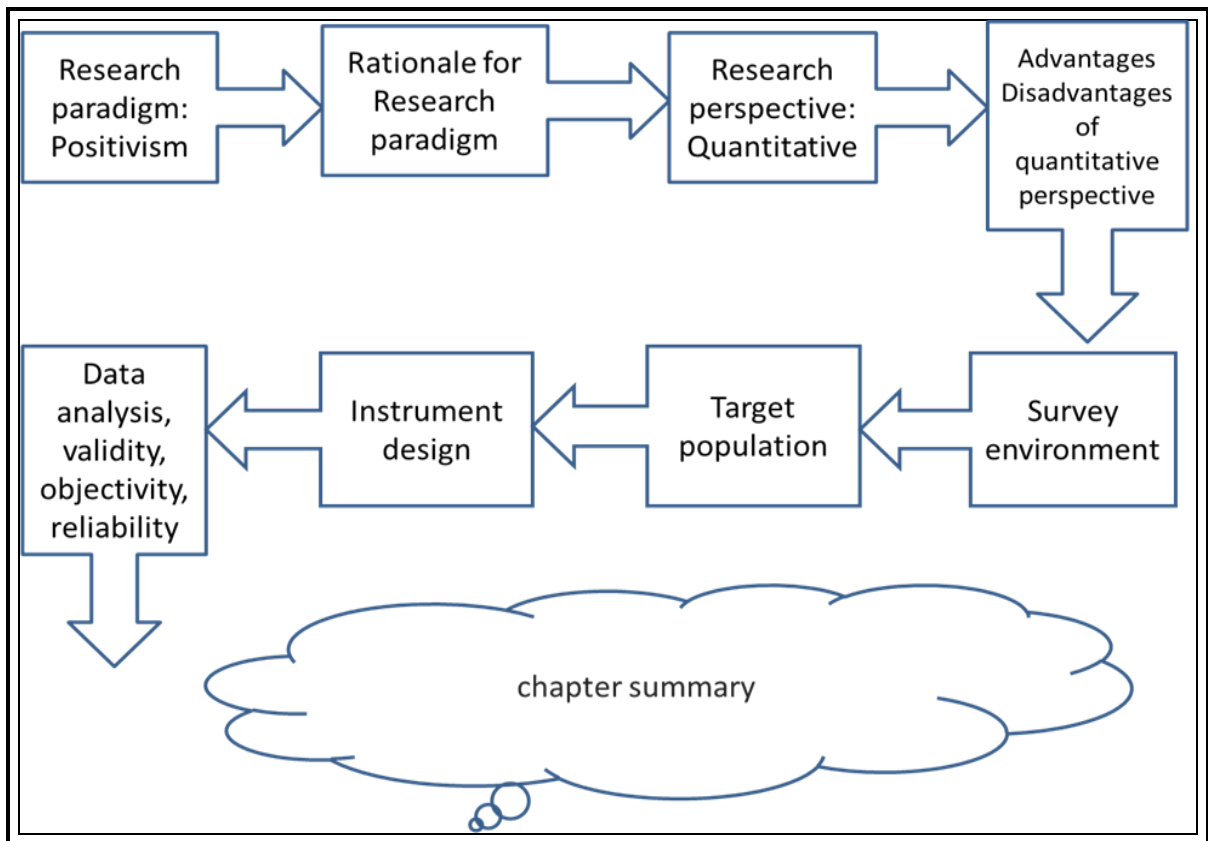
Figure 3. 1: Research design framework

3.3 THE RESEARCH PARADIGM

3.3.1 Introduction

Three main research paradigms, namely positivism, interpretivism and critical approach, were explored prior to the selection of the research philosophy appropriate for this study. According to Hammersley and Mackenzie & Knipe (2006), positivism asserts a deterministic and empiricist philosophy which argues that effects are determined by causes. This philosophy aims to directly observe, quantitatively measure and objectively predict relationships between variables. It assumes that social phenomena, like objects in natural science, can be treated in the same way. Mackenzie & Knipe (ibid.) explain that researchers adopting an interpretivist approach recognise that all respondents involved in research, including the researcher, come up with their own interpretations of the world. Critical educational research aims to eliminate injustice in society addressing inequality of any kind (Hammersley, n.d.; Mackenzie and Knipe, 2006).

Considering the problem stated in this study, a positivist approach was selected as a means to find a solution to the research question.

3.3.2 Rationale for the research paradigm

In view of the research instrument for this study which is discussed later in this chapter, the positivist approach was considered the most reliable approach to collect evidence to address the research problem. This research paradigm was chosen to ensure that variables are directly observed, quantitatively measured and that relationships between them are objectively predicted. The next section discusses the research perspective for this study.

3.3.3 The research perspective

It was important to differentiate between qualitative research and quantitative research before selecting the appropriate research perspective for this study. Vicki (2005) explains that qualitative research is used to understand underlying reasons, opinions and motivations whereas quantitative research deals with numbers and data that can be easily quantified.

With the quantitative research approach, attitudes, opinions, behaviours, and other defined variables can be quantified and results can be generalised from a larger sample population. In this research, data analysis was performed on the captured data with the aid of a statistical package called SPSS; further details are discussed later in this research. This research study was conducted taking a quantitative approach to investigate the end-users perceptions of information systems and processes at the selected UoT.

3.4 THE CASE

3.4.1 History and background

The selected UoT was established on 1 January 2005, when two Technikons situated in the Western Cape merged. With more than 34,000 students, many campuses and service points as well as more than 70 programmes, this selected UoT is the largest institution of higher learning in the region. This university, however, has humble beginnings in the two Technikons which started in the early 1900's (The selected UoT, History).

During March 2001, the Minister of Education announced the National Plan on Higher Education which resulted in the merger of various institutions of higher learning across South Africa and the formation of Universities of Technology. The Minister

approved the name of the selected UoT in 2003 after a lengthy process regarding the setting up of merger task teams and a renaming process. In 2005, the selected UoT was officially launched and on 1 February 2006, the first Vice-chancellor of the institution was appointed. In May 2008, the first Chancellor of the University was elected. According to Evans (2010), the merging of the institutions required realignment of processes and systems, as well as elimination of duplication of resources. Fortunately, both previous institutions used the same integrated suite of modules offering much of the functionality required by an HEI. The integrated suite used by both institutions was Integrated Tertiary Software (ITS). However, many challenges regarding data merging occurred since there were, for example, different numbering systems for student numbers. To solve this, a new format has been put in place for new and old students (Evans, 2011:10).

3.4.2 The functional view of the selected UoT.

The selected UoT is structured into different divisions and departments which fall under specific faculties. These various organisational units perform unique functions and are equipped with staff members who are expert at those particular functions. The institutional business processes are found across these organisational units like departments and faculties.

In instances where a process requires different skills to adequately carry out a range of activities, the process is likely to involve a number of students, staff and departments. For example, consider the student enrolment process. Within a typical implementation of this process:

a) The application office finds students, records them, and sorts them per faculties;
b) The faculties accept the relevant students' applications;
c) The departments receive relevant applications and go through the selection process;
d) The finance department invoices the students.

The next section discusses the information systems in use at the selected UoT since this constitutes the main component of this study.

3.4.3 Unit of analysis

The selected UoT makes use of the Integrated Tertiary Software as an ERP system which incorporates all operational units and functions onto a single integrated system

that serves the entire institution. According to ITS (online), the ITS system operates on an Oracle database with two Internet Applications servers. It can be accessed via any browser through the Intranet or Internet. Financial management systems including sub systems such as procurement systems, student management systems, telecommunications and marketing systems, HRM systems, iEnable (self-service) systems, and technical systems. In South Africa, ITS ERP system is used by over 50 institutions (Moses and Paulsen, 2007).

According to Evans (2010), some of the ITS- information systems in use at the selected UoT are:

➢ Student Registration Systems.
➢ Computer Aided Design (CAD): Application software used by engineers, architects, drafters, and others to create precision drawings or technical illustrations;
➢ e-Mail: Electronic mail used for communication, which predominantly replaces traditional paper mail;
➢ Information and Communication Technologies (ICT) Integrated Tertiary Software (ITS): The main database that CPUT uses for student and staff data (Evans, W.D. 2010);
➢ The Microsoft Office suite.

The following systems or modules are also integrated within ITS:
➢ Electronic Requisitioning System (ERS);
➢ Marks Administration System (MAS): Web based software that enables staff to upload students' assessment marks, as well as to draw class lists (Evans, W.D. 2011);
➢ Learning Management System (LMS): web based system used by lecturing staff to teach and assess students;
➢ Management Information System (MIS): this system is used to access statistical data such as student enrolments, pass rates, and throughput rates;
➢ CELCAT Timetabling System(CTS)

These last five systems together with the leave Application System (LAS) were subject of this research study.

3.4.4 Institutional business processes at the selected UoT

According to Rainer (2012:4), in order to improve universities' clients (students, staff, and partners) satisfaction and remain competitive, these institutions should manage their internal business processes in a similar way to Enterprises and SMEs. For the

purpose of this research, some of the internal business processes in use at the selected UoT which are considered a representation of the study are indicated as below:

- the Electronic Requisitioning or Procurement process (ERP);
- the Marks Alteration Process (MAIP);
- the Leave Application Process (LAP); and
- the Marks Administration Process (MAP).

The next section describes the mentioned business processes and how they are modeled at the selected UoT.

(a)   The current electronic requisitioning / procurement process of the selected UoT

(i) Process description

When there is a demand for furniture, as an example, by an academic staff member, the departmental administrator sends an e-mail to the supplier requesting a quotation. Once a quotation is received, the administrator processes the requisition which will either be approved or rejected by a buying officer. The departmental administrator receives an e-mail notifying her/him whether the requisition has been approved or not. Once approved, the requisition will be printed by the administrator and signed by both the administrator and the HOD. The signed requisition will be sent to the budget controller so that he/she can check the availability of funds and approve or not the requisition. Once the budget controller approves and signs the requisition, this will be sent the buying office for order number generation. The buying officer will generate the order number and communicate it to both the supplier and the departmental administrator. Once the supplier receives the order number, as per the procurement policy, the supplier will deliver the equipment to the departmental administrator.

(ii)Process modeling

The modeling of this process is done using one of the Business Process Modeling Languages called EPC. The modeling tool that is used is the Signavio Process Editor. Signavio Process Editor allows for professional process modeling and optimisation. This application provides an ideal platform that can accommodate as many process participants as possible in the process design and optimisation. With the utilisation of the Signavio Process Editor, there is an increase in transparency in institutional

business processes and the institution is awarded a coherent picture of its institutional business processes (Signavio Process Editor, Online)[4].

The best way to map and improve the organisation's procedures is to take a top down approach, and not undertake a project in isolation (Carter, 2005).

The following illustrates the user interface of the Signavio Process Editor:
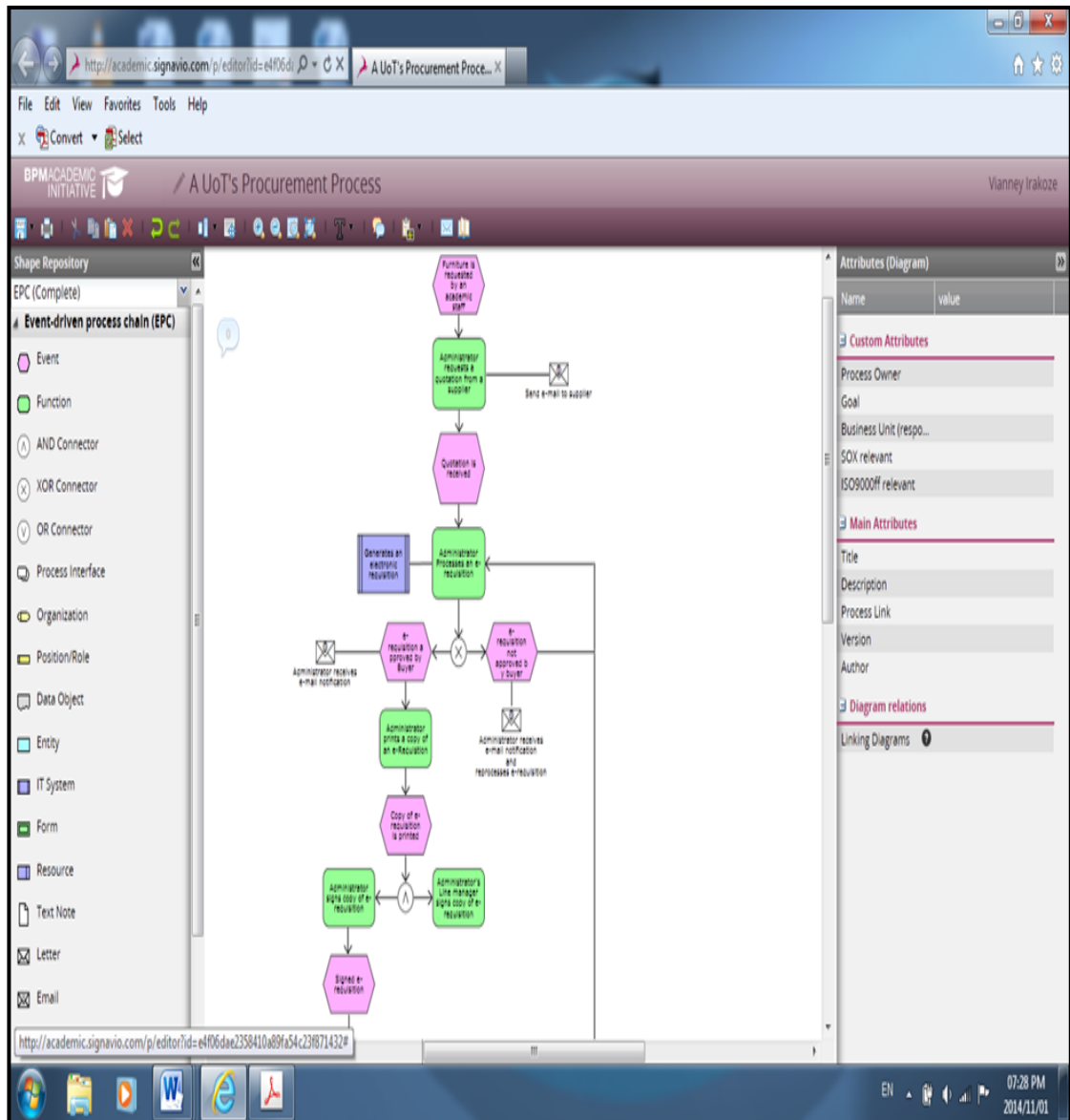
Figure 3. 2: The Signavio Process Editor User Interface

The following Diagram illustrates the current electronic requisitioning process model:

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4 Signavio Process Editor (online). Available from: http://marketplace.saphana.com/Lines-of-Business/Information-Technology/Signavio-Process-Editor/p/3781. Accessed on 01/11/2014.
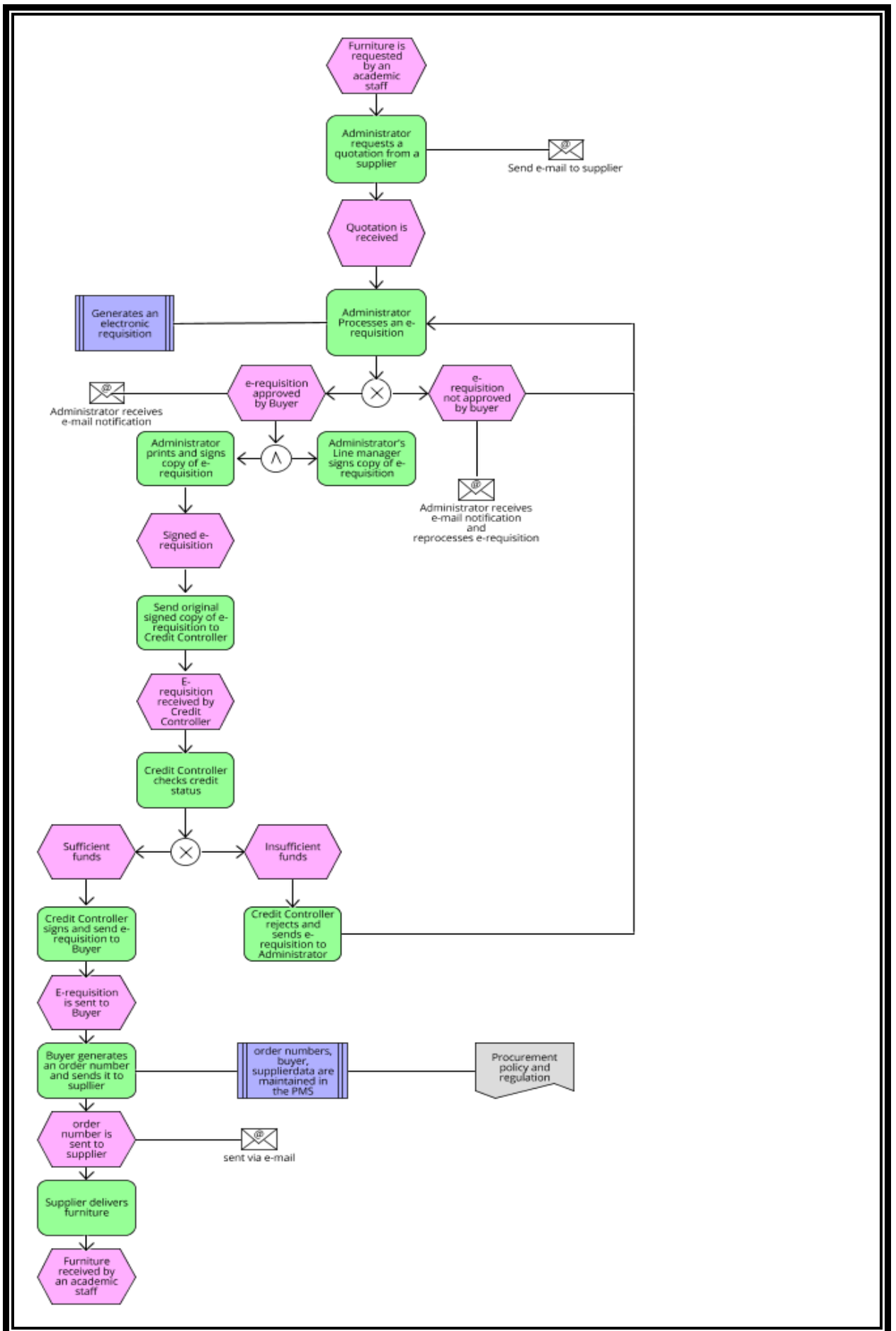
Figure 3.3: The current electronic requisitioning process of the selected UoT

The Signavio Process Editor[5] is a powerful and intuitive tool for mastering collaborative process management.

(b) Description and modeling of the current marks alteration process of the selected UoT

(i) Process description

When an error is reflected on the student academic record, the lecturer completes and submits a Marks Alteration Form to the HOD for signing. The HOD signs the form and sends it to the Faculty Officer for capturing, who then forwards it to the Dean for signature. The Dean sends the form to Senex for approval and once approved, the faculty officer is notified and alters the student academic record. The faculty officer should notify both the student and the subject lecturer.

(ii) Process modeling

The following Diagram illustrates the current marks alteration process:

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[5] The Signavio Process Editor. Available from: http://academic.signavio.com/p/editor?id=e4f06dae2358410a89fa54c23f871432. Accessed on 1/11/2014
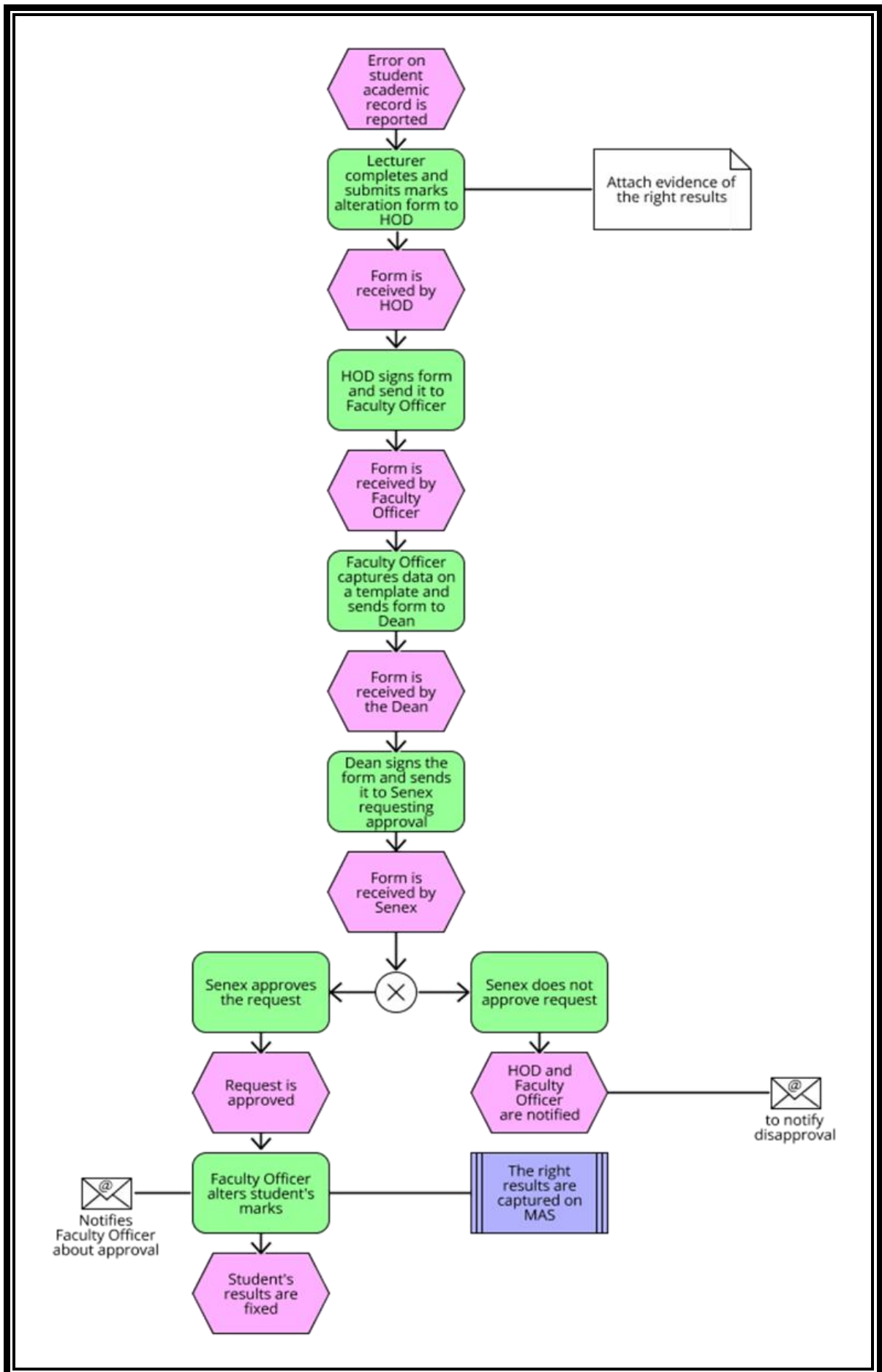
Figure 3. 4: The current marks alteration process of the selected UoT

(c)Description and modeling of the current leave application process of the selected UoT

(i) Process description

When a staff member wants to apply for leave, he/she applies online and the immediate line manager receives an e-mail notification to approve or reject the application. Whether approved or not, the applicant receives an e-mail notification as to the status of his/her application. With the current process, the evidence cannot be uploaded on the leave application system (LAS), it must be submitted as a hard copy.

(ii)Process modeling

The following Diagram illustrates the current leave application process:
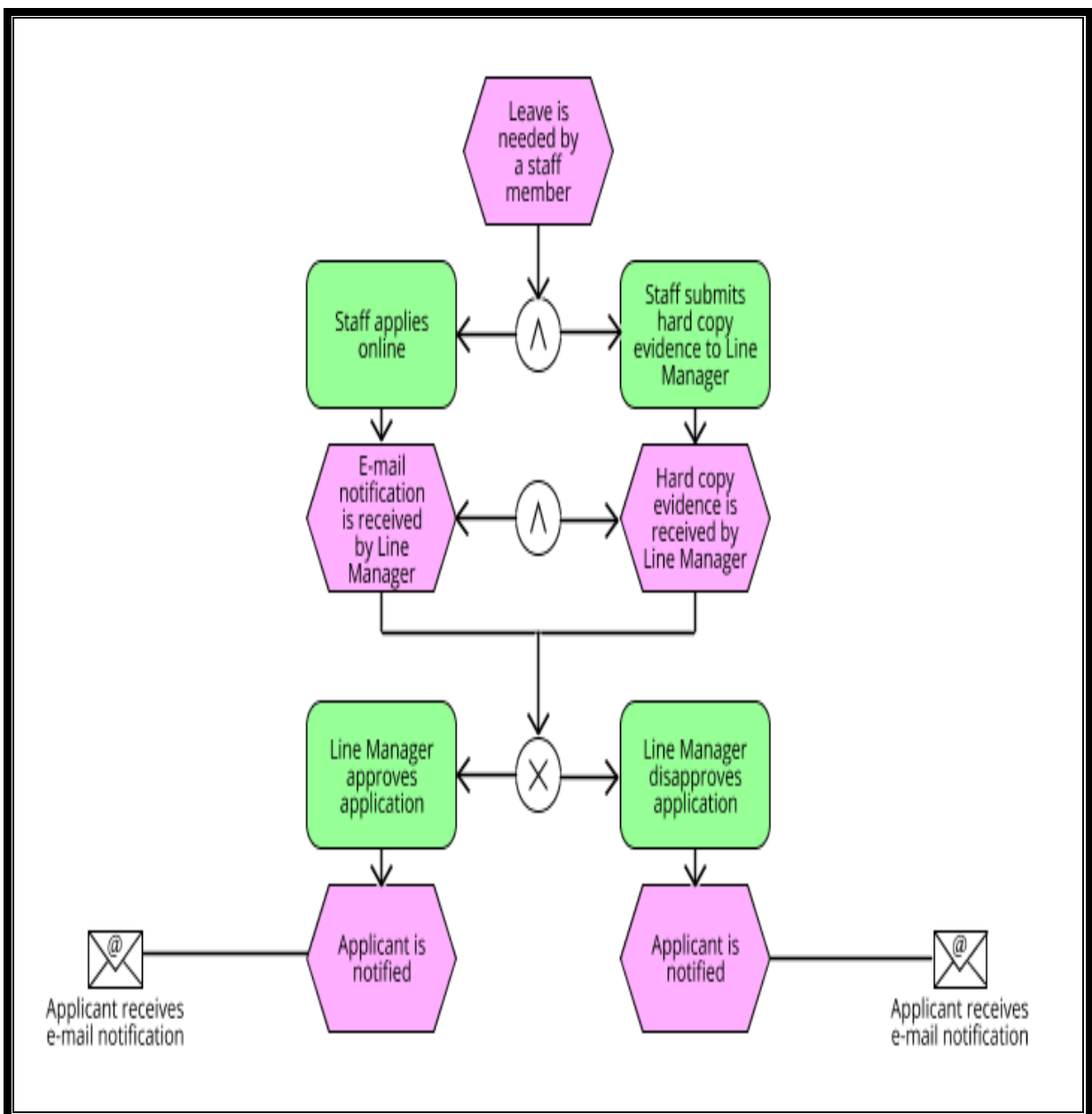
Figure 3. 5: The current leave application process of the selected UoT

(d)Description and modeling of the current marks administration process of the selected UoT

(i) Process description

When a lecturing staff member marks exam scripts, he/she uploads the marks onto the MAS. The department participates in a marks-related discussion and determines who qualifies for re-evaluations. Re-evaluations are written, marked, and relevant changes are made on the marks application system (MAS). The faculty officer computes, prints the board list (results) and sends hard copies to departments for signing off. The department identifies exclusion and study period on the board list, signs and sends signed copies to the dean for signing off. The dean sends signed copies to the faculty officer and the faculty officer blocks excluded students on the system. The faculty officer makes copies of board lists and sends originals to the exam office. The exam office makes corrections and publishes the results.

(ii) Process model
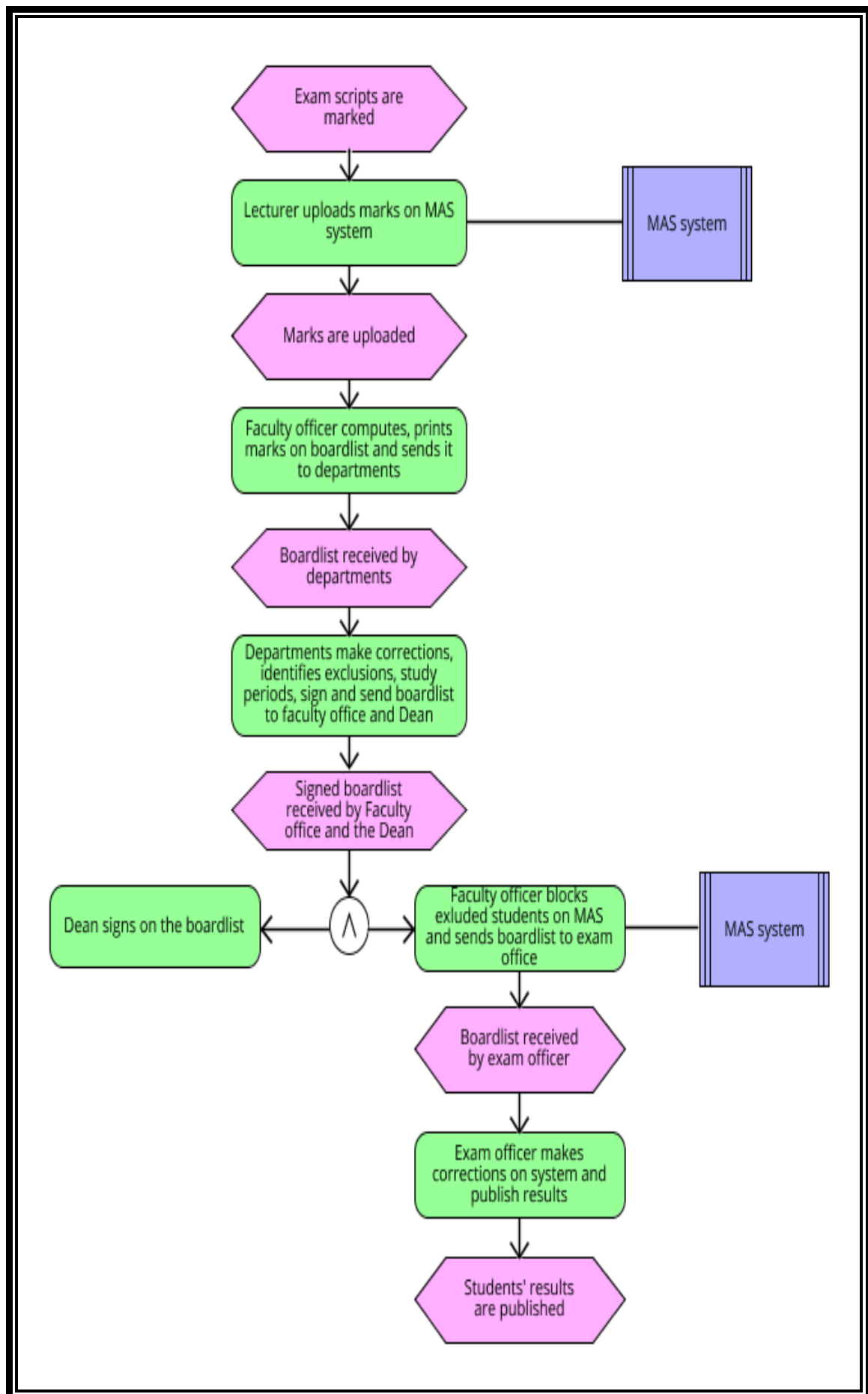
Figure 3. 6: The marks administration process of the selected UoT

3.5 SURVEY ENVIRONMENT

This research is a case study of a selected UoT's Information systems, while the unit of analysis is composed of selected integrated information systems and processes in the Engineering Faculty; this in order to demonstrate knowledge of research as well as investigating issues in sufficient detail. The Engineering Faculty is one of six faculties of the university. The rest are: the Faculty of Applied Sciences, the Faculty of Business and Management Sciences, the Faculty of Informatics and Design, the Faculty of Education and the Faculty of Health and Wellness. The Engineering Faculty is composed of eight departments including: the department of Civil Engineering and Surveying, the Electrical, Electronic and Computer Engineering department, the department of Construction Management and Quantity Surveying, the department of Mechanical Engineering, the department of Industrial and Systems Engineering, the department of Chemical Engineering, the department of Clothing and Textile, and the department of Maritime Studies. The Engineering Faculty is managed by a team led by the Dean of the faculty. The organogram of the management of the Engineering faculty is listed as appendix C for ease of reference.

The mission of the faculty of Engineering is, "to be a faculty of engineering excellence responsive to societal needs" and its slogan is, "the engineering pulse of Africa". The Faculty is managed by the Dean, the Deputy Deans, and the faculty manager. The departments are managed by respective Heads of Departments. The activities of the faculty are carried out by staff that can be categorised as the faculty management staff, the academic, administrative, and technical staff. The category of academics is made up of lecturing and research staff whereas the administrative category is composed of secretaries, administrative assistants and office assistants. Technical staff forms a group of laboratory technicians, laboratory assistants as well as maintenance staff. As at this point in time, the faculty numbers six staff at the top management level of the faculty, two hundred and eighty academic staff, twenty administrative staff members, and 40 technicians. In view of the above, it was important to specify which category of staff would be considered as participants in this research study.

3.6 OBJECT OF ANALYSIS

This research focused on two groups of staff namely the management of the Engineering Faculty and staff from a designated department in which a process of merger had been successfully completed. These two staff groups were well-suited to this research as being able to provide sufficient and reliable information relating to end-users experience and perceptions of information systems and processes at a University of Technology. This sample population seemed well positioned to provide

useful inputs in terms of business processes and information systems within the institution.

The faculty management staff who received a questionnaire includes:

    a) the Dean of the faculty,

    b) the Deputy Deans,

    c) the faculty manager,

    d) the faculty officer,

    e) the faculty coordinators,

    f) the heads of department,

    g) the faculty administrator, and

    h) the administrative personal assistants to the faculty managerial staff.

The HODs have been included in the category of the faculty management staff due to the fact that they constitute an integral part of the faculty management decision making body and take part in all meetings of the faculty management. Staff from the designated department included academic, technical and administrative staff members (see Appendix D). These two categories were familiar with internal processes and systems that are subject of this research study. The selection was done in an attempt to cover a larger sample of participants who make use of the information process and systems which are the subject of this study. Fifty-one staff out of seventy staff members who received the questionnaire completed them.

3.7 INSTRUMENT DESIGN

The research instrument selected for the purpose of this study was a questionnaire. According to Babbie and Mouton (2004), a questionnaire is a method used to collect data by asking questions and recording the responses. This technique was appropriate for this research since the nature of the study intended to deductively establish the perceptions of information systems by different role players within the institution. The questionnaire (Appendix A) used for the purpose of this study, was composed of closed-ended and open-ended questions. The questionnaire was compiled of check boxes aiming to collect data such as gender, type of position, qualification and information system experience of respondents. This questionnaire also included a five point Lickert scale with the following response categories:

    a) Strongly Disagree,

    b) Disagree,

    c) Agree,

d) Strongly Agree,

e) Not Applicable to me.

The advantages of using Lickert scales are that they are quick and easy to construct, each item meets an empirical test for discriminating ability and the Lickert scale is also treated as an interval scale (Emery and Cooper, 1995:180-181). Below is the questionnaire design model. Its description is discussed in the next chapter dealing with data analysis.
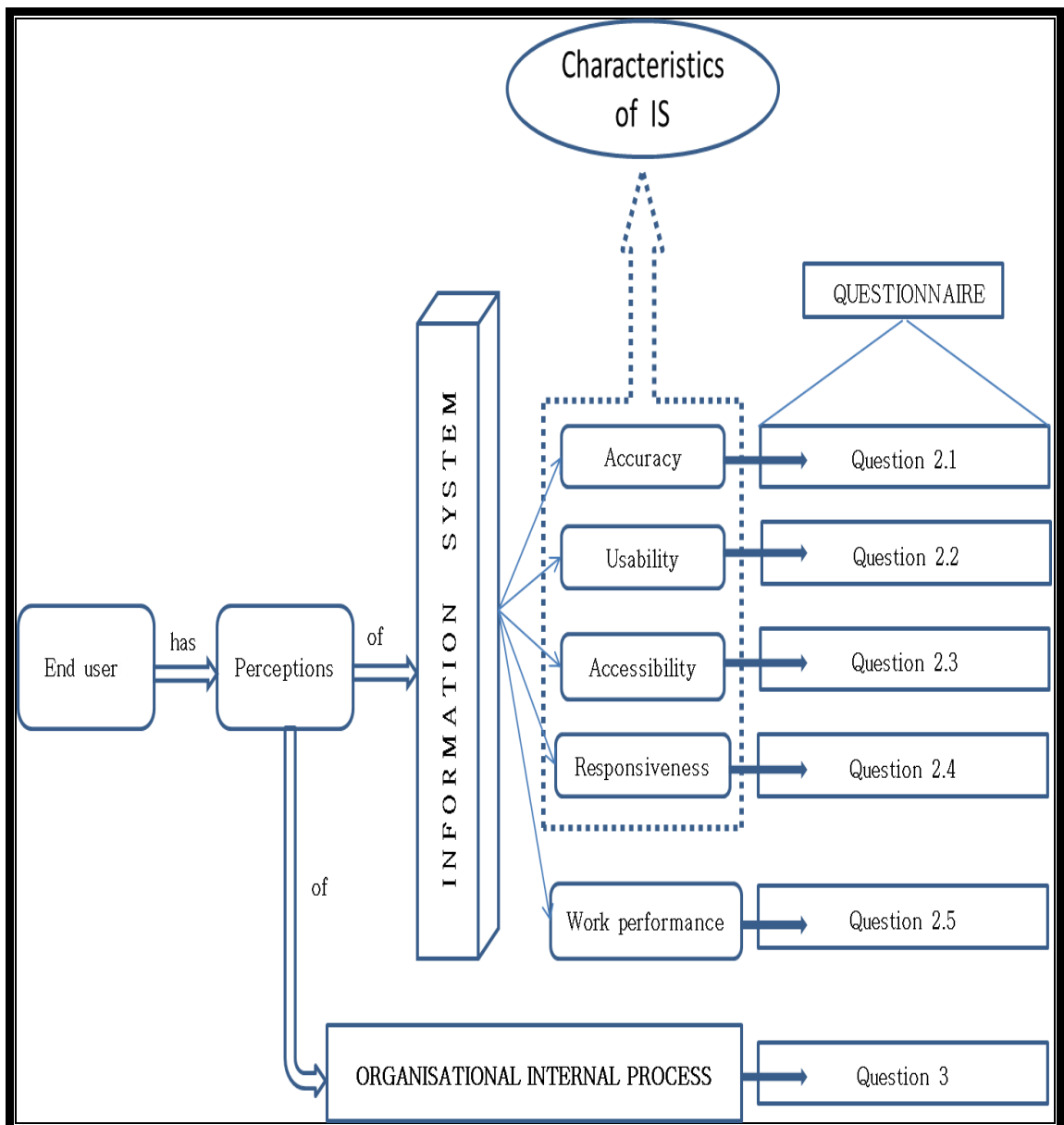
Figure 3. 7: Questionnaire design model

Before sending the questionnaire out for completion, three experts were consulted including a statistician, an IT professional and an academic who holds a PhD in information systems.

3.8   DATA ANALYSIS

The data analysis was carried out using the SPSS and a descriptive analysis. This statistical analysis enabled me to establish relationships and dependencies based on the demographic data drawn from the responses.

3.9   ETHICAL CONSIDERATIONS

3.9.1 Introduction

The research was undertaken in an ethical fashion to protect all participants as well as the University. Permission from the selected UoT to conduct research on this topic was granted by the relevant parties (see Appendix B). Saunders, Lewis and Thornhill (2000:130), define ethics as "...the appropriateness of your behaviour in relation to those who become the subject of your work or are affected by it".   It was a requirement of the research that there be no negative impact on the lecturing and administrative staff of the University, as well as on the reputation and image of the Faculty.

Most ethical issues in research fall into one of four categories, namely protection from harm, informed consent, right to privacy, and honesty with professional colleagues (Leedy and Ormrod, 2001:107-108). This source also indicates that researchers must report their findings in a full and honest fashion, without misrepresenting what they have done or intentionally misleading others as to the nature of their findings.

3.9.2 Validity

Validity refers to whether a measuring instrument measures what is expected to measure. Validity is measured by the use of group and it is expected that information measured should be reliable and valid (Jackson, 2008:741).Validity is the degree to which what is observed or measured gives the same result as what was supported to be observed or measured. Information can only be used if it is valid (Remenyi, Williams, Money & Swartz, 1998).

3.9.3 Objectivity

Welman, Kruger and Mitchell (2005) define objectivity as a procedure that does not rely on individual feeling or opinions with the same methods consistently being used at each stage of the research process. The methods include procedures for drawing a sample that measures variables, that collects information and a sample that analyses the information.

3.9.4 Reliability

Reliability is the degree to which what is observed or measured are consistent or stable. (Remenyi, Williams, Money and Swartz, (1998:291). Information must be reliable to give the accurate results. According to Welman, Kruger and Mitchell (2005:145), reliability focuses on the research findings and their credibility.

Staff were motivated to participate in this study since they were told that factors that constitute obstacles to the academic and administrative staff members' productivity and performance would be established.

3.10 CHAPTER SUMMARY

CHAPTER THREE: RESEARCH DESIGN		
Problem:		
Different role players perceive a widely varying range of problems in the use of organisational information systems at a selected UoT and the origin of these perceptions and problems should be investigated so that they can be better understood.		
Research question:		
Main research question *What are the experiences/perceptions of some information systems and processes by different end-users within the organisation?*		
Approach to the research:		
Philosophy: *Positivism* **Approach:** *Quantitative* **Data collection:** *The data collection instrument is a survey questionnaire and data will be collected from completed questionnaires by administrative, academic, and management staff members within the Engineering Faculty at a selected UoT; who are information systems end-users.* **Data analysis:** *Completed questionnaires will be analysed using a quantitative approach.* *The analysis will be conducted employing the IBM- SPSS.*		
Investigative questions	Purpose	Method
What processes and activities are critical to institutional performance?	To properly understand existing processes and how they impact on institutional performance.	All research participants must complete the questionnaire which includes open-ended questions.
Which systems are critical to the support of these processes and activities?	To establish gaps that constitute obstacles to end-user's performance.	Questionnaires sent to the rest of end-users within the faculty.

What processes and activities need to be streamlined? What effects do these systems/processes have on end-users and the organisation?	To determine internal processes that hamper the activities and performance of end-users.	Questionnaires sent to all designated participants within the faculty.

Table 3.1: Summary of chapter three

CHAPTER FOUR

DATA ANALYSIS AND RESULTS

*"Data is a precious thing and will last
longer than the systems themselves."*
– Tim Berners-Lee

4.1 INTRODUCTION

Welman, Kruger & Mitchel (2005) state that the analysis of data by means of statistical techniques enables the researcher to investigate variables and their effect, relationships and patterns of how we are involved within our world. Drawing from the above quote, an emphasis is made on the importance of useful data in a research.

The aim of this chapter is to discuss the statistical analysis of the responses obtained from the questionnaires that were sent out in order to elicit from users their perceptions of use of information system and the associated organisational internal processes at a selected UoT. The statistical techniques helped to investigate variables and their effects on end-users of information systems at the selected UoT. In this section, a presentation of results from the questionnaire is made. These results are presented from statistically analysed data received from completed and submitted questionnaires. The SPSS was employed for data capturing and analysis.

Data analysis is defined as a process of gathering and transforming information into useful data to use for research (Ader, Mellenbergh and Hand, 2008). The data analysis enabled the establishment of relationships and dependencies from the demographic data drawn from the responses. It is vital to firstly discuss the research questions to allow the reader to understand where the analysed information originated.

4.2 DISCUSSING THE RESEARCH QUESTIONNAIRE

The questionnaire was composed of three main sections. The first section covered mainly the biographic information about the research participants. The biographic section was to enable the researcher to establish relationships between participants' background and their perceptions of information systems being used. The questions as contained in the survey are placed along the right side of the model (see Figure 4.1 below). Questions from the first section helped to elicit from end-users' perceptions of information systems in use at a University of Technology. The

questions in the last two sections aimed to discover end-users' perceptions of organisational internal processes at the same institution.
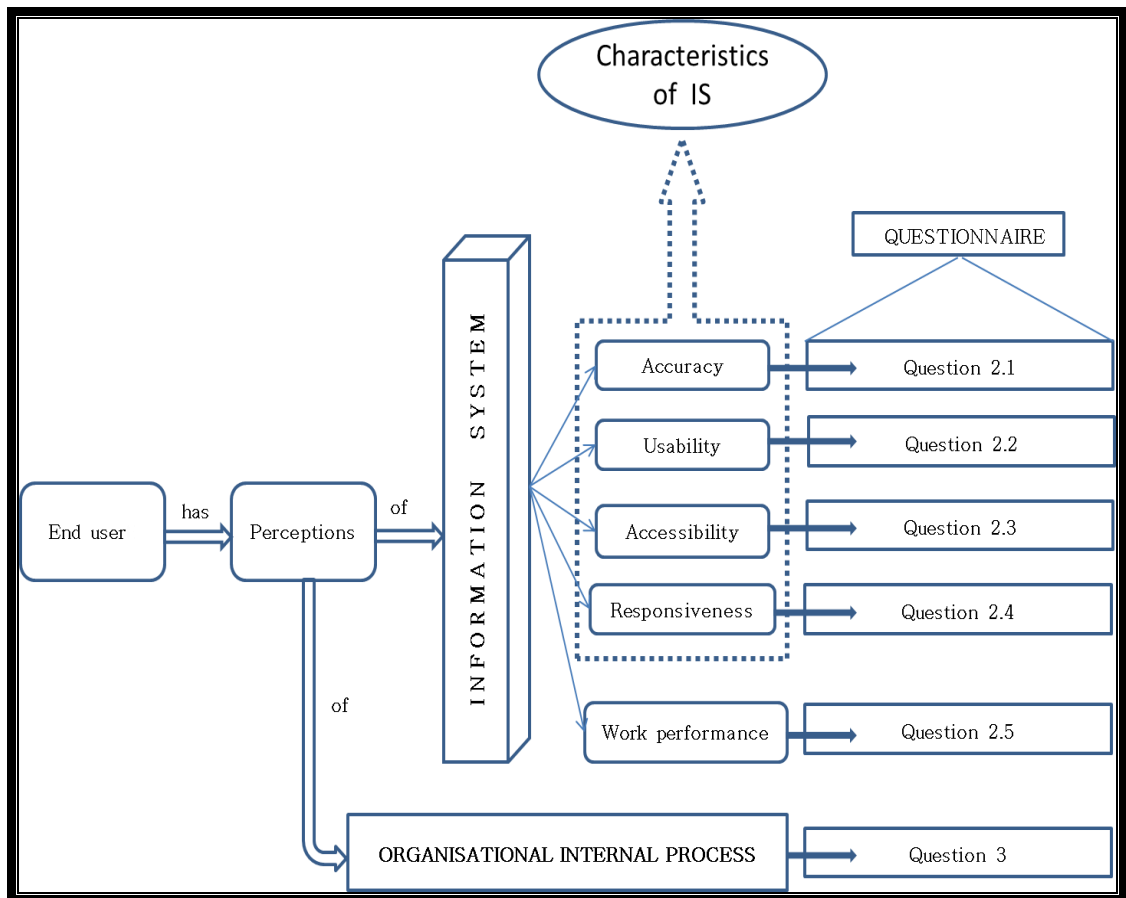
Figure 4. 1: Questionnaire design model

From the above model (from left to right), it is observed that an end-user has perceptions of IS regarding the accuracy of information, the usability, accessibility and responsiveness of selected information systems. These perceptions were derived from responses to questions 2.1; 2.2; 2.3; and 2.4 of the questionnaire. These questions sought to establish end-user perceptions of some of the information systems whereas question 2.5 aimed to establish end-user perceptions of the effect of these systems on their work performance. The third question sought to establish end-user perceptions of internal organisational processes at the selected UoT.

4.3 DATA VALIDATION AND FORMAT

Data gathered by means of questionnaires were prepared to ensure that SPSS ran on clean, correct and useful data. The questionnaires were coded on SPSS to order the collected data. As a result of data preparation only data collected from 49 questionnaires were analysed. The completed questionnaires received from respondents were coded and the data therein was captured on the IBM-SPSS statistics software. The following scale was used:

a) Strongly Disagree coded as 1;

b) Disagree coded as 2;

c) Agree coded as 3; and

d) Strongly Agree coded as 4

4.4   ANALYSIS

As was indicated in the introductory section of this chapter, the researcher sent out 70 questionnaires for completion, of which 57 were completed and 8 of them were not used since they were completed incorrectly, leaving the response rate at 70%. Statistical analysis of data was carried out and from the 49 responses which enabled the research to establish relationships and dependencies based on the demographic data drawn from the responses. The following are inferential and descriptive statistics for all variables measuring responses that establish the effects of information systems and processes on end-users at a selected UoT in the Western Cape of SA.

4.5   INFERENTIAL ANALYSIS

The inferential statistics that were performed on the data were the chi-square in order to determine if respondents converge in agreeing or disagreeing on each statement. In this research study, there was no significant difference in perception among people with different qualifications. However, it was noted that in spite of a large gap between the respondents who agreed and those who disagreed, the views of those who disagreed should not be undermined since this proved that they make use of the institutional information systems. The proportion of participants who agreed with a statement was compared to the proportion of respondents who did not agree with a statement. The chi-square test became invalid when completing these comparisons using the existing scale since there were frequencies of less than five in some cells. As a solution, an aggregation of categories with similar meanings was carried out. Strongly disagree and disagree were put together to form "Disagree" and agree and strongly agree where put together to form "Agree".

4.6   DESCRIPTIVE ANALYSIS

Due to their voluminous nature and for ease of reference, tables containing frequencies and cumulative percentages are found in Appendix E. Table 4.2 displays the descriptive statistics for section A which deals specifically with biographic variables, indicating the frequencies in each category and the percentage out of a total number of the respondents. The variables measuring the experience with some information systems by respondents at the selected UoT have been also provided. The frequency tables for the selected information systems staff experience are given,

enabling the researcher to establish whether the respondents had enough experience in using these systems.

4.6.1 SECTION ONE: Survey results for biographical variables

Descriptive statistics for section A – Frequency tables for the biographic variables:

GENDER				
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	30	61.2	61.2	61.2
	Female	19	38.8	38.8	100.0
	Total	49	100.0	100.0	
QUALIFICATION				
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Bachelor Degree	12	24.5	24.5	24.5
	Doctorate	7	14.3	14.3	38.8
	Masters	21	42.9	42.9	81.6
	Matric	2	4.1	4.1	85.7
	National Diploma	5	10.2	10.2	95.9
	National Higher Diploma	2	4.1	4.1	100.0
	Total	49	100.0	100.0	
TYPE OF POSITION				
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Lecturing staff	33	67.3	67.3	67.3
	Administrative Support Staff	7	14.3	14.3	81.6
	Faculty Management Staff	9	18.4	18.4	100.0
	Total	49	100.0	100.0	
EXPERIENCE AT THE SELECTED UoT				
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	6 months - under 1 year	1	2.0	2.0	2.0
	1 year - under 2 years	3	6.1	6.1	8.2
	2 years - under 3 years	4	8.2	8.2	16.3
	3 years or more	41	83.7	83.7	100.0
	Total	49	100.0	100.0	

Table 4.1: Descriptive statistics for biographic variables

The following graphical illustrations draw from the above table:
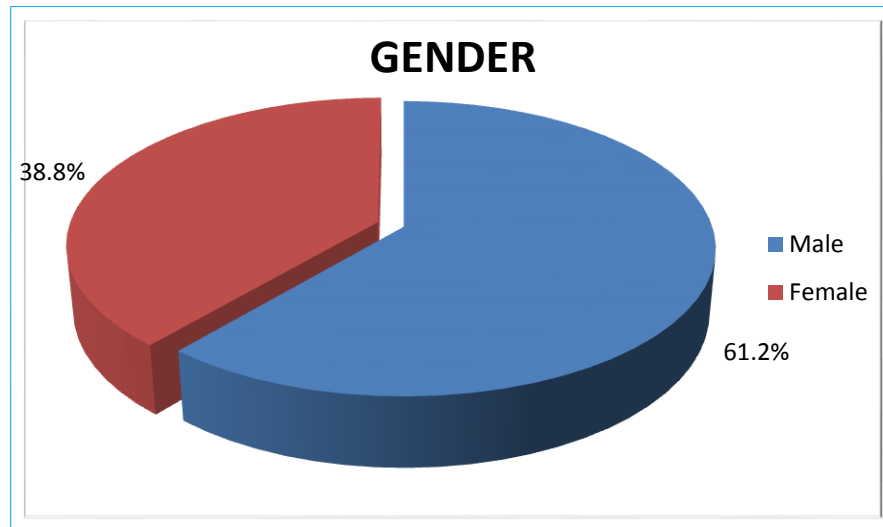
Figure 4.2: Gender of respondents

Given the list of respondents, the majority of the participants were males (61%) whereas 39% were females.
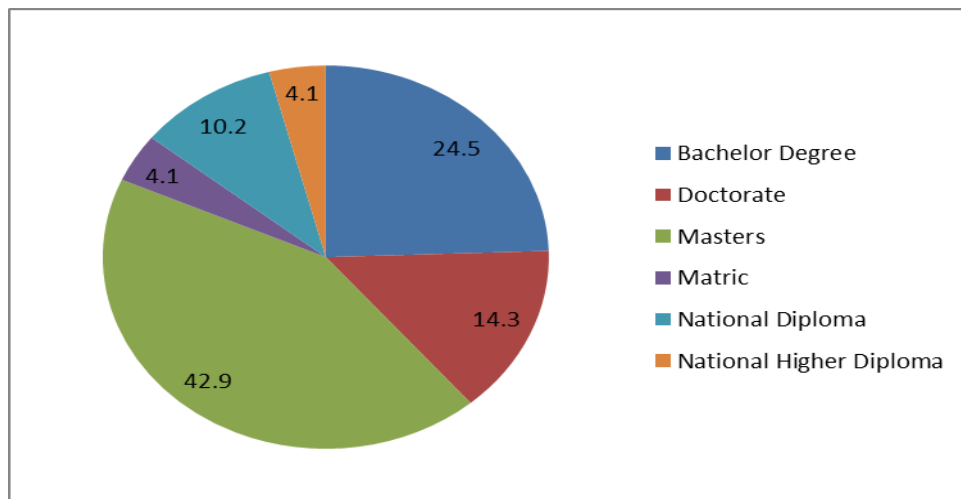
Figure 4.3: Qualification of respondents

The above figure shows that 14.30% of the respondents hold a Doctorate, while 42.90% of them hold a Master's Degree. 24.50% of respondents hold a Bachelor Degree, 4.10% of them hold a National Higher Diploma, 10.20% of respondents have a National Diploma and 4.10% of them have a Matric qualification.
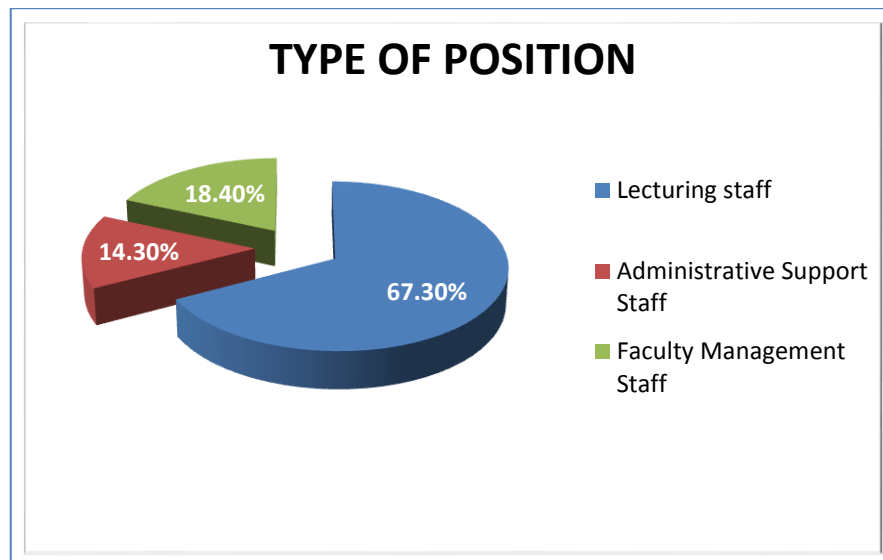
Figure 4.4: Type of position of respondents

Figure 4.4 shows that 67.30% of the respondents are in the category of lecturing staff, 18.40% of them are part of the managerial staff of the Faculty and 14.30% are in the category of administrative support staff.
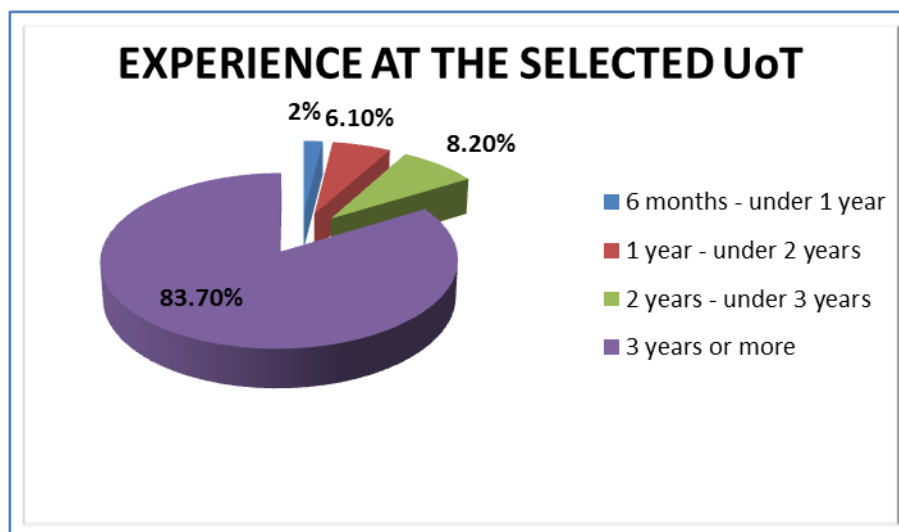
Figure 4.5: Respondent's experience with IS/BP at the selected UoT

Figure 4.6 shows that 83.70% of the respondents have been working for this selected UoT for more than three years, while 8.20% have been working for the selected UoT for more than two years. 6.10% of the respondents have been working for the selected UoT for more than a year, while 2% of the respondents have been working for the selected UoT for more than six months.

Descriptive analysis for section 1.2 of the questionnaire – Frequency tables for the information systems experience

		Frequency	Percent	Valid Percent	Cumulative Percent
EXPERIENCE WITH THE LAS					
Valid	Have not used it	19	38.8	38.8	38.8
	0 - under 6 months	2	4.1	4.1	42.9
	6 months - under 1 year	1	2.0	2.0	44.9
	1 year - under 2 years	16	32.7	32.7	77.6
	2 years - under 3 years	7	14.3	14.3	91.8
	3 years or more	4	8.2	8.2	100.0
	Total	49	100.0	100.0	
I HAVE BEEN USING MAS FOR					
Valid	Have not used it	9	18.4	18.4	18.4
	0 - under 6 months	1	2.0	2.0	20.4
	6 months - under 1 year	1	2.0	2.0	22.4
	1 year - under 2 years	3	6.1	6.1	28.6
	2 years - under 3 years	4	8.2	8.2	36.7
	3 years or more	31	63.3	63.3	100.0
	Total	49	100.0	100.0	
I HAVE BEEN USING MIS FOR					
Valid	Have not used it	11	22.4	22.4	22.4
	0 - under 6 months	2	4.1	4.1	26.5
	6 months - under 1 year	1	2.0	2.0	28.6
	1 year - under 2 years	6	12.2	12.2	40.8
	2 years - under 3 years	4	8.2	8.2	49.0
	3 years or more	25	51.0	51.0	100.0
	Total	49	100.0	100.0	
I HAVE BEEN USING LMS FOR					
Valid	Have not used it	22	44.9	44.9	44.9
	0 - under 6 months	2	4.1	4.1	49.0
	6 months - under 1 year	3	6.1	6.1	55.1
	1 year - under 2 years	2	4.1	4.1	59.2
	2 years - under 3 years	3	6.1	6.1	65.3
	3 years or more	17	34.7	34.7	100.0
	Total	49	100.0	100.0	

Table 4.1: Respondents' experience with selected information systems

EXPERIENCE WITH THE LAS
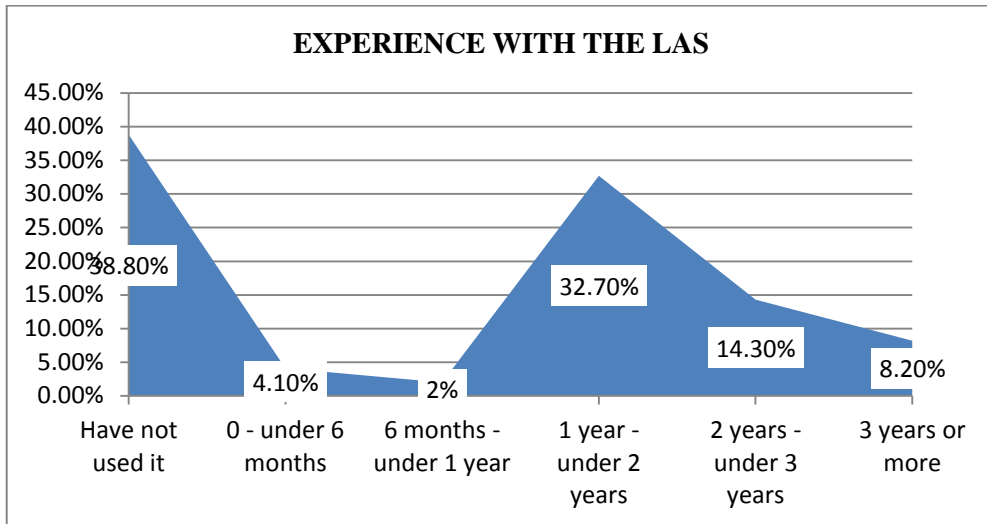
Figure 4.6: Respondents' experience with the LAS

The results show that 38.80% of the respondents indicated that they have not yet used the Leave Application System, 14.30% of them have used it for a period of between two years and three years, 32.70% them have used it for a period of between one year and two years, 8.20% of them have used it for more than three years and 4.10% have used it for a period under six months.

END USER EXPERIENCE WITH THE MAS
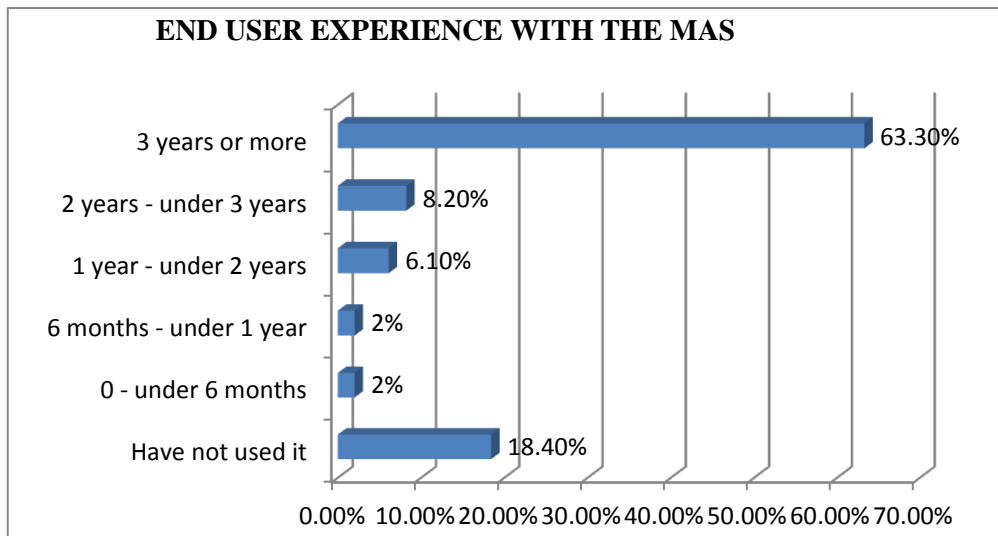
Figure 4.7: Respondents' experience with the MAS

The results show that 63.30% of the respondents indicated that have used the MAS for more than three years whereas 18.40% have not yet used it.
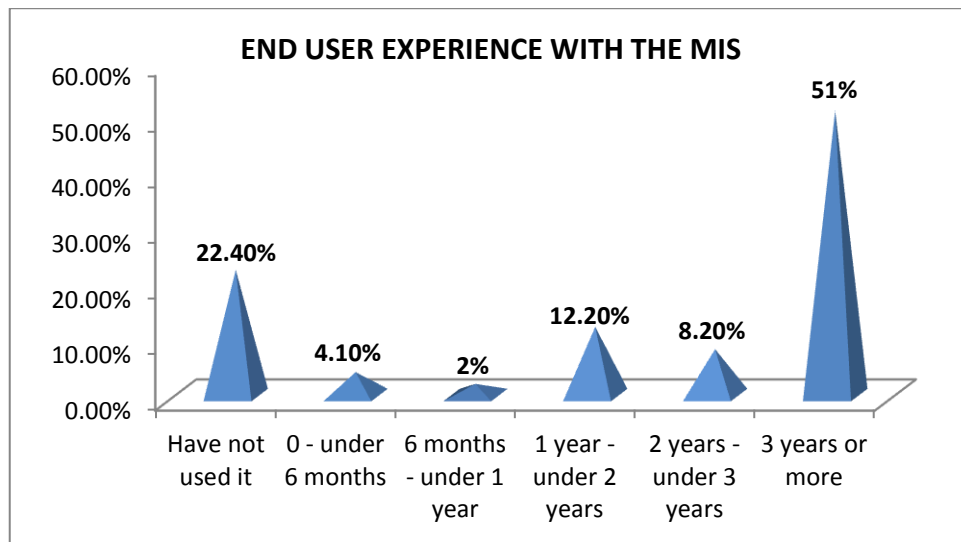
Figure 4.8: Respondents' experience with the MIS

The results show that 51% of the respondents indicated that have used the MIS for more than three years whereas 21% have not yet used it.
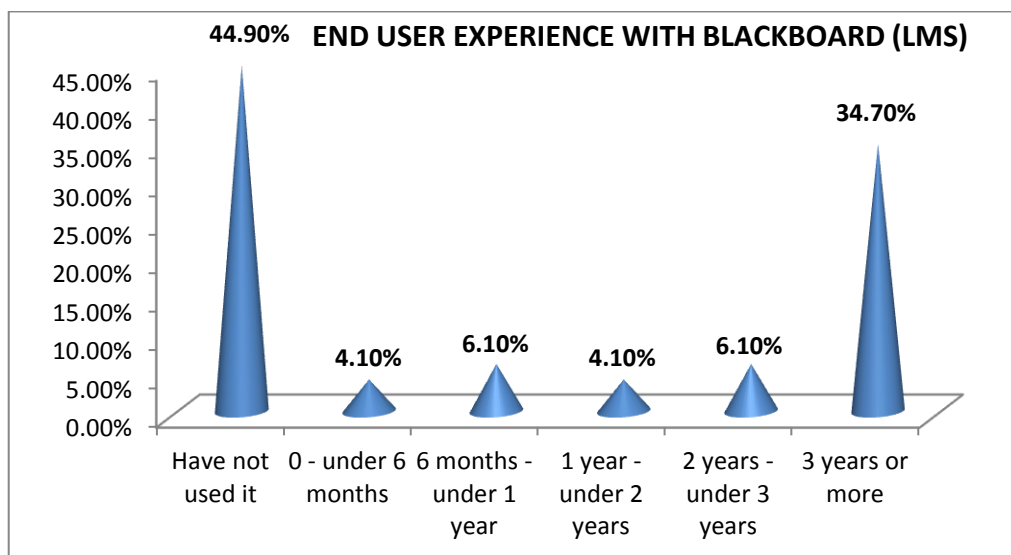
Figure 4.9: Respondents' experience with the LMS

The results show that 34.70% of the respondents indicated that have used the MIS for more than three years whereas 44.90% have not yet used it.

4.6.2 SECTION TWO: Participant's experience/perceptions of information system

The key objective of this section was to assess end-users' perceptions of the selected integrated institutional information systems and their impact on their performance. These perceptions were retrieved based on dimensions such as accuracy, usability, accessibility and responsiveness of information systems. It is of paramount

importance that institutional information systems give end-users accurate information in order to ensure satisfaction not only of end-users but also of other stakeholders such as students, parents, staff and other institutional partners. End-users need to be equipped with systems that are user-friendly to ensure their satisfaction. Information systems should be always accessible to avoid unnecessary delays when carrying out operational activities. They should provide information end-users require in order to fulfil their tasks.

As noted in the previous chapter, a Five-Point Likert scale was used in the questionnaire and for the purpose of the analysis of this section, an aggregation of the rating criteria has been done so as to provide a more definitive rating of each of the above dimensions. Thus, strongly disagree and disagree were combined to become a single criteria which is "Disagree". Agree and strongly agree became "Agree". In view of the descriptive analysis as contained in Appendix F, the following table was depicted with two single criteria. Participants who responded fully on the questionnaires were considered for analysis.

The following table 4.3 illustrates the respondents' perceptions of the integrated institutional information systems:

INFORMATION SYSTEM DIMENSION	RATING (% of RESPONDENTS)											
	LAS		ERS		MIS		CTS		MAS		LMS	
	Agree	Disagree	Agree	Disagree	Agree	Disagree	Agree	Disagree	Agree	Disagree	Agree	Disagree
Accuracy	87%	13%	100%	0%	93%	7%	81%	19%	85%	15%	89%	11%
Usability	88%	12%	83%	17%	89%	11%	81%	19%	90%	10%	86%	14%
Accessibility	88%	12%	92%	8%	87%	13%	75%	25%	88%	12%	72%	28%
Responsiveness	87%	13%	92%	8%	92%	8%	79%	21%	90%	10%	83%	17%

Table 4. 2: Respondents' perceptions of institutional information systems

The results show that 87% of respondents agreed with the accuracy of information generated by the LAS, indicating that this information system did give them accurate information and that they were satisfied, while 13% of them did not agree. The results show that 88% of the respondents agreed with the usability of the LAS indicating that this information system was user-friendly and they were satisfied, whereas the remaining 12% did not agree. 88% of the respondents indicated that the LAS is always accessible and they were satisfied whereas 12% disagreed. 87% of the respondents indicated that they received the information they required from this information system and they were satisfied. The rate of responsiveness was high.
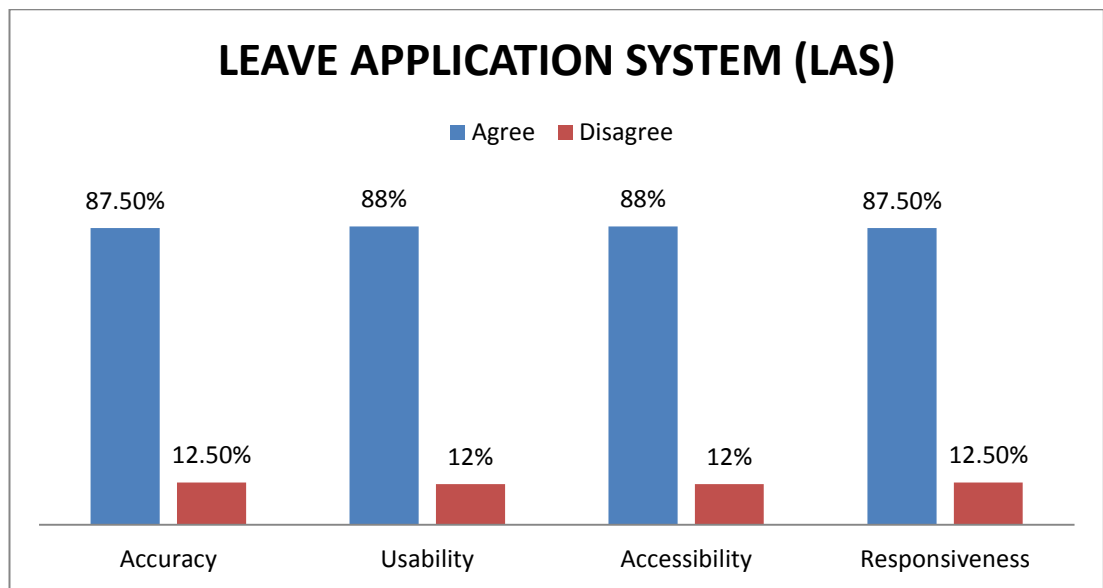
Figure 4.10: Respondents' perceptions of the LAS

All respondents agreed with the accuracy of information generated by the ERS, indicating that this information system did give them accurate information and they were satisfied. 83% of the respondents agreed with the usability of the ERS, indicating that this information system was user-friendly and they were satisfied whereas the remaining 17% did not agree. 92% of the respondents indicated that the ERS was always accessible and they were satisfied whereas 8% disagreed. 92% of the respondents indicated that they received the information they required from this information system and they were satisfied.
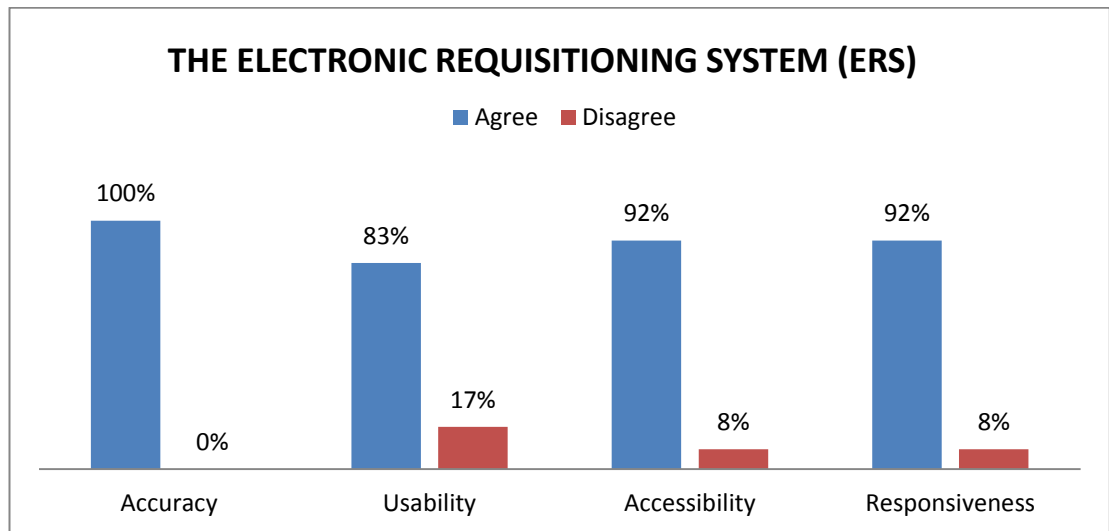
Figure 4.11: Respondents' perceptions of the ERS

The results show that 93% of respondents agreed with the accuracy of information generated by the MIS, indicating that this information system did give them accurate information and they were satisfied. 89% of the respondents agreed with the usability of the MIS, indicating that this information system was user-friendly and they were satisfied whereas the remaining 11% did not agree. 87% of the respondents indicated that the MIS was always accessible and they were satisfied whereas 13% disagreed. 92% of the respondents indicated that they received the information they required from this information system and they were satisfied.
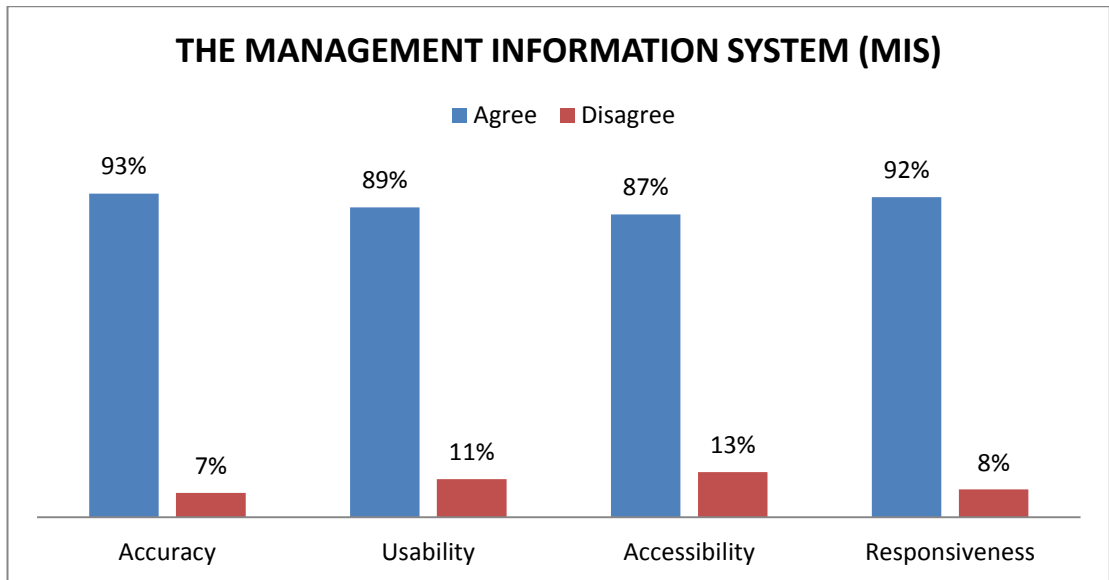
Figure 4.12: Respondents' perceptions of the MIS

The results show that 81% of respondents agreed with the accuracy of information generated by the CTS, indicating that this information system gave them accurate information and they were satisfied. 81% of the respondents agreed with the usability of the CTS, indicating that this information system is user-friendly and they were satisfied whereas the remaining 19% did not agree. 75% of the respondents indicated that the CTS was always accessible and they were satisfied whereas 25% disagreed. 79% of the respondents indicated that they received the information they required from this information system and they were satisfied.
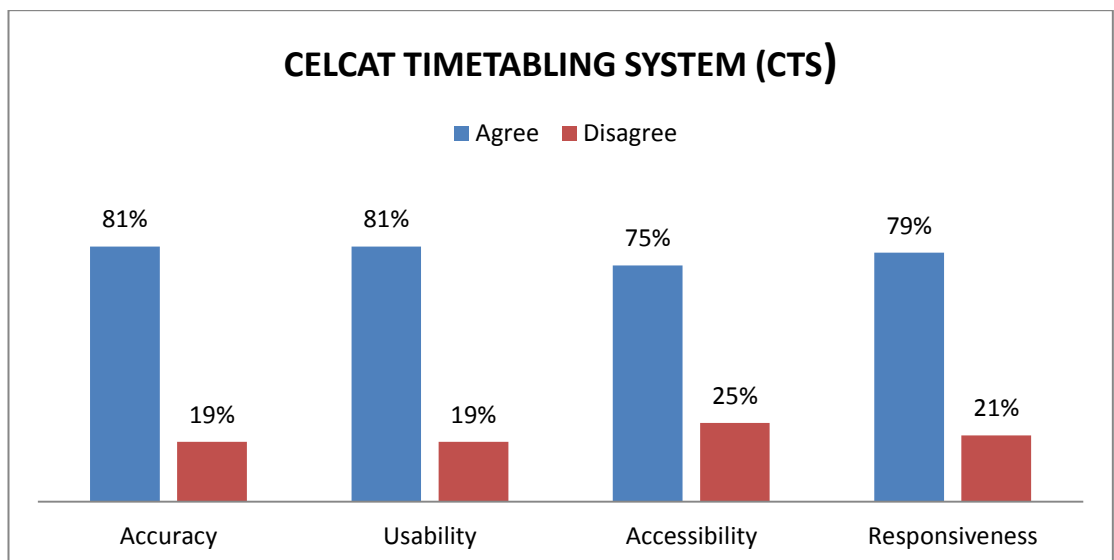
Figure 4.13: Respondents' perceptions of the CTS

The results show that 85% of respondents agreed with the accuracy of information generated by the MAS, indicating that this information system did give them accurate information and they were satisfied. 90% of the respondents agreed with the usability

of the MAS, indicating that this information system was user-friendly and they were satisfied whereas the remaining 10% did not agree. 88% of the respondents indicated that the MAS was always accessible and they were satisfied whereas 12% disagreed. 90.5% of the respondents indicated that they received the information they required from this information system and they were satisfied.
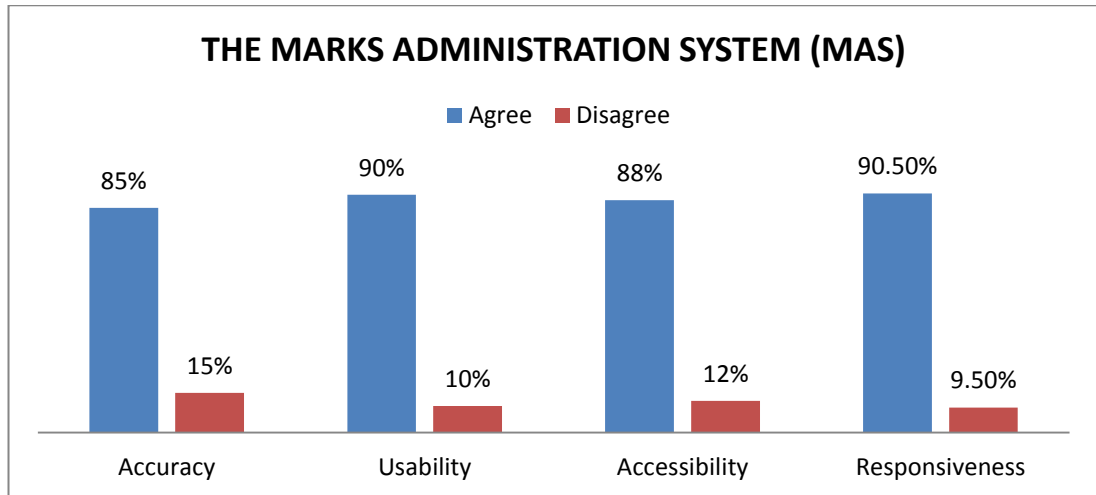
Figure 4.14: respondents' perceptions of the MAS

The results show that 89% of respondents agreed with the accuracy of information generated by the LMS, indicating that this information system did give them accurate information and they were satisfied. 86% of the respondents agreed with the usability of the LMS, indicating that this information system was user-friendly and they were satisfied whereas the remaining 14% did not agree. 72% of the respondents indicated that the LMS was always accessible and they were satisfied whereas 28% disagreed. 83% of the respondents indicated that they received the information they required from this information system and they were satisfied.
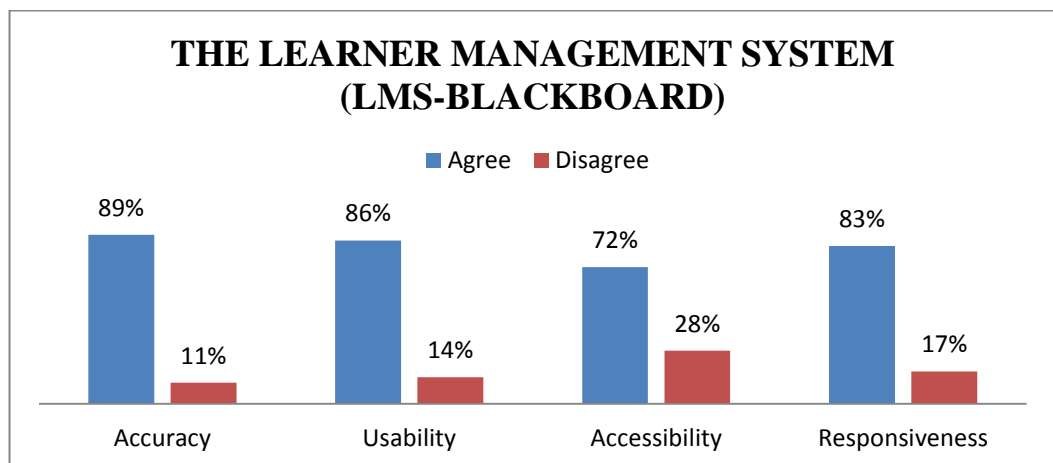
Figure 4.15: Respondents' perceptions of the LMS-BLACKBOARD

INFORMATION SYSTEMS' IMPACT ON WORK PERFORMANCE AND USER SATISFACTION

Respondents provided their perceptions or opinions with regards to the institutional information system user satisfaction and system impact on work performance. The table below shows information system impact on work performance:

INFORMA TION SYSTEM DIMENSIO N	RATING (% of RESPONDENTS)											
	LAS		ERS		MIS		CTS		MAS		LMS	
	Agree	Disagree	Agree	Disagree	Agree	Disagree	Agree	Disagree	Agree	Disagree	Agree	Disagree
System ensures user satisfaction and work performance	86%	14%	64%	36%	97%	3%	87%	13%	85%	15%	75%	25%

Table 4.3: Information system impact on work performance and user satisfaction

The observations that are made from the above table are, inter alia:

(a) 25% of respondents indicated that the LMS neither ensures their satisfaction nor their work performance.

(b) 15% of respondents indicated that the MAS neither ensures their satisfaction nor their work performance.

(c) 36% of respondents indicated that the ERS neither ensures their satisfaction nor their work performance.

(d) 14% of respondents indicated that the LAS neither ensures their satisfaction nor their work performance.

4.6.3 SECTION THREE: Participant perceptions of internal processes

INFORMATION SYSTEM DIMENSION	RATING (% of RESPONDENTS)							
	LAP		ERP		MAIP		MAP	
	Agree	Disagree	Agree	Disagree	Agree	Disagree	Agree	Disagree
Process needs to be streamlined	53%	47%	95%	5%	85%	15%	63%	37%

Table 4.4: Participant perception of internal processes

The results from the survey relating to the institutional internal business processes are rather alarming. It can be noted that all processes that constitute the subject of this study need to be streamlined. Almost all respondents indicated that the ERP needs to be streamlined and 85% of respondents indicated that the MAIP needs to be streamlined.

4.7   ANALYSIS OF RESPONSES FROM OPEN-ENDED QUESTIONS

The respondents were encouraged to provide further opinions, comments and suggestions by responding to questions as contained in the sections 3.2 & 3.3 of the survey. The following are some of the comments and suggestions that were given:

(a) Concerning the institutional business processes:

It was reported that the marks alteration process, the procurement process, the marks administration process and the leave application process took so long to produce results. It was suggested that all these processes be streamlined. It was suggested that the marks alteration process be a faculty function and not that of the Senate Executive. It was reported that students complain about these processes all the time and that this was giving the institution a bad reputation.

Respondents suggested that the buying officer processes the electronic requisition when given a signed quotation by the administrator. It was requested that the leave application process be re-engineering in a way that allows the applicant to upload evidence on the system for leave taken or to be taken. It was also requested that the marks administration process be re-engineered in a manner that enables greater efficiency.

Another suggestion was that the registration process be improved to ease the mark administration process. Some respondents reported that it was impossible to upload marks of a student who is not in the system. It was also noted that the selected UoT had no manual to describe and illustrate internal institutional processes and this was enabling some staff to make up their own rules along the way to the detriment of the institutional performance. It was suggested that the institution produce a manual to guide its staff through these institutional process, especially newly inducted staff. It was requested that existing **manual processes be automated** for operational efficiency.

(b) Concerning the institutional information systems:

It was reported that leave applicants could not apply electronically for leave in January, and that that they could not upload evidence such as medical certificates on the leave application system. It was requested that the leave application system be equipped with an option to upload evidence and that this system be reworked to enable staff to apply for leave in January electronically. It was also requested that the leave application system be made more user friendly.

Respondents reported that the LMS-blackboard required a lot of work by the lecturer in order to customise it to their particular needs. The fact that not all students have internet and computer connections both on and off campus was noted as a disadvantage for some students and it was suggested that management takes the above into account when CPUT is trying to enforce the use of the LMS-Blackboard. It was also suggested that staff be trained in the use of the LMS-Blackboard. It was suggested that the LMS-Blackboard makes provision to input student private email addresses other than CPUT ones to improve information flow. It was reported that the Blackboard system is not very user friendly and is not always available to students. It is difficult for students who are placed all across the country and even across the borders where there may be a weak internet signal to access the system. Students have expressed instances of inaccessibility when off campus.

Lecturers thought there was something wrong with the MAS and reported that this proved to be a significant hindrance in their efficiency in the workplace. It was requested that the class or group information on the Marks Administration System be up-to-date at all times and that class lists generated by the MAS reflect the names of students in those particular classes. It was suggested that the MAS allow lecturing staff an option to input student marks per student and to work with one student's mark-sheet at a time without having to download the entire group's mark-sheet.

Respondents requested that a way of creating a subset of students within a class (or subject) to access certain content be put in place.

Respondents reported that marks disappear from the MAS even though they were uploaded and it was requested that the subject lecturer be trusted to alter marks to avoid a long and tedious process that currently exists and which sometimes does not work. Respondents made a strong case for the security on the MAS be improved since it was found that in the previous two years some marks had been changed after being uploaded by the lecturer.

It was reported that the system error on the MAS in the past three years has resulted in a huge number of marks amendment forms having to be completed by the lecturer as a consequence. It was requested that MAS be able to sort students into their correct class groups which would also include aspects such as students who are omitted from lists, or incorrectly allocated, who have been given wrong codes, and occasional incorrect student information, etc., although already registered at the UoT. One respondent suggested that class groups be finalised as early as possible, at least before the first class tutorials/tests.

It was suggested that the MAS provide a way of extracting data/information electronically to facilitate marks discussion instead of using the manual procedures. Respondents also requested that an institutional standard policy be put in place with regard the re-assessment procedures. It was reported there was need to improve on accuracy of information on Marks administration system because at times the weightings were incorrect. At other times there was a delay in registered students appearing on the system resulting in lecturers being forced to go through a tedious marks alteration process.

Suggestions regarding the electronic requisitioning system were that it be made more user friendly and up to date. It was reported that the electronic requisitioning system did not reduce the amount of paperwork, but that it maintained the same amount of paperwork as the previous manual process. It was requested that staff be trained in terms of ERS to speed up the procurement process and to ease administrative workload of secretaries. Respondents asked that the ERS track the movement of requisition related documents and that the Requisition or Procurement process be linked to response times e.g., 48 hours.

It was reported that the MIS needed to be improved especially as it relates to people's information or details, as it doesn't provide the updated information.

In general, it was it was suggested that staff receive up-to–date, thorough training on all these info systems.

It was requested that end-users receive in depth **training** in the use of information systems; that a **system security** be put in place to ensure data integrity.

4.8   CHAPTER SUMMARY

CHAPTER FOUR: DATA ANALYSIS AND RESULTS		
1	Introduction of the study	This was provided in section 4.1. The main items that were discussed in this chapter were introduced in this section.
2	Discussing the research questionnaire	It is vital to firstly discuss the research questions to allow the reader an understanding of where the analysed information emanated from. This was dealt with in section 4.2
3	Data validation and format	Data gathered by means of questionnaires were prepared to ensure that SPSS run on clean, correct and useful data. The questionnaires were coded on SPSS in order to bring order to the collected data. As a result of data preparation only data collected from 49 questionnaires were analysed. The completed questionnaires received from respondents were coded and the data therein was captured on the IBM-SPSS statistics software.
4	Descriptive statistics	The descriptive statistics for all variables measuring responses that establish the effects of information systems and processes on end-users at a selected UoT in the Western Cape were provided in section 4.6
5	Analysis of responses from open-ended questions	The analysis of responses from open-ended questions was dealt with in sections 3.2 & 3.3

Table 4.5: Summary of Chapter Four

FINDINGS AND DISCUSSIONS

"What we find changes who we become."
- Peter Morville

5.1 INTRODUCTION

This chapter deals with the research findings and discussions. These findings were based on results from the fourth chapter and the conceptual framework illustrated in the second chapter. In presenting the research findings, references are also made to literature reviewed in the second chapter and to previous research in support or in contradiction to these findings.

5.2 THE RESEARCH FINDINGS

The research findings were very interesting and provided information and insights beyond the researcher's expectations. This is in support of Peter Morville's quote that indicates that "What we find changes who we become". Respondents were open to the questions posed to them especially in providing comments and suggestions with regard to the institutional information systems and business processes at the selected UoT. The research topic seemed to prove relevant to the needs of the participants at this particular time. The following findings focus on the biographical data and on the end-users' experience of certain institutional information systems and processes.

5.2.1 Discussing the biographical findings

In view of the research results, the following were relevant to my study:

➢ The research sample consisted mainly of respondents who hold a Master's Degree with fewer of them holding a Doctorate or Bachelor's Degrees.

➢ The respondents were in the employ of the selected UoT and occupy positions ranging from Dean of Faculty, Faculty Manager, Faculty Coordinators, Faculty Officer, Faculty Administrator, Head of Academic Department, Senior Lecturers, Lecturers, Junior Lecturers, Technicians as well as departmental secretaries.

➢ The majority of respondents were male.

➢ The great majority of respondents were in the employ of the selected UoT for more than three years and proved to be aware of the internal business processes at the selected UoT.

5.2.2 End-users' experience of certain institutional information systems

➢ The majority of respondents have been using institutional information systems for more than three years, with a few exceptions where some staff members still require training on the use of the integrated institutional information systems.

➢ The respondents' perceptions of the selected institutional information systems were generally positive even though there are still some areas that need improvements

➢ 38% of respondents have not used the Leave Application System despite the fact that this system has been available for more than two years.

➢ 17% of respondents indicated that the LAS was difficult to work with.

➢ 15% of respondents indicated that information generated by the MAS was inaccurate and this impacted negatively on their work performance.

➢ The MAS, ERS-PMS and the LMS-BLACKBOARD have proved to be more problematic than other systems for end-users at the selected UoT.

5.2.3 End-users' experience of certain institutional business processes

It was found that almost all internal business processes needed to be streamlined to ensure smooth flow of internal business operations. It was also found that existing institutional processes were not standardised. In addition, there was no manual for the institution that explains existing internal business processes. The respondents' perceptions of internal processes were very negative and require immediate interventions. Almost all respondents indicated that the ERP and the MAIP at the selected UoT need to be streamlined. Due to the above critical findings, the next section will focus on analysing and re-engineering these processes so as to propose a more streamlined set of institutional processes.

5.3 BUSINESS PROCESS ANALYSIS AND RE-ENGINEERING AT THE SELECTED UoT.

In view of the research findings that question the current UoT internal processes, these processes have been analysed and re-engineered in the next section. More streamlined business processes are also proposed for this selected University of Technology.

5.3.1 Analysing and re-engineering the current procurement process

The respondents reported that the current procurement process takes too long be finalized and involves a significant amount of paper based activity which could be reduced by increasing automation of process related activities. Respondents

requested that this process be streamlined in a way that is acceptable to all stakeholders. With reference to the current UoT procurement process model as discussed in section 3.4.4 (a) of this research and in view of these research findings, suggestions to re-engineer and improve this process were made as follows:

➢ The departmental administrator should request a quotation, sign it together with the Line Manager and e-mail it to the Buying office for processing.

➢ The Buying Officer should process the requisition in order save time.

➢ The process of approving the requisition by the budget controller should be automated

➢ The budget controller should be located in the same building as the buying office in order to make the process smoother.

➢ The analysis of the current procurement process has shown that, if changed, a great deal of time and energy can be saved, cutting costs and resulting in process improvement.

➢ The proposed process will make the work of the messenger much easier or enable the HRM to reduce the number of messengers and therefore cutting costs.

In consideration of all the above and in order to ensure business process improvement, **a new procurement management process model** is therefore proposed:
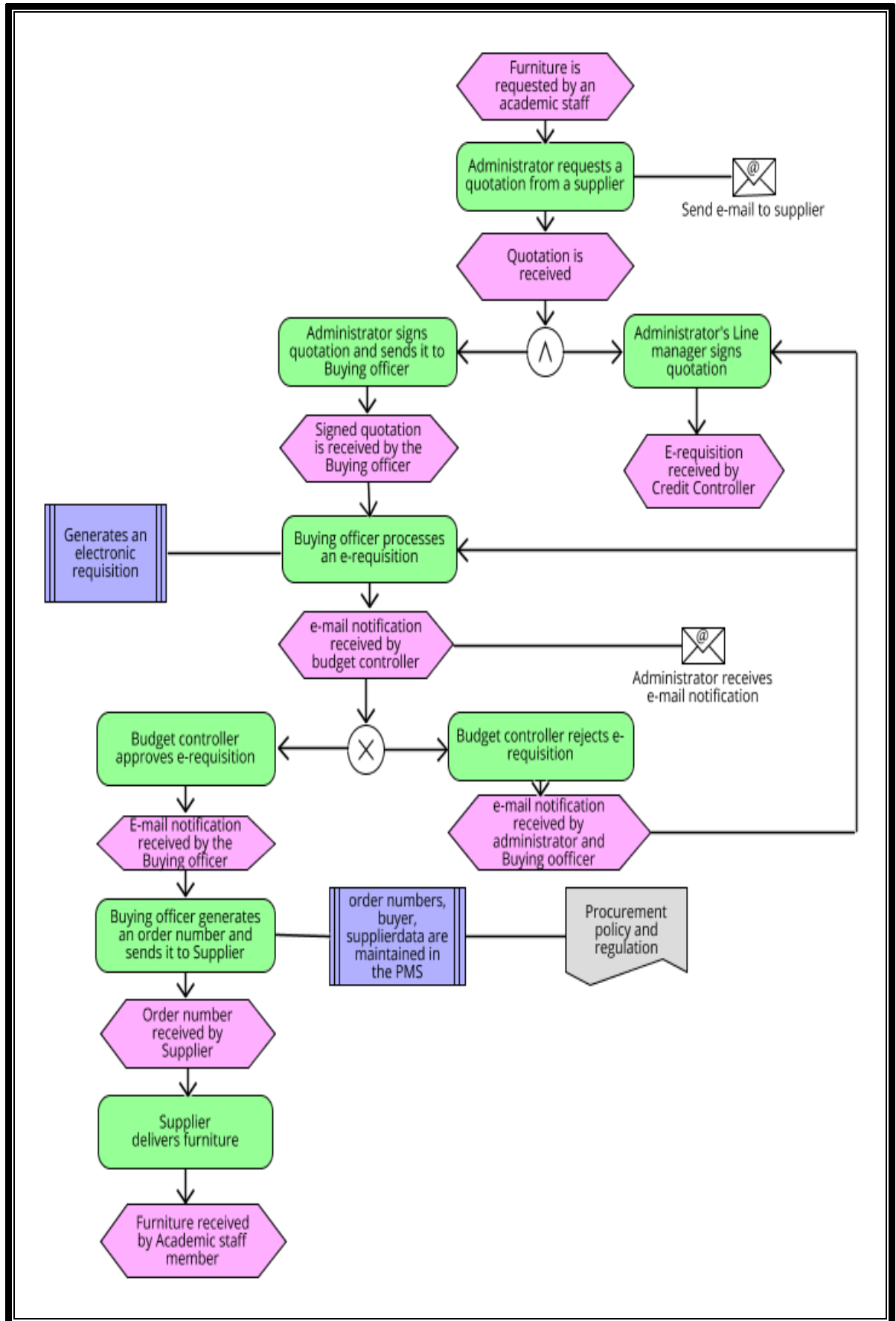
Figure 5. 1: A proposed electronic requisitioning process model for the selected UoT

5.3.2 Analysing and re-engineering the current leave application process

With reference to the current UoT leave application process, as described and modeled in section 3.4.4 (c) of this research and in view of this research findings, suggestions to re-engineer and improve this process were made were as follows:

➢ The submission of evidence should be automated.

➢ Staff should be able to apply for leave in January

In consideration of all the above and in order to ensure business process improvement, **a new leave application process model** is therefore proposed:
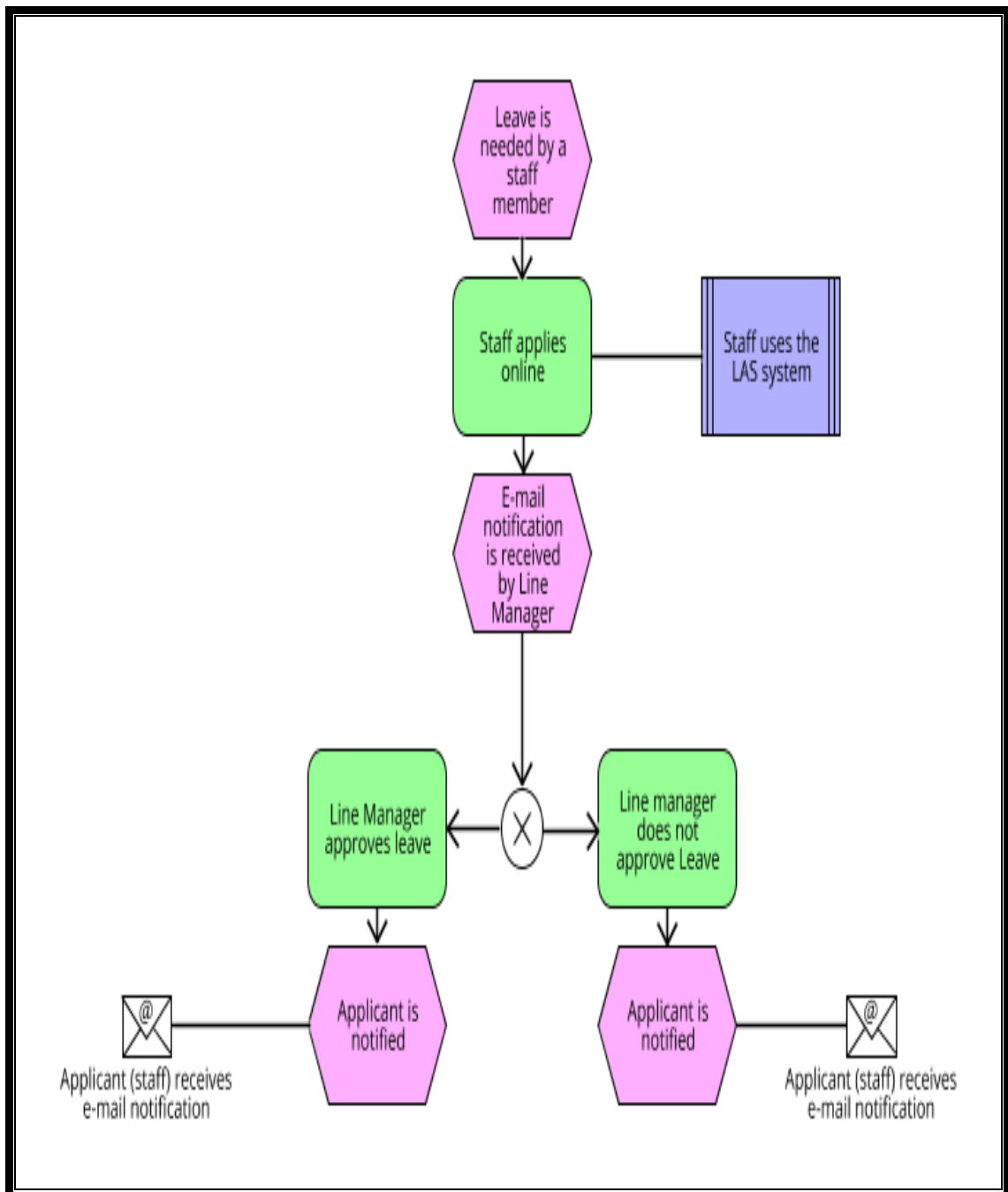
Figure 5. 2: A proposed leave application process for the selected UoT

5.3.3 Analysing and re-engineering the current marks alteration process

With reference to the current UoT marks alteration process, as described and modeled in section 3.4.4 (b) of this research and in view of this research findings, suggestions to re-engineer and improve this process were made. It was suggested that this process be streamlined. It was suggested that the marks alteration process be a faculty function and not that of the Senate Executive. It was reported that students complain about these processes all the time and that this was giving the institution a bad reputation.

In consideration of all the above and in order to ensure business process improvement, **a new marks alteration process model** is therefore proposed:
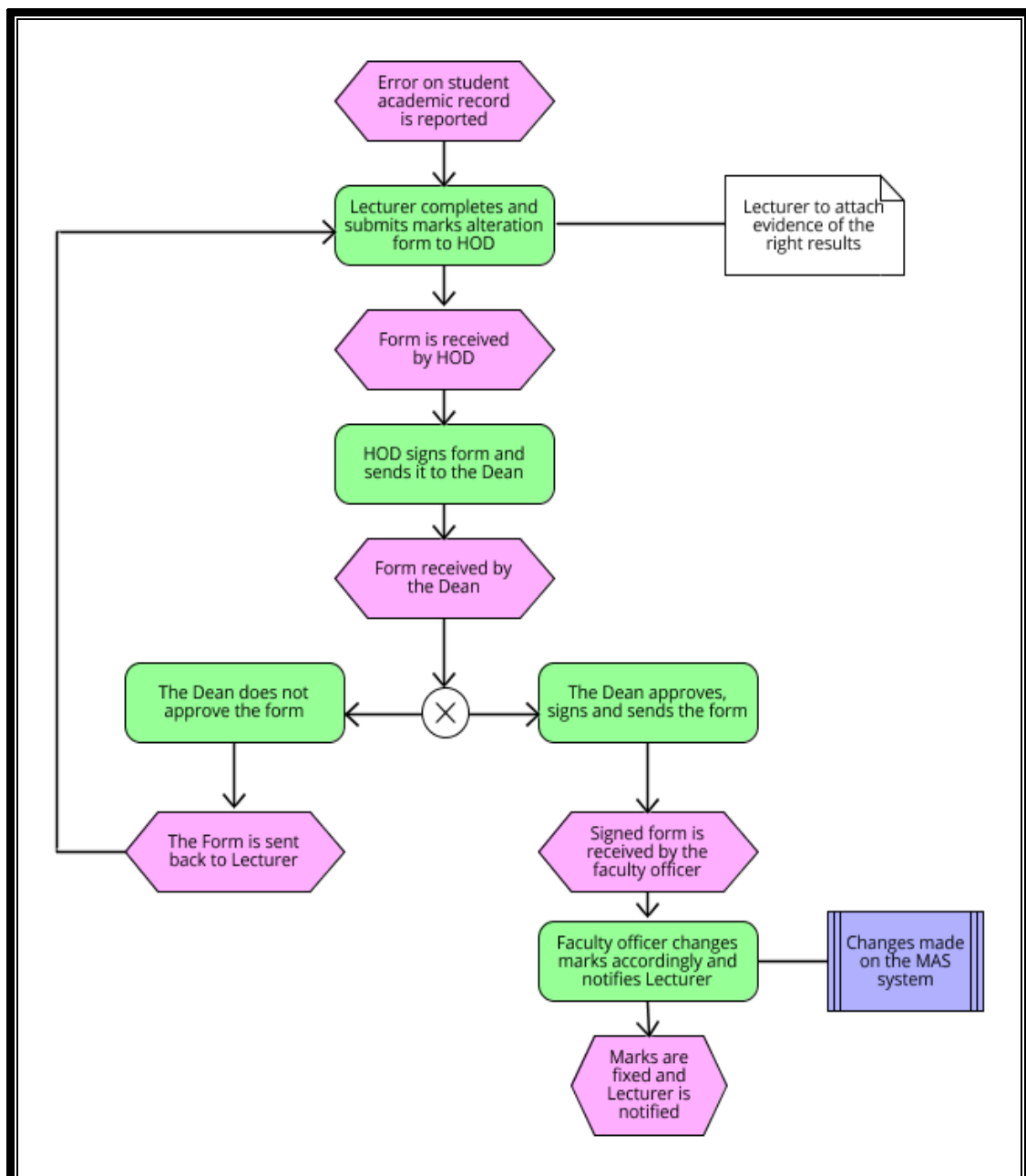
Figure 5. 3: A proposed marks alteration process for the selected UoT

5.3.4 Analysing and Re-engineering the current marks administration process

With reference to the current UoT marks administration process, as described and modeled in section 3.4.4 (d) of this research and in view of this research findings, suggestions to re-engineer and improve this process were made. It was reported that this process took so long to be productive. It was suggested that all this process be streamlined. It was also requested that the marks administration process be re-engineered in a manner that enables that shortens this process. In consideration of all the above and in order to ensure business process improvement, **a new marks administration process model** is therefore proposed:
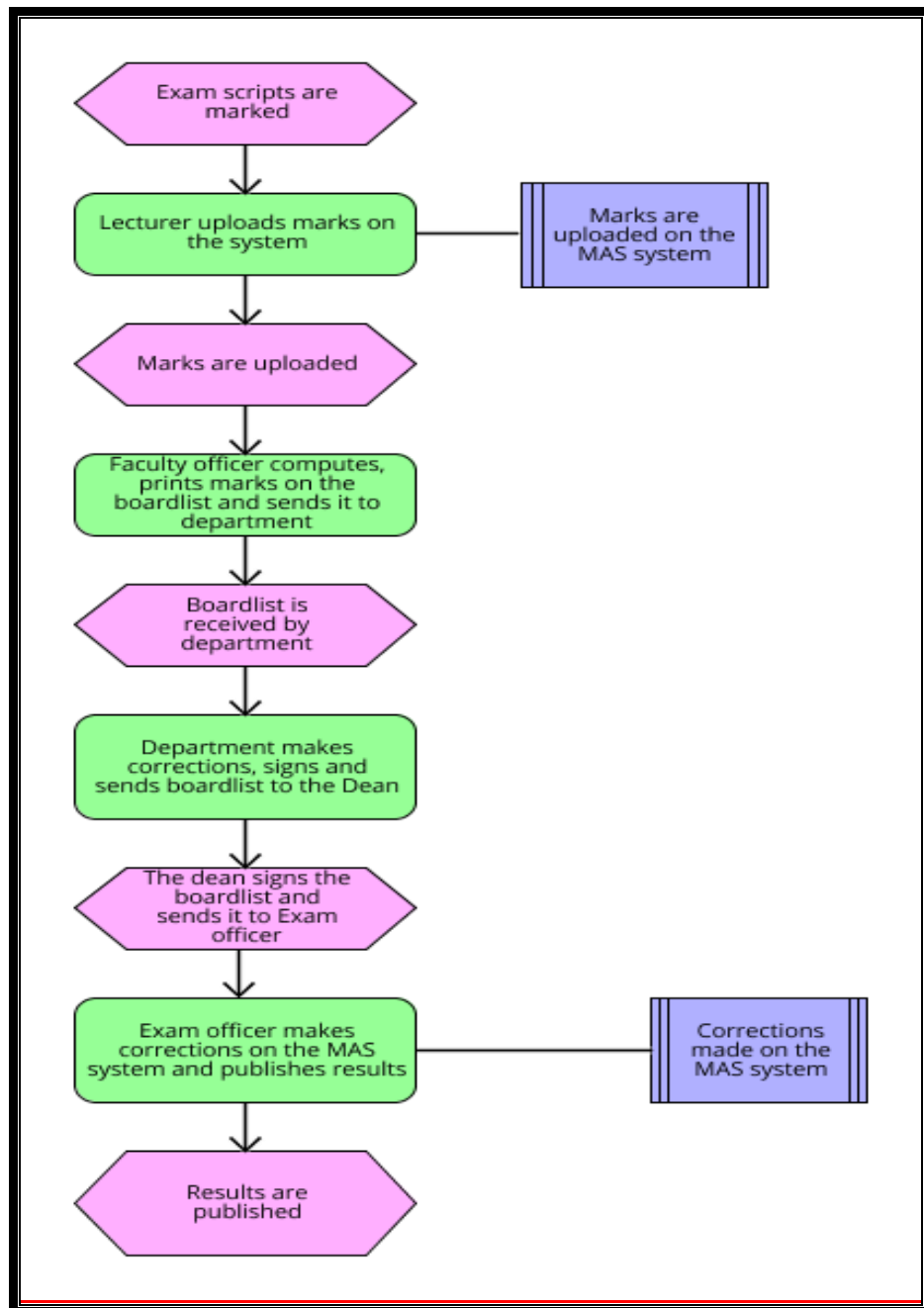
Figure 5. 4: A proposed marks administration process for the selected UoT

5.4   GENERAL FRAMEWORK

In view of the results from the data analysis and subsequent recommendations, a general framework for effective use of information systems and business processes at a University of Technology is proposed. As illustrated in the general framework, it was recommended that end-users receive in depth **training** in the use of information systems; that a **system security** be put in place to ensure data integrity, and that existing **manual processes be automated** for operational efficiency.

Figure 5.5 proposes a general framework for effective use of information systems and business processes at a University of Technology.
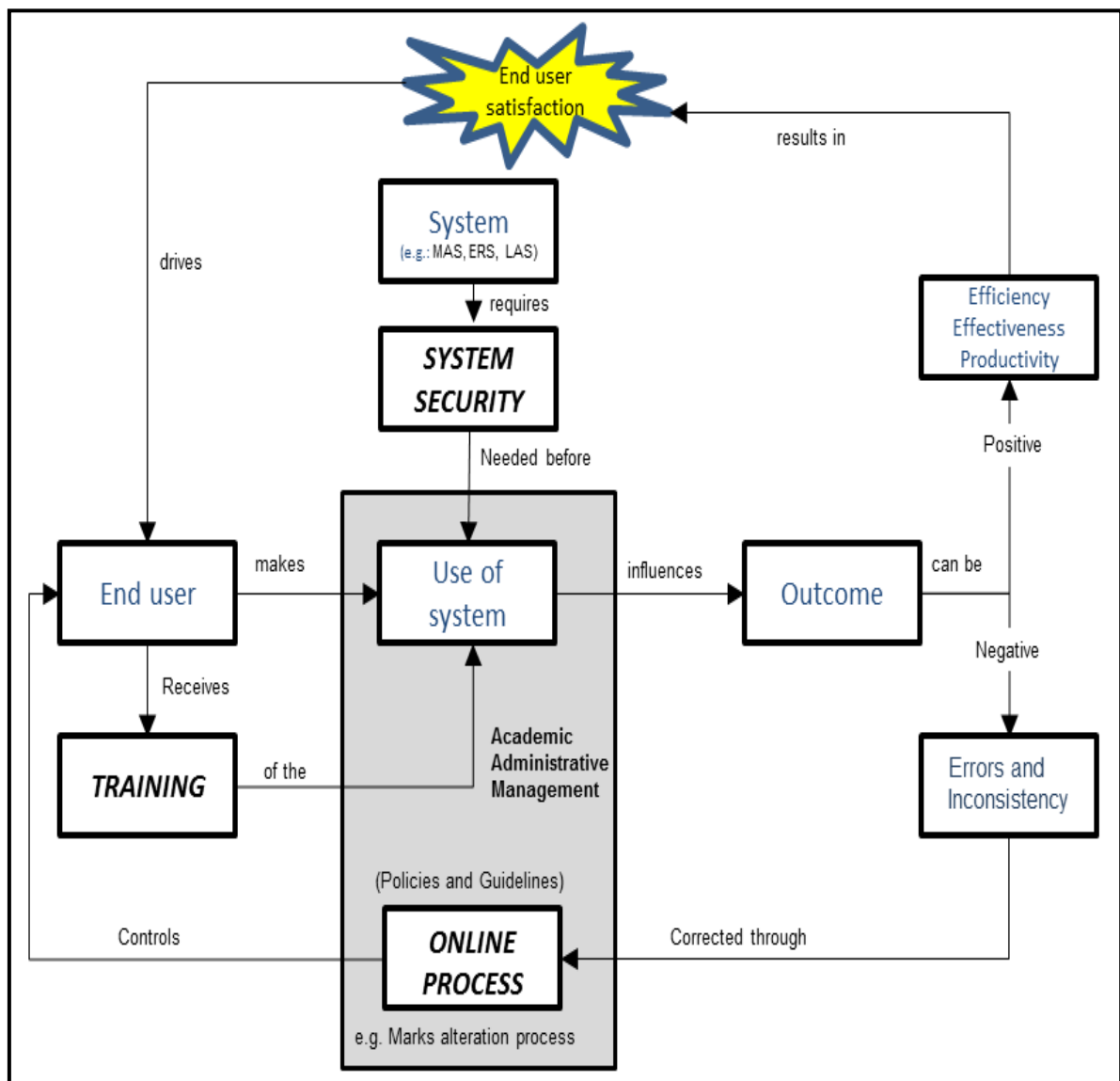
Figure 5.5: A proposed general framework for effective use of information systems and business processes at the selected UoT

One of the objectives of this paper was to propose a general framework for effective use of IS and business process innovation at the selected UoT. This framework is provided in Figure 5.1. The paper argues that the status of the outcome of IS use will determine the user satisfaction or dissatisfaction. Since the IS job is to make sure that an activity is carried out at

an optimum level and must yield good results, in instances of negative outcome, remedial alternatives should be opted for in any manner that will maintain the smooth running of the organizational main activity. An end user makes use of an information system in order to generate an outcome or results. In HEIs such as UoTs, an end user may be a lecturing staff member, an administrative staff member, a technician or any member of the management of the institution. The use of an information system by an end user at the selected UoT generates an outcome that can be either positive or negative. When a positive outcome is generated by the use of an information system, it is in most of the cases certain to experience efficiency, effectiveness and productivity which result in user satisfaction. A negative outcome can be generated from the use of an information system and this is experienced when erratum is noticed in a report generated by an information system. Inaccurate information resulting from the use of an information system can be caused by an end user or by the system itself. To solve this, a remedial strategy is sometimes concretized through a manual process which involves an extra activity, thus wasting time, energy and money. As universities of technology, to reflect their denominations these institutions of higher learning need to ensure that effective information systems and processes are in use in order to satisfy their stakeholders. As vocationally orientated institutions, universities of technology such as the selected UoT need to ensure that internal work processes are refined in a manner that allow them to speak directly to existing business systems. Institutional Information systems and processes need to be utilised in a manner that quickens administrative information flow and timely increase in throughput rates.

5.5 CHAPTER SUMMARY

CHAPTER FIVE: RESEARCH FINDINGS AND INTERPRETATION		
1	Introduction of the chapter	This was provided in section 5.1. The main items that were discussed in this chapter were introduced in this section.
2	The research findings	The research findings went, beyond the researcher's expectations. Respondents were open in responding to questions posed to them especially in providing comments and suggestions with regard to the institutional information systems and business processes at the selected UoT. This proves how very important this research topic seemed to participants and was dealt with in section 5.2
3	Business process analysing and re-engineering at the selected UoT	In view of the research findings, this study proposes business process analysing and re-engineering at the selected UoT.

Table 5.1: Summary of chapter

CONCLUSION AND RECOMMENDATIONS

"The roots of education are bitter, but the fruit is sweet."[6]
- Aristotle

6.1   INTRODUCTION

This chapter concludes the study and provides recommendations based on the findings. The introductory chapter of this research articulated the research problem posed in this study and explained the objectives put forward as an attempt to address this problem. Questions were asked in support of the set objectives. The second chapter gathered, explored and reviewed the literature concerning information systems and business processes in various sectors emphasising the Higher Education sector particularly at the selected UoT. The third chapter discussed the research design and provided a process to be followed so as to systematically elaborate on steps required to elicit adequate evidence that enabled the author to meet the objectives set in this research study. The fourth chapter dealt with the analysis of the responses obtained from the questionnaires sent out in order to ascertain end-users' perceptions of the integrated information systems and business processes in use at the selected UoT.

The statistical techniques enabled the researcher to investigate variables and their effects on end-users of information systems at the selected UoT. This chapter evaluates the research findings and revisits the research problem, objectives and questions. A final conclusion and a number of recommendations are provided.

6.2   REVISITING THE RESEARCH PROBLEM

The research problem that was posed in this research reads as follows:

> *"Different role players perceive a widely varying range of*
> *problems in the use of organisational information*
> *systems/processes at the selected UoT and the origin of these*
> *perceptions and problems should be investigated."*

The results of the data analysis proved that this problem still exists and proposed solutions in an attempt to address the problem. A significant number of respondents

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[6] http://www.brainyquote.com/quotes/topics/topic_education.html . Accessed on 12.11.2014

(38.80% of the respondents) indicated that they have not yet used the Leave Application System, and this needs to be addressed. 75% of the respondents indicated that the CTS was always accessible and that they were satisfied, whereas 25% of respondents disagreed. Data analysis shows that the inaccessibility of the CELCAT Timetabling System needs to be addressed. 83% of the respondents agreed that the ERS was user-friendly and were satisfied with the system, whereas the remaining 17% did not agree. 85% of respondents agreed with the accuracy of information generated by the MAS, indicating that they were satisfied. 90% of the respondents agreed with the usability of the MAS, indicating that this information system was user-friendly and they were satisfied whereas the remaining 10% did not agree. 88% of the respondents indicated that the MAS was always accessible and they were satisfied with it, whereas 12% disagreed.

86% of the respondents agreed with the level of usability of the LMS, indicating that this information system was user-friendly and they were satisfied whereas the remaining 14% did not agree. 72% of the respondents indicated that the LMS was always accessible and that they were satisfied whereas 28% disagreed. Suggestions to mitigate the research problems are provided later in the recommendations section.

6.3   REVISITING THE RESEARCH QUESTIONS: MAIN QUESTION

What are the perceptions of the use of the selected information systems and processes by different end-users within the organisation?

In this study, end-users provided their perceptions, comments and suggestions with regards to the integrated institutional information systems and business processes at the selected UoT. The results obtained went beyond the researcher's expectations. More details can be obtained from sections 4.6.2; 4.6.3; and 5.2 of this mini-dissertation.

6.4   REVISITING THE INVESTIGATIVE RESEARCH QUESTIONS: SUB-QUESTIONS

(a) What processes and activities are critical to institutional performance?
Respondents emphasised that the Electronic Requisitioning Process/Procurement Management Process, the Marks Alteration Process, and Marks Administration Process are critical to institutional performance.

(b) Which systems are critical to the support of these processes and activities?
Respondents emphasised that the Electronic Requisitioning System and the Marks Administration System are critical to institutional performance.

(c) What effects do these systems/processes have on end-users and the organisation?

End-users indicated their dissatisfaction with these systems which have created a negative impact on their work performance and the effectiveness of the organisation as a whole.

6.5   REVISITING THE RESEARCH OBJECTIVES

According to the research findings, the research objectives set in section 1.3 of the first chapter were met. In view of the literature reviewed in this study as well as the research results, a general framework is proposed which serves as a guide in determining the impact of information systems and business process at the selected UoT. For ease of reference it is illustrated in Figure 5.5.

(a) Determine different end-user experience of the use of certain information systems/processes and performance thereof;

The results obtained from data analysis indicated end-users' perceptions of institutional information systems and processes and their effects on performance. The recommendations that are given later in this research contain useful guidelines for the strategic management of information and business processes at the selected UoT.

(b) Propose certain general business process models that will improve internal operations at the selected UoT.

Certain institutional business process models were proposed in order to improve internal operations at the selected UoT. The modeling of these processes was done using one of the Business Process Modeling Languages called Event-driven Process Chain (EPC). The modeling tool that was used is the Signavio Process Editor.

(c) Propose a framework for effective use of IS and business processes at the selected UoT

Figure 5.5 proposes a general framework for effective use of information systems and business processes at a University of Technology.

6.6   RESEARCH CONTRIBUTIONS

6.6.1 General contributions

One of the objectives of this research was to propose a conceptual framework for the effective use of IS and business processes at the selected UoT. This framework is provided in section 6.7.5 of this thesis. The study argues that the status of the

outcome of IS use will determine the user satisfaction or dissatisfaction. Since the role of IS is to ensure that an activity is carried out at an optimum level and yields good results, in instances of negative outcome, remedial alternatives that will maintain the smooth running of the organisational main activity should be selected.

An end-user makes use of an information system in order to generate an outcome. In HEIs such as UoTs, an end-user may be a lecturing staff member, an administrative staff member, a technician or any member of the management of the institution. The use of an information system by a CPUT end-user or a role player generates an outcome that can be either positive or negative. When a positive outcome is generated by the use of an information system, efficiency, effectiveness and productivity are experienced which results in user satisfaction. A negative outcome can be generated from the use of an information system which is experienced when an error is noticed in a report generated by an information system. Inaccurate information resulting from the use of an information system can be caused by an end-user or by the system itself. To solve this, a remedial strategy is sometimes concretised through a manual process which involves an extra activity, thus wasting time, energy and money. Universities of Technology need to ensure that effective information systems and processes are in use in order to satisfy their stakeholders and need to take the lead in streamlining their existing processes, employing cutting edge information and communication technologies in order to attract, develop and maintain more students who graduate with both theoretical and technological knowledge. As vocationally orientated institutions, Universities of Technology such as the selected UoT need to ensure that internal work processes are refined in a manner that allow them to speak directly to existing business systems. Institutional Information systems and processes need to be utilised in a manner that speeds up administrative information flow and enables an increase in throughput rates.

Since the competition becomes more and more fierce in the work place, these Universities of Technology need to prepare graduates who are ready for employment and who meet industry requirements to ensure socio-economic development of the country.

6.6.2 Methodological contributions

This research study was conducted by adopting a quantitative approach in investigating the end-users' perceptions of information systems and processes at a selected UoT. Data was analysed with the aid of a statistical package – IBM SPSS. The methodological contributions are that the approach provides a design that would enable an information systems' researcher to solve research problems that relate to

different role players' perceptions across a wide range of problems relating to the use of organisational information systems in a an organisation where the origin of these problems need to be investigated.

6.6.3 Technical/practical contributions

The International Machines Corporation (IBM)-Statistical Package for Social Software (SPSS 22.0) was employed for data capturing and analysis. Chi-square testing was performed on the data in order to determine if respondents converge in agreeing or disagreeing on each statement. In this research study, there was no significant difference in perception among people with different qualifications. However, it was noted that in spite of a large gap between the respondents who agreed and those who disagreed, the views of those who disagreed should not be undermined since this proved that they make use of the institutional information systems.

One of the objectives of this research was to propose certain institutional business process models that will improve internal operations at the selected UoT. The modeling of these processes was done using one of the Business Process Modeling Languages called Event-driven Process Chain (EPC). The modeling tool that was used is the Signavio Process Editor. Signavio Process Editor allows for professional process modeling and optimisation. This application makes provision of an ideal platform that can accommodate as many process participants as possible in the process design and optimisation. With the utilisation of the Signavio Process Editor, the transparency in institutional business processes increases and the institution develops a coherent picture of its institutional business processes (Signavio Process Editor, Online).

This thesis was written with a particular writing style in that each chapter starts with a striking quote and ends with a chapter summary in the form of a table. Several graphical illustrations were designed to guide the reader's understanding of the thesis. A logical flow of ideas is reflected throughout this thesis and the reader can easily access central points articulated in this research.

6.7   RECOMMENDATIONS AND FURTHER RESEARCH

6.7.1 Introduction

The research findings were beyond the researcher's expectations. There was more data than what was expected, the research findings were richer and more insightful than what was expected, and they resulted in being some really good information that

might be transformative for the selected UoT. These recommendations are directly derived from the findings. These recommendations are, inter alia:

(a) The Marks Administration System is a sensitive and critical information system and its integrity should be ensured at all times. Since the reliability and accuracy of MAS has been questioned, corrective measures should be undertaken to ensure that staff and students' data are treated with caution and professionalism.

(b)The institutional process of self-assessment should be implemented as well as design and map business processes that serve as a reference for all staff members, especially newly inducted staff members. The research findings highlight the need for all institutional business processes to be re-engineered to ensure business process improvement.

(c)The institutional business process management should be embedded within the selected UoT as a new area of expertise to ensure effectiveness and efficiency of institutional business operations. The business processes should be mapped at all levels of management to ease the administrative flow of business operations. This can be effectively accomplished with the intervention of professional business process analysts. The department dealing with institutional business processes should be headed by its HOD, seconded by the business process manager, who in turn should be assisted by the business process assistants. The Department of Institutional Business Processes should be incorporated under the leadership of the Deputy Vice Chancellor of Information Services. This new functional area will enable the institution to move from good to great. Within this department, institutional business process models will be designed to ensure smooth administrative information flow within and throughout the university. These business models will play a significant role during automation of institutional business activities that are still paper-based, saving the university a considerable amount of money.

(d)Staff should be trained in the use of institutional information systems. This was also be dealt with in the proposed general framework for effective use of information systems and business processes at the selected UoT (See Figure 5.1) as discussed in the objectives' section of this study. This research study was conducted within one faculty of the selected UoT in the Western Cape due to the limited time and resources allocated for this work. It is therefore recommended that a more thorough study be conducted across the whole institution to investigate the effects of institutional information systems and business processes on end-users and the university.

It is hoped that the strategic management of the selected UoT have been provided with end-users' experience, perceptions, comments and suggestions with regard to their use of the institutional information systems and business processes. Strategic management can locate properly where problems are, where there might be difficulties in implementation, and establish an appropriate course of action.

This topic on information systems and operational business processes at universities is expected to attract scholars and practitioners in this area. More research studies in this in this area will be more useful and fruitful. Quoting Aristotle *"The roots of education are bitter, but the fruit is sweet."*[7]

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[7] http://www.brainyquote.com/quotes/topics/topic_education.html . Accessed on 12.11.2014

6.8 CHAPTER SUMMARY

CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS		
1	Introduction of the chapter	The main items that were discussed in this chapter were introduced.
2	Revisiting the research problem	The research problem was revisited to illustrate how it was solved within the course of this study.
3	Revisiting the research questions	The research questions were revisited to illustrate how they were answered within the course of this study.
4	Revisiting the investigative research questions	The research investigative questions were revisited to illustrate how they were answered within the course of this study.
5	Revisiting the research objectives	The research objectives were revisited to illustrate how they were met within the course of this study.
6	Conclusion	A conclusion provided an overarching statement about this research.

Table 6. 1: Summary of chapter six

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APPENDICES

Cape Peninsula
University of Technology

QUESTIONNAIRE: *CPUT's Information Systems and Organisational processes.*

I am currently undertaking research on the above mentioned topic in order to establish the factors that constitute obstacles to the academic and administrative staff members' productivity and performance.

The Cape Peninsula University of Technology (CPUT) strives to provide its staff with information systems to ensure delivery of good quality services and, where appropriate, profit maximization. For examples, academic staff members make use of information systems such as Marks Administration System to upload Students' assessment marks, as well as to draw class lists. They use a Learning Management System (Blackboard) to teach and assess students. Staff at the managerial level uses the Management Information System (MIS) to access statistical data such as student enrolments, pass rates, and throughput rates. Administrative staff members use the Electronic Requisitioning System (ERS) to process their purchasing requisitions.

This research aims to evaluate the effects of some institutional Information Systems on the Cape Peninsula University of Technology (CPUT) academic and administrative staff productivity and performance. Your assistance in providing responses to these questions will be highly appreciated since it will provide valuable information to render this research a success. Your responses will be confidential.

Many thanks for the time taken to answer the following questions.

CONTACT:
Name & Surname: Mr JM Vianney Irakoze
Tel: 021 959 6650
E-mail: irakozev@cput.ac.za

SECTION ONE: ABOUT PARTICIPANT (ANONYMOUS)

1.1 Please mark with an X and complete the following

TYPE OF POSITION:

	Lecturing Staff (e.g.: Junior Lecturer, Lecturer, Senior Lecturer… etc)
	Administrative Support Staff (e.g.: Secretary, Admin Assistant, Administrator… etc)
	Faculty Management Staff (e.g: Dean, Deputy Dean, Faculty Manager/Officer… etc)

GENDER:

Male	
Female	

DEPARTMENT: _____ (e.g.: Electrical Eng.)

QUALIFICATION _____ (e.g.: Matric, Diploma, MTech, DTech/PhD…etc)

POSITION: _____ (e.g.: HOD, Lecturer… etc)

How long have you been working for CPUT?	0 – under 6 months	
	6 months – under 1 year	
	1 year – under 2 years	
	2 years – under 3 years	
	3 years or more	

1.2   Information system experience of a staff member

I have been using this information system for: (Please mark with an X)

Information system	Period	Please mark with an X
Leave Application System (LAS) e.g.: for how long have you been applying for leave	Have not used it	
	0 – under 6 months	
	6 months – under 1 year	
	1 year – under 2 years	
	2 years – under 3	

electronically?	years	
	3 years or more	
Learner Management System (LMS)-Blackboard e.g.: for how long have you been using Blackboard?	Have not used it	
	0 – under 6 months	
	6 months – under 1 year	
	1 year – under 2 years	
	2 years – under 3 years	
	3 years or more	
Electronic Requisitioning System (ERS) e.g.: for how long have you been doing your e-requisitions	Have not used it	
	0 – under 6 months	
	6 months – under 1 year	
	1 year – under 2 years	
	2 years – under 3 years	
	3 years or more	
Marks Administration System (MAS) e.g.: for how long have you been uploading marks or drawing class lists	Have not used it	
	0 – under 6 months	
	6 months – under 1 year	
	1 year – under 2 years	
	2 years – under 3 years	
	3 years or more	
Management Information System (MIS) e.g.: for how long have you been checking student numbers…?	Have not used it	
	0 – under 6 months	
	6 months – under 1 year	
	1 year – under 2 years	
	2 years – under 3 years	
	3 years or more	
CELCAT Timetabling System	Have not used it	
	0 – under 6 months	

	6 months – under 1 year	
(CTS)		
e.g.: for how long have you been working on electronic timetables?	1 year – under 2 years	
	2 years – under 3 years	
	3 years or more	

SECTION TWO: PARTICIPANT'S PERCEPTIONS OF INFORMATION SYSTEM

2.1 Accuracy of information generated by information system

The following information system gives me accurate information and I am satisfied. Mark with an X.

Information system	Strongly disagree	Disagree	Agree	Strongly agree	N/A
Leave Application System (LAS)					
Electronic Requisitioning System (ERS)					
Management Information System (MIS)					
CELCAT Timetabling System (CTS)					
Marks Administration System (MAS)					
Learner Management System (Blackboard)					

2.2 Usability of information system

The following information system is easy to work my way through and I am satisfied. Mark with an X.

Information system	Strongly disagree	Disagree	Agree	Strongly agree	N/A
Leave Application System (LAS)					

Information system	Strongly disagree	Disagree	Agree	Strongly agree	N/A
Electronic Requisitioning System (ERS)					
Management Information System (MIS)					
CELCAT Timetabling System (CTS)					
Marks Administration System (MAS)					
Learner Management System (Blackboard)					

2.3 Accessibility of information system

The following information system is always accessible and I am satisfied. Mark with an X.

Information system	Strongly disagree	Disagree	Agree	Strongly agree	N/A
Leave Application System (LAS)					
Electronic Requisitioning System (ERS)					
Management Information System (MIS)					
CELCAT Timetabling System (CTS)					

Information system	Strongly disagree	Disagree	Agree	Strongly agree	N/A
Marks Administration System (MAS)					
Learner Management System (Blackboard)					

2.4 Responsiveness of information system

Most of the time, I receive the information I require from this information system and I am satisfied. Mark with an X.

Information system	Strongly disagree	Disagree	Agree	Strongly agree	N/A
Leave Application System (LAS)					
Electronic Requisitioning System (ERS)					
Management Information System (MIS)					
CELCAT Timetabling System (CTS)					
Marks Administration System (MAS)					
Learner Management System (Blackboard)					

2.5 Impact on work performance

This information system enables me to perform well in my work as per my job expectation and I am satisfied. Mark with an X.

Information system	Strongly disagree	Disagree	Agree	Strongly agree	N/A
Leave Application System (LAS)					
Electronic Requisitioning System (ERS)					
Management Information System (MIS)					
CELCAT Timetabling System (CTS)					
Marks Administration System (MAS)					
Learner Management System (Blackboard)					

SECTION THREE: PARTICIPANT' PERCEPTIONS OF INTERNAL PROCESSES

3.1 The following process needs to be streamlined. Mark with an X

Internal process	Strongly disagree	Disagree	Agree	Strongly agree	N/A
Leave Application Process					
Electronic Requisitioning or Procurement process. (From requesting a quotation to the delivery and payment for ordered item)					

Internal process	Strongly disagree	Disagree	Agree	Strongly agree	N/A
Marks Administration Process					
Marks Alteration Process					

3.2 Please provide comments/suggestions on the above CPUT systems and processes

3.3What other process/es is/are critical to institutional performance? Does it need to be improved?

THANK YOU FOR COMPLETING THIS QUESTIONNAIRE!

Faculty of Engineering

Office of the Dean: Dr Nawaz Mahomed

Email: mahomedn@cput.ac.za

Tel: + 2721 959 6612

Cape Peninsula
University of Technology

18 March 2013

TO WHOM IT MAY CONCERN

Re: PERMISSION TO USE CPUT ENGINEERING FACULTY STAFF MEMBERS AS AN AUDIENCE FOR MTECH: BUSINESS INFORMATION SYSTEMS RESEARCH – JM Vianney Irakoze.

This letter serves to grant permission for JM Vianney Irakoze to canvass the opinion of Engineering Faculty academic and administrative staff towards the research effort in fulfillment of the MTech Business Information Systems at CPUT. The active research is to take place from the first and second semester of 2013. Any further requirement for access to Engineering Faculty staff for the purpose as stated will need to first be approved by the Dean of the Faculty.

Such research activities are not to negatively impact on the lecturing and administrative staff of the University, as well as the reputational image of the Faculty.

Sincerely,

Dr Nawaz Mahomed
Dean: Engineering, CPUT

ORGANOGRAM FACULTY: ENGINEERING

Dean
Dr Nawaz Mahomed

Secretary:
S Williams

Assist Dean: Academic:
Prof M Sheldon

Secretary: M Sogiba

Assist Dean: Research & Innovation: Prof V Fester

Faculty Operations:
Niven Cloete

HoD: Construction & QS T Stringer

IT Coordinator:
David Evans

Marketing, Public Relations & Events: No Post

Secretary:
Vacant

HoD: Civil Engineering
A Kamalie

Student Engage Officer:
C Pearce (Contract)

Research Coordinator:
Vacant

HR & Finance
Officer: N Ncoko

HoD: Electrical Eng
B Groenewald

Language Coordinator:
Prof Ken Barris

Strategic Partnerships:
B Cassiem (redeploy)

Academic
Admin: Faculty
Officer: Vacant

HoD: Chemical Eng
Prof D Iku-Omeregbe

T&L Coordinator:
Vacant

Research Development:
J Medhurst (redeploy)

See Faculty
Office
Organogram

HoD: MechanicalEng
Dr M Kaunda

ECP Coordinator: Dr
Mark Jacobs

PG Studies
Admin: T Green

HoD: Industrial Eng
A Bester (Acting)

CE & WIL Coordinator:
M Mabogo

Engineering Projects & Innovation Centre:
F Hoffman

HoD: Maritime Studies
Prof E Snyders

Coop Admin Assistant:
F Ismail

HoD: Clothing & Textile
Dr E Hovgaards

Department of Civil Engineering & Surveying

HOD: A KAMALIE

ADMINISTRATION
V IRAKOZE
H VAN ZYL

COURSE HEAD	COURSE HEAD	COURSE HEAD	COURSE HEAD	COURSE HEAD	COURSE HEAD	ECP Coordinator
STRUCTURAL	MANAGEMENT	WATER	RESEARCH	TRANSPORT	SURVEYING	
W v Schoor	M Habets	M Phillips	R Haldenwang	P Neal	JH Raubenheimer	N Armien

STRUCTURAL
J Kotsopoulos
E V D Heever
Jabaar
C Theron
S. Paulse,

Lab Tech.
L Maduna
X Nkwanteni

MANAGEMENT
CJ van Rensburg
S Mahomed
A Cloete
R Loots

WATER
J Neethling
R Mambwe
C Mutsvangwa

Lab Tech.
L Minnies

Gen work
M Williams

RESEARCH
I Masalova
V Fester
A Sutherland
O Selekisho
R Du Toit

Lab. Technician
T Hendricks

Lab Assist.
P Mralaza

TRANSPORT
J Erasmus
P Siebritz
M Khahledi
F Maneli
S Belford

Lab. Technician
Vacant

Lab Assist.

SURVEYING
H Hugo
S Motala
K Musungu
L Ngesi
N Gazi

D Appolis
La Cock

Lab. Assist.

IT Technician
V Lolwana

ECP Coordinator
G Bohle
B Fortuin
S Mouton
B Kabamba
I Ebrahim

Co-op
Coordinator
P Overmeyer

Appendix E: Descriptive Statistics for section one (Biographic Variables)

Type of position		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Lecturing staff	33	67.3	67.3	67.3
	Administrative Support Staff	7	14.3	14.3	81.6
	Faculty Management Staff	9	18.4	18.4	100.0
	Total	49	100.0	100.0	

Gender		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	30	61.2	61.2	61.2
	Female	19	38.8	38.8	100.0
	Total	49	100.0	100.0	

Department		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Engineering Faculty Management	9	18.4	18.4	18.4
	Engineering Faculty Management/Clothing and Textiles	1	2.0	2.0	20.4
	Engineering Faculty Management/Construction Management and Quantity Surveying	1	2.0	2.0	22.4
	Engineering Faculty Management/Mechanical Engineering	1	2.0	2.0	24.5
	Selected Engineering Faculty's Department	37	75.5	75.5	100.0
	Total	49	100.0	100.0	

Qualification		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Bachelor Degree	12	24.5	24.5	24.5
	Doctorate	7	14.3	14.3	38.8
	Masters	21	42.9	42.9	81.6
	Matric	2	4.1	4.1	85.7
	National Diploma	5	10.2	10.2	95.9
	National Higher Diploma	2	4.1	4.1	100.0
	Total	49	100.0	100.0	

Position		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Admin Assistant	1	2.0	2.0	2.0
	Administrative Assistant	2	4.1	4.1	6.1

		Frequency	Percent	Valid Percent	Cumulative Percent
	CO-OP Coordinator	1	2.0	2.0	8.2
	Dean	1	2.0	2.0	10.2
	ECP Coordinator	1	2.0	2.0	12.2
	Faculty Administrator	1	2.0	2.0	14.3
	Faculty Manager	1	2.0	2.0	16.3
	Faculty Officer	1	2.0	2.0	18.4
	Head of Programme	1	2.0	2.0	20.4
	Head of Research	1	2.0	2.0	22.4
	HOD	3	6.1	6.1	28.6
	IT Coordinator	1	2.0	2.0	30.6
	IT Technician	1	2.0	2.0	32.7
	Junior Lecturer	2	4.1	4.1	36.7
	Language Coordinator	1	2.0	2.0	38.8
	Lecturer	21	42.9	42.9	81.6
	Secretary	2	4.1	4.1	85.7
	Senior Lecturer	3	6.1	6.1	91.8
	Technician	4	8.2	8.2	100.0
	Total	49	100.0	100.0	

How long have you been working for CPUT?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	6 months - under 1 year	1	2.0	2.0	2.0
	1 year - under 2 years	3	6.1	6.1	8.2
	2 years - under 3 years	4	8.2	8.2	16.3
	3 years or more	41	83.7	83.7	100.0
	Total	49	100.0	100.0	

I have been using LAS for

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Have not used it	19	38.8	38.8	38.8
	0 - under 6 months	2	4.1	4.1	42.9
	6 months - under 1 year	1	2.0	2.0	44.9
	1 year - under 2 years	16	32.7	32.7	77.6
	2 years - under 3 years	7	14.3	14.3	91.8
	3 years or more	4	8.2	8.2	100.0
	Total	49	100.0	100.0	

I have been using LMS for

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Have not used it	22	44.9	44.9	44.9
	0 - under 6 months	2	4.1	4.1	49.0
	6 months - under 1 year	3	6.1	6.1	55.1
	1 year - under 2 years	2	4.1	4.1	59.2

	2 years - under 3 years	3	6.1	6.1	65.3
	3 years or more	17	34.7	34.7	100.0
	Total	49	100.0	100.0	

I have been using ERS for

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Have not used it	38	77.6	77.6	77.6
	0 - under 6 months	3	6.1	6.1	83.7
	6 months - under 1 year	1	2.0	2.0	85.7
	1 year - under 2 years	1	2.0	2.0	87.8
	3 years or more	6	12.2	12.2	100.0
	Total	49	100.0	100.0	

I have been using MAS for

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Have not used it	9	18.4	18.4	18.4
	0 - under 6 months	1	2.0	2.0	20.4
	6 months - under 1 year	1	2.0	2.0	22.4
	1 year - under 2 years	3	6.1	6.1	28.6
	2 years - under 3 years	4	8.2	8.2	36.7
	3 years or more	31	63.3	63.3	100.0
	Total	49	100.0	100.0	

I have been using MIS for

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Have not used it	11	22.4	22.4	22.4
	0 - under 6 months	2	4.1	4.1	26.5
	6 months - under 1 year	1	2.0	2.0	28.6
	1 year - under 2 years	6	12.2	12.2	40.8
	2 years - under 3 years	4	8.2	8.2	49.0
	3 years or more	25	51.0	51.0	100.0
	Total	49	100.0	100.0	

I have been using CTS for

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Have not used it	35	71.4	71.4	71.4
	0 - under 6 months	4	8.2	8.2	79.6
	6 months - under 1 year	4	8.2	8.2	87.8
	3 years or more	6	12.2	12.2	100.0
	Total	49	100.0	100.0	

Appendix F: Descriptive Statistics for Section Two (Respondents' Perceptions of IS)

Frequency Table

Leave Application System (LAS) accuracy					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	1	2.0	2.0	2.0
	Disagree	3	6.1	6.1	8.2
	Agree	15	30.6	30.6	38.8
	Strongly Agree	13	26.5	26.5	65.3
	N/A	17	34.7	34.7	100.0
	Total	49	100.0	100.0	

Electronic Requisitioning System (ERS) accuracy					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Agree	6	12.2	12.2	12.2
	Strongly Agree	5	10.2	10.2	22.4
	N/A	38	77.6	77.6	100.0
	Total	49	100.0	100.0	

Management Information System (MIS) accuracy					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	1	2.0	2.0	2.0
	Agree	23	46.9	46.9	49.0
	Strongly Agree	14	28.6	28.6	77.6
	N/A	11	22.4	22.4	100.0
	Total	49	100.0	100.0	

CELCAT Timetabling System (CTS) accuracy					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	1	2.0	2.0	2.0
	Disagree	2	4.1	4.1	6.1
	Agree	9	18.4	18.4	24.5
	Strongly Agree	4	8.2	8.2	32.7
	N/A	33	67.3	67.3	100.0
	Total	49	100.0	100.0	

Marks Administration System (MAS) accuracy					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	2	4.1	4.1	4.1
	Disagree	4	8.2	8.2	12.2
	Agree	19	38.8	38.8	51.0
	Strongly Agree	16	32.7	32.7	83.7

		Frequency	Percent	Valid Percent	Cumulative Percent
	N/A	8	16.3	16.3	100.0
	Total	49	100.0	100.0	

Learner Management System (Blackboard) accuracy

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	3	6.1	6.1	6.1
	Agree	14	28.6	28.6	34.7
	Strongly Agree	11	22.4	22.4	57.1
	N/A	21	42.9	42.9	100.0
	Total	49	100.0	100.0	

Leave Application System (LAS) usability

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	disagree	4	8.2	8.2	8.2
	agree	12	24.5	24.5	32.7
	strongly agree	17	34.7	34.7	67.3
	N/A	16	32.7	32.7	100.0
	Total	49	100.0	100.0	

Electronic Requisitioning System (ERS) usability

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	1	2.0	2.0	2.0
	disagree	1	2.0	2.0	4.1
	agree	6	12.2	12.2	16.3
	strongly agree	4	8.2	8.2	24.5
	N/A	37	75.5	75.5	100.0
	Total	49	100.0	100.0	

Management Information System (MIS) usability

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	disagree	4	8.2	8.2	8.2
	agree	21	42.9	42.9	51.0
	strongly agree	11	22.4	22.4	73.5
	N/A	13	26.5	26.5	100.0
	Total	49	100.0	100.0	

CELCAT Timetabling System (CTS) usability

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	2	4.1	4.1	4.1
	disagree	1	2.0	2.0	6.1
	agree	13	26.5	26.5	32.7
	N/A	33	67.3	67.3	100.0
	Total	49	100.0	100.0	

Marks Administration System (MAS) usability

		Frequency	Percent	Valid Percent	Cumulative Percent

Valid	strongly disagree	1	2.0	2.0	2.0
	disagree	3	6.1	6.1	8.2
	agree	16	32.7	32.7	40.8
	strongly agree	21	42.9	42.9	83.7
	N/A	8	16.3	16.3	100.0
	Total	49	100.0	100.0	

Learner Management System (LMS) usability

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	1	2.0	2.0	2.0
	disagree	3	6.1	6.1	8.2
	agree	17	34.7	34.7	42.9
	strongly agree	7	14.3	14.3	57.1
	N/A	21	42.9	42.9	100.0
	Total	49	100.0	100.0	

Leave Application System (LAS) accessibility

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	1	2.0	2.0	2.0
	disagree	3	6.1	6.1	8.2
	agree	14	28.6	28.6	36.7
	strongly agree	16	32.7	32.7	69.4
	N/A	15	30.6	30.6	100.0
	Total	49	100.0	100.0	

Electronic Requisitioning System (ERS) accessibility

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	disagree	1	2.0	2.0	2.0
	agree	7	14.3	14.3	16.3
	stronly agree	4	8.2	8.2	24.5
	N/A	37	75.5	75.5	100.0
	Total	49	100.0	100.0	

Management Information System (MIS) accessibility

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	1	2.0	2.0	2.0
	disagree	4	8.2	8.2	10.2
	agree	21	42.9	42.9	53.1
	strongly agree	12	24.5	24.5	77.6
	N/A	11	22.4	22.4	100.0
	Total	49	100.0	100.0	

CELCAT Timetabling System (CTS) accessibility					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	2	4.1	4.1	4.1
	disagree	2	4.1	4.1	8.2
	agree	10	20.4	20.4	28.6
	strongly agree	2	4.1	4.1	32.7
	N/A	33	67.3	67.3	100.0
	Total	49	100.0	100.0	

Marks Administration System (MAS) accessibility					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	1	2.0	2.0	2.0
	disagree	4	8.2	8.2	10.2
	agree	23	46.9	46.9	57.1
	strongly agree	13	26.5	26.5	83.7
	N/A	8	16.3	16.3	100.0
	Total	49	100.0	100.0	

Learner Management System (LMS) accessibility					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	1	2.0	2.0	2.0
	disagree	7	14.3	14.3	16.3
	agree	15	30.6	30.6	46.9
	strongly agree	6	12.2	12.2	59.2
	N/A	20	40.8	40.8	100.0
	Total	49	100.0	100.0	

Leave Application System (LAS) responsiveness					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	1	2.0	2.0	2.0
	disagree	3	6.1	6.1	8.2
	agree	14	28.6	28.6	36.7
	strongly agree	14	28.6	28.6	65.3
	N/A	17	34.7	34.7	100.0
	Total	49	100.0	100.0	

Electronic Requisitioning System (ERS) responsiveness					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	disagree	1	2.0	2.0	2.0
	agree	9	18.4	18.4	20.4
	strongly agree	2	4.1	4.1	24.5
	N/A	37	75.5	75.5	100.0
	Total	49	100.0	100.0	

Management Information System (MIS) responsiveness

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	disagree	3	6.1	6.1	6.1
	agree	25	51.0	51.0	57.1
	strongly agree	8	16.3	16.3	73.5
	N/A	13	26.5	26.5	100.0
	Total	49	100.0	100.0	

CELCAT Timetabling System (CTS) responsiveness

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	1	2.0	2.0	2.0
	disagree	2	4.1	4.1	6.1
	agree	10	20.4	20.4	26.5
	strongly agree	1	2.0	2.0	28.6
	N/A	35	71.4	71.4	100.0
	Total	49	100.0	100.0	

Marks Administration System (MAS) responsiveness

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	1	2.0	2.0	2.0
	disagree	3	6.1	6.1	8.2
	agree	21	42.9	42.9	51.0
	strongly agree	17	34.7	34.7	85.7
	N/A	7	14.3	14.3	100.0
	Total	49	100.0	100.0	

Learner Management System (LMS) responsiveness

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	disagree	5	10.2	10.2	10.2
	agree	12	24.5	24.5	34.7
	strongly agree	12	24.5	24.5	59.2
	N/A	20	40.8	40.8	100.0
	Total	49	100.0	100.0	

Leave Application System (LAS) leads to user satisfaction and work performance

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	1	2.0	2.0	2.0
	disagree	3	6.1	6.1	8.2
	agree	13	26.5	26.5	34.7
	strongly agree	12	24.5	24.5	59.2
	N/A	20	40.8	40.8	100.0
	Total	49	100.0	100.0	

Electronic Requisitioning System (ERS) leads to user satisfaction and work performance

		Frequency	Percent	Valid Percent	Cumulative Percent

Valid	strongly disagree	1	2.0	2.0	2.0
	disagree	3	6.1	6.1	8.2
	agree	5	10.2	10.2	18.4
	strongly agree	2	4.1	4.1	22.4
	N/A	38	77.6	77.6	100.0
	Total	49	100.0	100.0	

Management Information System (MIS) leads to user satisfaction and work performance

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	disagree	1	2.0	2.0	2.0
	agree	25	51.0	51.0	53.1
	strongly agree	8	16.3	16.3	69.4
	N/A	15	30.6	30.6	100.0
	Total	49	100.0	100.0	

CELCAT Timetabling System (CTS) leads to user satisfaction and work performance

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	1	2.0	2.0	2.0
	disagree	1	2.0	2.0	4.1
	agree	12	24.5	24.5	28.6
	strongly agree	1	2.0	2.0	30.6
	N/A	34	69.4	69.4	100.0
	Total	49	100.0	100.0	

Marks Administration System (MAS) leads to user satisfaction and work performance

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	2	4.1	4.1	4.1
	disagree	4	8.2	8.2	12.2
	agree	20	40.8	40.8	53.1
	strongly agree	14	28.6	28.6	81.6
	N/A	9	18.4	18.4	100.0
	Total	49	100.0	100.0	

Learner Management System (LMS) leads to user satisfaction and work performance

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	2	4.1	4.1	4.1
	disagree	5	10.2	10.2	14.3
	agree	10	20.4	20.4	34.7
	strongly agree	11	22.4	22.4	57.1
	N/A	21	42.9	42.9	100.0
	Total	49	100.0	100.0	

Appendix G: Descriptive Statistics for Section Three (Respondents' Perceptions of Internal Processes)

Leave Application Process (LAP) needs to be streamlined

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	1	2.0	2.0	2.0
	disagree	14	28.6	28.6	30.6
	agree	10	20.4	20.4	51.0
	strongly agree	7	14.3	14.3	65.3
	N/A	17	34.7	34.7	100.0
	Total	49	100.0	100.0	

Electronic Requisitioning Process (ERP) needs to be streamlined

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	disagree	1	2.0	2.0	2.0
	agree	6	12.2	12.2	14.3
	strongly agree	15	30.6	30.6	44.9
	N/A	27	55.1	55.1	100.0
	Total	49	100.0	100.0	

Marks Administration Process (MAP) needs to be streamlined

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	3	6.1	6.1	6.1
	disagree	12	24.5	24.5	30.6
	agree	15	30.6	30.6	61.2
	strongly agree	11	22.4	22.4	83.7
	N/A	8	16.3	16.3	100.0
	Total	49	100.0	100.0	

Marks Alteration process (MalP) needs to be streamlined

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	2	4.1	4.1	4.1
	disagree	4	8.2	8.2	12.2
	agree	13	26.5	26.5	38.8
	strongly agree	20	40.8	40.8	79.6
	N/A	10	20.4	20.4	100.0
	Total	49	100.0	100.0	