Cape Peninsula
University of Technology

AN EVALUATION OF MECHANISMS FOR INFORMATION COMMUNICATION TECHNOLOGY SERVICE IMPROVEMENT

VOLUME 1

A Research Dissertation submitted

by

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DECLARATION

By

Liezel Jo-anne Ijambo

"I Liezel Jo-anne Ijambo, hereby declare that the content of this dissertation submitted for the degree (Magister Technologiae) at the Cape Peninsula University of Technology, represents my own original unaided work and has not previously been submitted for any other institution of higher education. I further declare that all sources cited or quoted indicated or acknowledged by means of a comprehensive list of references. Furthermore, it represents my own opinion and not necessarily those of the Cape Peninsula University of Technology.

Name: Liezel Jo-anne Ijambo

November 2011

Signature:

DEDICATION

This study is dedicated to my father Edmund and mother Joan for their unconditional love and support.

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude and appreciation for their contribution to the following:

ABSTRACT

The adoption of best practice methodologies within Information Communication Technology (ICT) departments, are on the increase in order to bring about quality in their day-to-day activities. Computer and Telecommunication Services (CTS) is the ICT department within Cape Peninsula University of Technology (CPUT), and is in no way exempted from this. CTS adopted ITIL (Information Technology Infrastructure Library) as an Information Technology Service Management (ITSM) best practice framework for service support and service delivery.

CTS implemented a Service Desk function, Incident Management process, Change Management process, Information Technology Service Continuity process, and elements of other ITSM process. ICT organisations adopt an ad hoc approach in applying continuous process improvement mechanisms in the day-to-day operation of service support and service delivery processes and functions resulting in poor service support and service delivery.

The primary research objectives are to identify the best practice principles and guidelines (i.e. IT, Quality, Project Management, etc.) adopted by CTS, to assist in establishing the gaps between the current status of these processes and the desired state. Further, to determine the elements or component parts of the proposed continuous process improvement mechanisms, to demonstrate the effectiveness of the implementation of such mechanisms, and to define metrics for proving measurable improvements to the processes.

The adoption of continuous process improvement mechanisms will assist in mapping ITSM with other best practice methodologies (i.e. Quality and Project Management). A qualitative method will be used to review the existing processes and/or functions and highlight evidence of adherence to best practice methodologies. A quantitative method will be used to

collect data from the CTS Service Desk and to conduct user surveys to determine current levels of service. These results will underline the elements and component parts needed for continuous process improvement.

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Note: Due to the volume of the analysis (Refer paragraph 5.3, Chapter 5) of the Reliability Testing, Descriptive Statistics, Uni-Variate Graphs, Inferential Statistics and Annexures pertaining to this research, these, are contained in Volume 2 of this dissertation.

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ABBREVIATIONS

BAS	Business and Administrative Services
BIA	Business Impact Analysis
CAB	Change Advisory Board
CAB/EC	Change Advisory Board/Emergency Committee
CPUT	Cape Peninsula University of Technology
CRM	Customer Relationship Management
CTS	Computer and Telecommunication Services
DR	Disaster Recovery
DRP	Disaster Recovery Plan
DVC	Deputy Vice Chancellor
ECM	Enterprise Content Management
EFQM	European Foundation for Quality Management
EUC	End-User Computing
FSC	Forward Schedule of Changes
HE	Higher Education
ICT	Information Communication Technology
ICTS	Information Communication Technology Services
ISF	Integrated Systems and Facilities
ISO	International Standards Organisation
ISP	Internet Service Provider
IST	Information Systems and Technology
IT	Information Technology
ITIL	Information Technology Infrastructure Library
ITS	Integrated Tertiary Software
ITSCM	Information Technology Service Continuity Management
ITSM	Information Technology Service Management
itSMF	Information Technology Service Management Forum
KM	Knowledge Management
KPI	Key Performance Indicator
LAN	Local Area Network
MIS	Management Information Systems

MRP	Material Requirement Planning
N	Networking
NCR	Non-Conformance Reports
OLA	Service Level Agreement
OPA	Operational Level Agreement
PB	Project Board
PDCA	Plan-Do-Check-Act
PE	Project Executive
PM	Project Manager
QIP	Quality Improvement Plan
QMS	Quality Management System
RA	Risk Assessment
RFC	Request for Change
SAN	Storage Area Network
SAS	Strategic and Administrative Services
SDLC	Systems Development Life Cycle
SIP	Service Improvement Plan
SLA	Service Level Agreement
SLM	Service Level Management
SLM	Service Level Management
SOW	Scope of Work
SPoC	Single Point of Contact
TENET	Tertiary Education and Research Network
ToR	Terms of Reference
TQM	Total Quality Management
UC	Underpinning Contract
WBS	Work Breakdown Structure

CHAPTER 1: SCOPE OF THE RESEARCH

1.1 INTRODUCTION AND BACKGROUND

Computer and Telecommunication Services (CTS) is the Information Communication Technology (ICT) department of Cape Peninsula University of Technology (CPUT). In January 2005, Peninsula Technikon and Cape Technikon merged due to the National Plan for Higher Education. As a result, the Information Communication and Telecommunication Services (ICTS) and Information Systems and Technology (IST) departments of these two institutions, respectively, were merged to form CTS. Since the merger, like many other departments within the institution, CTS embarked on a restructuring process. CTS provides service support and delivery to nine geographically spread campuses, namely, Bellville, Cape Town, Mowbray, Tygerberg Hospital, Grootte Schuur Hospital, Wellington, Granger Bay, Athlone and Worcester.

Over the past few years, CTS's processes, systems and services were consolidated and streamlined across these campuses. Services are contained in a Service Portfolio which makes provision for services offered by CTS, sub-services, target audiences, service owners and support hours.

As a result of restructuring, CTS's new proposed structure made provision for a new cross-functional unit, called Strategic and Administrative Services (SAS), to deal with strategic and administrative activities, functions and processes within CTS. The role of this unit would be to manage, implement and maintain strategic activities, functions or processes, such as, Information Technology Service Management (ITSM), Quality Management, Project Management, Auditing, etc. In order for CTS to bring about improvement in their processes and services, it is vital that the principles and guidelines of best practice methodologies as such, be adopted.

In addition to the SAS section, there are four additional sections within CTS, namely, Networking (N), Business and Administrative Services (BAS), End-user Computing (EUC) and Integrated Systems and Facilities (ISF). These operational sections play an important role in bringing about improvement in the day-to-day operation of processes and services.

CTS adopted an Information Technology Infrastructure Library (ITIL) as an ITSM framework. The processes and/or functions which have been installed to date, include the Service Desk, Incident Management, Change Management, Configuration Management, IT Service Continuity Management, Problem Management and Service Level Management. Some of these processes and functions are at different stages of being implementation.

Other initiatives, driven by the Tertiary Education and Research Network of South Africa (TENET), the Internet Service Provider (ISP) for Higher Education (HE) institutions, contributed to the adoption of ITIL within the CPUT. ITIL is an IT best practice framework concerned with IT Service Management processes and/or functions. It also involves the interrelationships and synchronization of processes. These initiatives included ITIL workshops and conferences, and ITIL training at various levels (e.g. foundation, practitioners, and managers), establishing communities of practice, etc.

The Quality office is responsible for the day-to-day management and coordination of quality-related activities as well as the coordination of both internal and external quality reviews and audits. A Project Office has been established within the SAS section which manages small, medium and large scale projects, both internal and external to CTS. The Service Desk within the SAS section is regarded as one of the key functions within CTS, as it deals with the day-to-day IT related requests and/or incidents logged by users. It is also the first point of entry where users make contact with CTS.

1.2   THE RESEARCH PROCESS

Watkins (2010:39), (citing Rementy, Williams, Money and Swartz 2002), states the research process is explained as consisting of eight specific phases, namely:

➢ Reviewing the literature.
➢ Formalising a research question.
➢ Establishing the methodology.
➢ Collecting evidence.
➢ Analysing the evidence.
➢ Developing conclusions.
➢ Understanding the limitations of the research.
➢ Producing management guidelines or recommendations.

According to Watkins (2010:40), (citing Collis and Hussey 2003), there are six fundamental stages in the research process, namely:

➢ Identification of the research topic.
➢ Definition of the research problem.
➢ Determining how the research is going to be conducted.
➢ Collection of the research data.
➢ Analysis and interpretation of the research data.
➢ Writing up of the dissertation or thesis.

The process that will be followed in this research study is;

➢ The identification of the research topic.
➢ Reviewing the literature.
➢ Formalising a research question.
➢ Establishing the methodology.
➢ Determining how the research is going to be conducted.
➢ Collecting evidence.
➢ Developing conclusions.

1.3 BACKGROUND TO THE RESEARCH PROBLEM

Computer and Telecommunication Services (CTS) as Cape Peninsula University of Technology's (CPUT) IT department, adopted IT Best Practice frameworks, such as ITIL, to implement and manage service support and delivery processes or functions. Investment is made in the implementation of these processes and functions as, without the existence of mechanisms for service improvement could result in re-works, which are costly and time consuming, would result. By adopting such mechanisms and incorporating it into the day-to-day operations, cost and time spent on re-work, will be reduced. These controls are mostly applied when the environment is impacted on, negatively, resulting in CTS operating in reactive mode rather than proactive. These mechanisms will comprise of guidelines and principles from several best practice methodologies from various fields of study; e.g. ICT, Project Management, Quality Management, etc. Some of these guidelines and principles are applied only on an ad hoc basis.

The main objective of this research study is to evaluate mechanisms for the improvement of ICT services at CPUT. There are a number of secondary objectives following on the overall objective of this research, namely:

➢ To assess the Service Desk function and Incident Management process as part of CTS's adoption of ITSM.

➢ To assess the Service Level Management process as part of CTS's adoption of ITSM.

➢ To assess the Project Management activity as part of CTS's adoption of best practice methodologies.

➢ To assess the Quality Management activity as part of CTS's adoption of best practice methodologies.

➢ To establish user perception of service levels for core services offered by CTS.

➢ To establish user perception and expectations of CTS's adoption of the Service Desk function, Incident Management process and Service Level Management process.

1.4 RESEARCH PROBLEM STATEMENT

ICT organisations adopt an ad hoc approach in applying mechanisms for service improvement in their day-to-day operations. This results in poor service support and service delivery. The research problem to be specifically focused on within the ambit of this proposal, reads as follows: "Computer and Telecommunication Services are adversely impacted upon by non-prioritised requests and uncoordinated approaches to process delivery".

1.5 THE RESEARCH QUESTION

The research question to be considered within the ambit of this dissertation, reads as follows: "How can the evaluation of stringent mechanisms in Information Communication Technology (ICT) improve service delivery?"

1.5.1 Investigative questions

In support of the research question, the following investigative questions will be researched:
➢ Does the CTS Service Desk function, and does the Incident Management process meet the requirements of ITSM best practice methodologies?
➢ Does the CTS Service Level Management process meet the requirements of ITSM best practice methodologies?
➢ Does the Project Management activity within CTS meet the requirements of best practice methodologies?

➢ Does the Quality Management activity within CTS meet the requirements of best practice methodologies?

➢ How do users perceive the service levels of core services offered by CTS?

➢ What are the user's perception and expectation of the CTS' Service Desk function, Incident Management process and Service Level Management process?

1.6 PRIMARY RESEARCH OBJECTIVES

The key research objectives with this research study, are:

➢ To assess the Service Desk function and Incident Management process as part of CTS's adoption of ITSM.

➢ To assess the Service Level Management process as part of CTS' adoption of ITSM.

➢ To assess the Project Management activity as part of CTS's adoption of best practice methodologies.

➢ To assess the Quality Management activity as part of CTS's adoption of best practice methodologies.

➢ To establish user perception of service levels for core services offered by CTS.

➢ To establish user perception and expectations of CTS's adoption of the Service Desk function, Incident Management process and Service Level Management process.

1.7 RESEARCH DESIGN AND METHODOLOGY

Case study research will form the primary research method for this study. Falling primarily within the phenomenological (qualitative) paradigm, case study research can equally be applied within the context of the positivistic (quantitative) paradigm.

According Watkins (2010:42), (citing Yin 1994), a research design can be defined as, "...the logical sequence that connects the empirical data to a study's initial research question and ultimately, to its conclusions. Colloquially, a research design *is an action plan for getting from here to there*, where *here* may be defined as the initial set of questions to be answered, and the *there* is some set of conclusions (answers) about these questions".

Furthermore, according to Watkins (2010:46), (citing Yin 1994), case study research is described as follows:

➢ A case study is an empirical enquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident.

➢ Case study research aims not only to explore certain phenomena, but also to understand them in a particular context.

➢ 'How' and 'why' questions are explanatory, and likely to be used in a case study research.

➢ A case study illuminates a decision or set of decisions – why they were taken, how they were implemented, and with what result.

➢ The case study as a research strategy comprises an all-encompassing method – with the logic of the design incorporating specific approaches to data collection and data analysis. In this sense, the case study is not either a data collection tactic or merely a design feature alone, but 'a comprehensive research strategy'.

➢ A case study is typically used when contextual conditions are the subject of research.

According to Watkins (2010:47), (citing Collis and Hussey 2003), case studies are often described as exploratory research used in areas where there are few theories or a deficient body of knowledge. In addition, the following types of case studies can be identified:

- ➢ **Descriptive case studies:** Where the objective is restricted to describing current practice.
- ➢ **Illustrative case studies:** Where the research attempts to illustrate new and possibly innovative practices adopted by particular companies.
- ➢ **Experimental case studies:** Where the researcher examines the difficulties in implementing new procedures and techniques in an organisation and evaluating the benefits.
- ➢ **Explanatory case studies:** Where existing theory is used to understand and explain what is happening.

Watkins (2010:47), (citing Yin 1994) emphasises the following five components of a research design, which are especially important for case studies:

- ➢ **Study questions:** The case study strategy is most likely to be appropriate for 'how' and 'why' questions, which calls for the initial task being to clarify precisely the nature of the study questions.
- ➢ **Study propositions:** A study proposition directs the attention to something that should be examined within the scope of the study. For greater clarity, the proposition points to the 'reason for the study'.
- ➢ **Unit of analysis:** Should the case study involve a specific person being studied, say a person with a rare medical problem, the individual being studied is the primary unit of analysis. The tentative definition of the unit of analysis is related to the way in which the initial research questions were formulated.
- ➢ **Linking data to propositions:** A number of ways are open to students to link data to the propositions. An approach suggested by Yin is that of 'pattern matching', whereby several pieces of information from the same case may be related to some theoretical proposition.
- ➢ **Criteria for interpreting findings:** If the different 'patterns' are sufficiently contrasting, the findings can be interpreted in the terms of comparing at least two rival propositions.

1.7.1   The survey design and methodology

The survey design and methodology is elaborated upon within the ambit of Chapter 4.   Primary data will be collected via the following sources, namely:

➢ **Interviews:** Serve as a data collection methodology for research methods falling within the context of the phenomenological (qualitative) research paradigm. According to Watkins (2010:60), (citing Cooper and Schindler 2006), three types of interviews are identifiable:

  ➢ **Unstructured interview:** No specific questions or order of topics to be addresses, with each interview customised to each participant.

  ➢ **Semi-structured interview:** Generally starts with a few specific questions and then follows the individual's tangents of thought with interviewer probes.

  ➢ **Structured interview:** Similar to a questionnaire to guide the question order and the specific way the questions are asked, but the questions generally remain open-ended.

➢ **A survey using questionnaires:** Questionnaires fall within the ambit of a broader definition of 'survey research' or 'descriptive survey'. For absolute clarity, the concept of 'survey' is according to Watkins (2010:67), (citing Remenyi *et al.* 2002), defined as "...the collection of a large quantity of evidence, usually numeric, or evidence that will be converted to numbers, normally by means of a questionnaire". A questionnaire is a list of carefully structured questions, chosen after considerable testing with a view to elicit reliable responses from a chosen sample. The aim is to establish what a selected group of participants does, thinks or feels. A positivistic approach suggests structured 'closed' questions, while a phenomenological approach suggests unstructured 'open-ended' questions.

In this research study, structured interviews will be conducted.

1.8   RESEARCH ASSUMPTIONS

According to Watkins (2010:71), (citing Leedy and Ormrod 2001), the following provides an explanation of assumptions which could not be improved upon, and is thus cited verbatim: "Assumptions are what the researcher takes for granted. But taking things for granted may cause much misunderstanding. What we may tacitly assume, others may have never considered. If we act on our assumptions, and if in the final result such actions make a big difference in the outcome, we may face a situation we are totally unprepared to accept. In research we try to leave nothing to chance in the hope of preventing any misunderstanding. All assumptions that have a material bearing on the problem should be openly and unreservedly set forth. If others know the assumptions a researcher makes, they are better prepared to evaluate the conclusions that result from such assumptions. To discover your own assumptions, ask yourself, what am I taking granted with respect to the problem? The answer will bring your assumptions into clear view".

The researcher assumes that:
➢   CTS has not implemented ITSM processes as part of adopting ITIL as a best practice framework.
➢   A project office has not been established to deal with the day-to-day projects within CTS.
➢   A quality office is not responsible for the day-to-day activities relating to quality.
➢   CPUT staff is not willing to participate and avail themselves in the process of gathering information.
➢   There is no need to streamline and establish relationships between processes in the adoption of best practice methodologies for ICT service improvement.

1.9   RESEARCH CONSTRAINTS

Watkins (2010:73), (citing Collis and Hussey 2003), states that 'limitations' identify weaknesses in the research, while 'de-limitations' explain how the scope of the study was focussed on only one particular area or entity, as opposed to a wider or holistic approach.

1.8.1   Limitations

The research is limited in that, not all processes as part of CTS's drive to implement ITSM; will be covered as part of evaluating mechanisms for ICT service improvement. The focus will be on the Service Desk, Incident Management and Service Level Management implementation.

1.8.2   De-limitations

Establishing user perceptions of CTS's service levels will only be restricted to some of the campuses and not include all. One of the main campuses and a remote site will be identified. Two separate questionnaires will be drafted to cater for students and staff respectively, as service offering is different for these two categories of users.

1.8.3   Data Validity and Reliability

Furthermore, 'validity' is concerned with the extent to which the research findings accurately represent what is happening. More specifically, whether the data is a true picture of what is being studied. According to Watkins (2010:67), (citing Cooper and Schindler 2006), three major forms of validity can be identified, namely, 'content validity', criterion-related validity' and 'construct validity'. These are expanded upon below to provide a holistic perspective of each of the concepts:

➢ **Content validity:** Content of the measuring instrument is the extent to which it provides adequate coverage of the investigative (sub-)

questions guiding the study. If the instrument contains a representative sample of the universe of subject matter of interest, then content validity is good.

➢ **Criterion-related validity:** Reflects the success of measures used for prediction or estimation. Any criterion measure must be judged in terms of the following four qualities:

  ➢ **Criterion is relevant:** The criterion is defined and scored in the terms in which the proper measures of success are judged.

  ➢ **Freedom from bias:** When the criterion gives each respondent the opportunity to score well.

  ➢ **Reliability:** A reliable criterion is stable and reproducible.

  ➢ **Availability:** The information specified by the criterion must be available.

➢ **Construct validity:** According to Watkins (2010:68), (citing Collis and Hussey 1979), construct validity relates to the problem that there are a number of phenomena, which are not directly observable, such as motivation, satisfaction, ambition and anxiety. These are known as hypothetical constructs, which are assumed to exist as factors which explain observable phenomena.

Reliability, also referred to as 'trustworthiness', is concerned with the findings of the research according to Watkins (2010:68), (citing Collis & Hussey, 2003). The findings can be said to be reliable if, when the research is repeated by other researchers, the same results are obtained. There are three common methods of estimating the reliability, namely:

➢ **Test re-test method:** The questions are repeated with the same people, but on two separate occasions. Responses of the two occasions are correlated, and the correlation coefficient of the two sets of data computed, thus providing an index of reliability.

➢ **Split-halves method:** The questionnaires or interview record sheets are divided into two equal halves. The two halves are then correlated, and the correlation coefficient of the two sets of data computed, thus providing an index of reliability.

- ➢ **Internal consistency method:** Every item is correlated with every other item across the entire spectrum of the sample, and the average inter-item correlation is taken as the index of reliability.

1.10   CHAPTER AND CONTENT ANALYSIS

The following chapters and content analysis pertain to the research study:

- ➢ **Chapter 1 – Scope of the research:** In this chapter, a holistic background to the proposed research to be conducted within the ambit of this dissertation is provided.
- ➢ **Chapter 2 – A holistic perspective of the research environment:** In this chapter, the structure of CTS, services and operations are elaborated upon in detail.
- ➢ **Chapter 3 – A literature review:** In this chapter, a literature review will be conducted on mechanisms for service improvement.
- ➢ **Chapter 4 – CPUT student and staff user satisfaction survey design and methodology:** In this chapter, the research design and methodology for data collection and analysis of results, will be elaborated upon.
- ➢ **Chapter 5 – Interpretation of data and analysis of results:** In this chapter, the statistical analysis of the results obtained from Chapter 4, will be analysed and interpreted.
- ➢ **Chapter 6 – Conclusion and Recommendations:** In this chapter, the research will be concluded and final analogies drawn. The chapter will include recommendations which will mitigate the research problem and provide an answer to the research question.

1.11   SIGNIFICANCE OF THE PROPOSED RESEARCH

The significance of this research stems from the fact that:

- ➢ It is the first research executed in ICT service improvement mechanisms at the Cape Peninsula University of Technology.

➤ Should the recommendations made in this dissertation be acceptable, it would promote process efficiency relating to ICT service improvement within the Cape Peninsula University of Technology.

1.12 ETHICAL CONSIDERATIONS

In the context of research, according Watkins (2010:69), (citing Saunders *et al.* 2000), "...*ethics* refers to the appropriateness of your behaviour in relation to the rights of those who become the subject of your work, or are affected by it". Furthermore, according to Watkins (2010:69), (citing Leedy and Ormrod 2001), 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:

➤ **Protection from harm:** In cases where the nature of a study involves creating a small amount of psychological discomfort, participants should know about it ahead of time, and any necessary debriefing or counselling should follow immediately after their participation.

➤ **Informed consent:** Participants should be told, in advance about the nature of the study to be conducted, and be given the choice of either participating or not participating. Furthermore, they should be given the right to withdraw from the study at any time, as participation in a study should be strictly voluntary. It is suggested that an informed consent form, that describes the nature of research, as well as the nature of the required participation, be presented to participants in a research study. Such a form should contain the following information:

➤ A brief description of the nature of the study.

➤ A description of what participation will involve, in terms of activities and duration.

➤ A statement indicating that participation is voluntary and can be terminated at any time without prejudice.

- ➤ A list of potential risk and/or discomfort that participants may encounter.

- ➤ The guarantee that all responses will remain confidential and anonymous.

- ➤ The researcher's name, and information on how he/she can be contacted.

- ➤ An individual or office that participants can contact, should they have questions or concerns about the study.

- ➤ An offer to provide detailed information about the study (e.g., a summary of findings) upon its completion.

- ➤ A space for participants to sign and date the consent form, indicating agreement to participate.

➤ **Right to privacy:** Any research study should respect participants' right to privacy. In general, a researcher must keep the nature and quality of a participant's performance strictly confidential.

➤ **Honesty with professional colleagues:** Researchers must report their findings in a complete and honest fashion, without misrepresenting what they have done or intentionally misleading others as to the nature of their findings. Under no circumstances should a researcher fabricate data to support a particular conclusion, no matter how seemingly 'noble' that conclusion may be.

1.13 CONCLUSION

In this chapter a holistic perspective has been provided of the issues pertaining to the proposed research. The following areas were explained, namely: the research process, the research problem, formulating the associated research question, the research design and methodology elaborated upon. The chapter concluded with a chapter content analysis, and key research objectives were listed.

In Chapter 2, a holistic perspective of the research environment will be provided.

CHAPTER 2: A HOLISTIC PERSPECTIVE OF THE RESEARCH ENVIRONMENT

2.1   INTRODUCTION

Over the past few years, since the merger between Peninsula and Cape Technikons in 2005, CTS implemented its new structure. It succeeded in the reformation of functional areas within the various sections and introduced a new SAS section which did not form part of either of the two institutions prior to the merger. In addition to finalising the five sections, CTS went a step further by introducing an additional tier in the structure. This would allow for supervisory and/or co-ordinator roles within each of the sections, reporting to the section managers.

This chapter will highlight the research environment by giving an overview of the CTS structure and its reporting, covering functional areas which are split into strategic and operational areas. In addition to this, an in-depth clarification, with specific emphasis and focus on the strategic areas, will be presented. The introduction of a SAS section within CTS has certainly contributed to the adoption of best practice methodologies. This allowed for focus areas and concentration on best practice methodologies, such as Quality Management, Project Management and IT best practice frameworks, such as ITIL.

The following areas will be elaborated upon in this section:
➢   An overview of the CTS structure.
➢   CTS reporting within CPUT.
➢   Emphasis on strategic areas within CTS.
➢   Adoption of best practice methodologies within CTS.
➢   Other initiatives in the adoption of IT best practice methodologies.
➢   Challenges in bringing about continuous improvement within CTS.

2.2 OVERVIEW OF COMPUTER AND TELECOMMUNICATION SERVICES STRUCTURE

The organogram (Figure 2.1) below, illustrates the CTS structure, functional areas (Strategic and Operational) and a representation of the tiers within the structure:
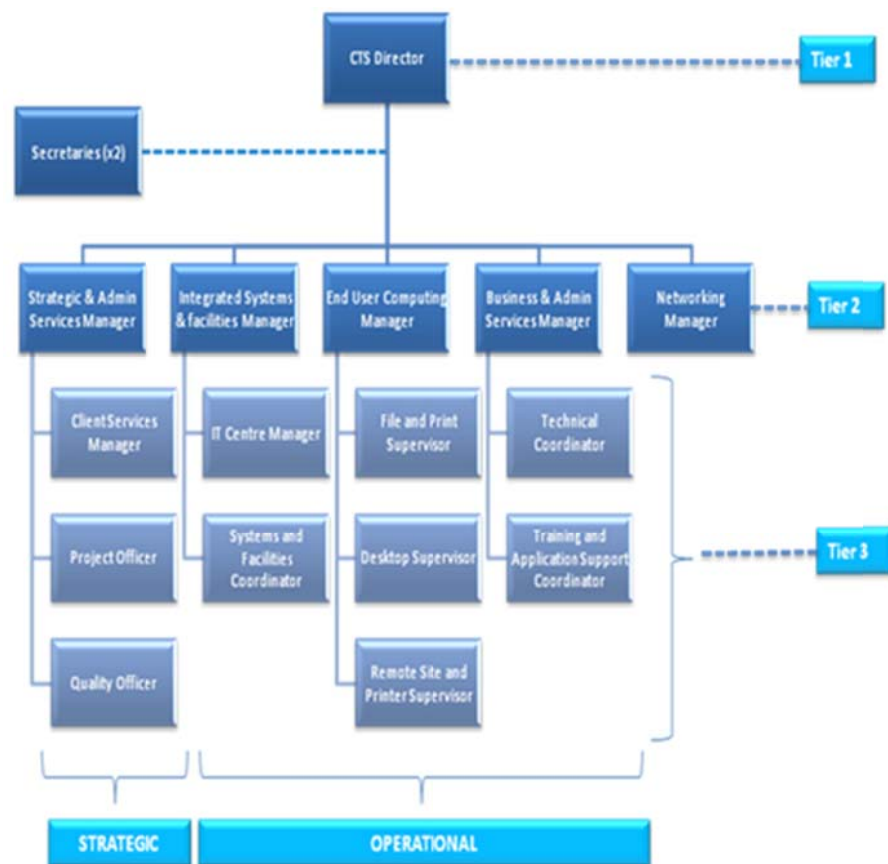
Figure 2.1: Computer and Telecommunication Services Structure

The structure provides for a CTS Director (tier 1) with two secretaries and five Section Managers (tier 2) reporting directly to him/her. The five sections are split up into one strategic section and four operational sections. Section managers have several tier 3 roles reporting into it, and the tier 3 roles have tier 4 roles reporting to them. At the fourth tier, provision is also made for senior roles. In some of the sections, proposed roles have been identified for future growth and expansion of the existing structure.

2.2.1 Strategic Section

The strategic section within CTS is responsible for all strategic matters. It comprises of three main areas of focus which includes Service Desk, Project Management and Quality Management.

The strategic area includes the following:

➢ **Strategic and Administrative Services**

    ➢ The following roles are represented in figure 2.3 below: Strategic and Administrative Services (SAS) section manager with the Client Services manager (tier 3), Project officer (tier 3) and Quality officer (tier 3) reporting into this role.

    ➢ In addition to the tier 3 roles, there are also other roles within this section reporting to the Client Services manager, namely, Service Desk operators and Telephonists. These roles can be recognized as tier 4 roles.

    ➢ There is also a proposed role for a Financial Contract administrator to be introduced within this section.

Figure 2.2: Strategic and Administrative Services

2.2.2 Operational Sections

The operational sections within CTS are responsible for the day-to-day operational and technical support. . It is made up of three main areas of focus which includes Integrated Systems and Facilities, End-user computing, Business and Administrative Services and Networking.

The four operational areas include the following:

➤ **Integrated Systems and Facilities (ISF)**

   ➤ The following roles are represented in figure 2.3. Integrated Systems and Facilities (ISF) section manager (tier 2) with the IT Centre manager (tier 3) and Systems and Facilities coordinator (tier 3) reporting into this role.

   ➤ The IT Centre manager has two roles recognized in tier 4 reporting into it, namely, IT Centre assistant and Assistant IT manager who has several contract Student Assistants reporting into this role.

   ➤ The Systems and Facilities co-ordinator has several tier 4 roles reporting into this function, ranging from an Oracle technician to UNIX technicians. There is also a Meals System technician reporting into this role.

   ➤ Two Software developers, also regarded as tier 4 roles, are reporting directly to the section manager.
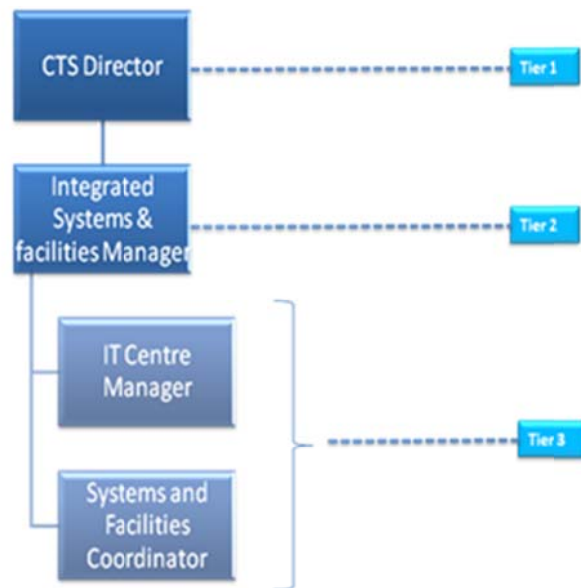
Figure 2.3: Integrated Systems and Facilities

> ➤ **End user Computing**
>> ➤ The following roles are represented in figure 2.4. End User Computing (EUC) section manager (tier 2) with the File and Print supervisor (tier 3), Desktop supervisor (tier 3) and Remote Site and Printer supervisor (tier 3) reporting into this role.
>>
>> ➤ The File and Print supervisor, who is currently in an acting role, has four Novell technicians, recognized as tier 4 roles, reporting into this role.
>>
>> ➤ The Desktop supervisor has several tier 4 roles, ranging from Desktop technicians, Computer Laboratory technicians and Contractors reporting into it.
>>
>> ➤ The Remote Site supervisor has tier 4 Remote Site technician and contractors reporting into it.
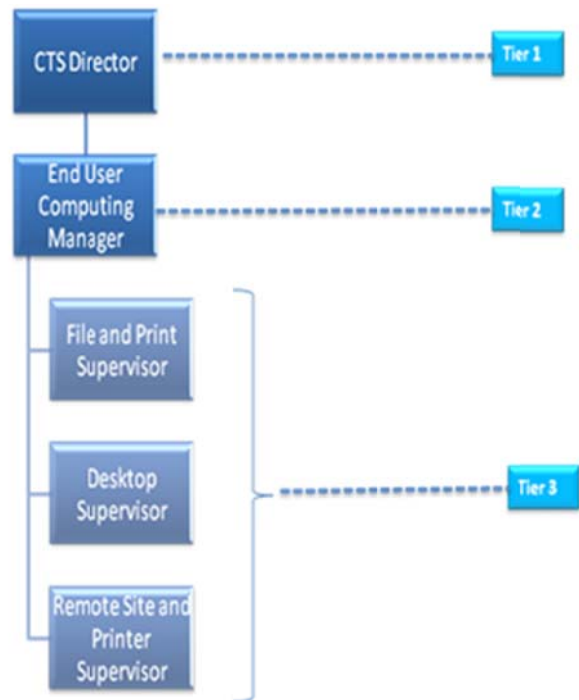
Figure 2.4: End User Computing

➢ **Business and Administrative Services**

    ➢ The following roles are represented in figure 2.5. Business and Administrative Services (BAS) section manager (tier 2) with the Technical co-ordinator (tier 3) and the Training and Application Support co-ordinator (tier 3) reporting into this role.

    ➢ The Technical co-ordinator has two Software Developers on tier 4 reporting into this role.

    ➢ The Training and Application Support co-ordinator has an ITS Trainer on tier 4 reporting to him/her.
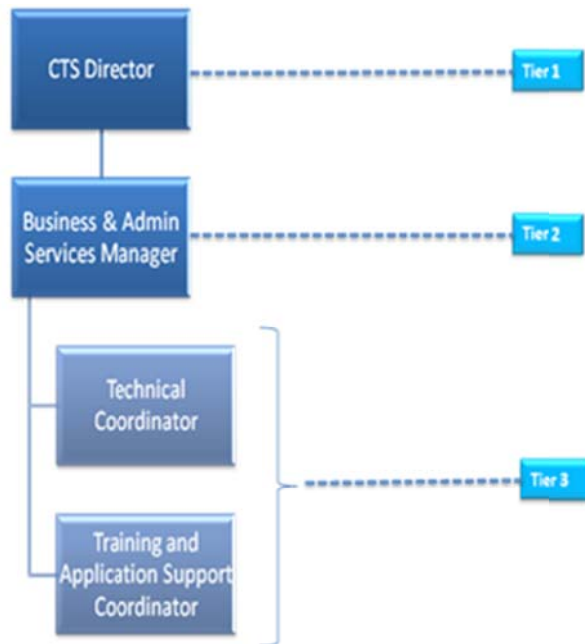
Figure 2.5: Business and Administrative Services

➢ **Networking**

    ➢ The following roles are represented in figure 2.6. Networking (N) section Manager (tier 2) which presently does not have any tier 3 roles reporting into it.

    ➢ There are several roles, regarded as tier 4 roles, reporting into this function. These roles include Network technicians and Telephone administrators.
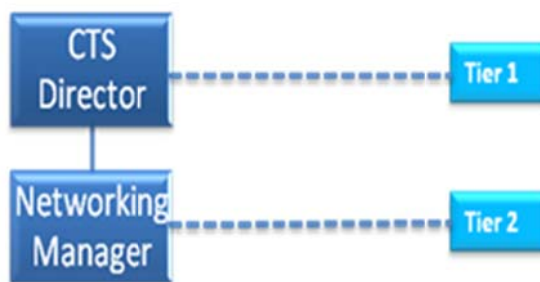
Figure 2.6: Networking

2.3 GOVERNANCE – COMPUTER AND TELECOMMUNICATION SERVICES REPORTING WITHIN CAPE PENINSULA UNIVERSITY OF TECHNOLOGY

CTS reports to the Deputy Vice Chancellor (DVC): Operations, and also to several other IT-related bodies and committees within the institution, which include the following (as illustrated in figure 2.7).

2.3.1 Committees

➢ ICT committee for IT strategy and policies (including ICT Operational Workgroup).

➢ Data Quality committee for Data Ownership.

➢ Audit committee for IT Risk mitigation.

2.3.2 Information Technology-related services to departments and faculties

➢ Management Information Systems (MIS) department for management information and Web Development.

➢ Library department for Electronic Library services.

➢ e-Learning for Learner Management System (Blackboard)

➢ IT-related projects such as Electronic Content Management (ECM), CPUT Webpage, RIMMS, etc.

➢ Academic computing within Faculties (computer laboratories, faculty servers and services, etc.).

Figure 2.7: Computer and Telecommunication Services Reporting within Cape Peninsula
University of Technology

2.4 EMPHASIS ON STRATEGIC AREAS WITHIN COMPUTER AND TELECOMMUNICATION SERVICES

2.4.1 Computer and Telecommunication Services Strategic Plan

During 2008, after the merger, CTS developed its first strategic plan to be aligned with the strategic plan of CPUT.

The strategic objectives included the following:
- To proactively enable the academic project.
- To educate users through marketing the technology.
- To establish and maintain a high availability of key systems.
- To target a high level of user satisfaction.
- To establish and maintain an acceptable response/resolve time.
- To improve on the financial administration in ICT.

The 2008 strategic plan is currently being reviewed so as to align it with the institution's draft 2020 strategic plan.

2.4.2 Terms of Reference (ToR)

There are Terms of References (ToR) for several activities and/or functions within CTS, ranging from CTS Management, Change Advisory Board (CAB), Change Advisory/Emergency Committee (CAB/EC) and Projects.

➤ The CTS Management ToR was developed to reflect management's mandate for the department. It covers the following areas: scope, accountability, meetings, communication, staff management, operational management, project management, finance and contract management, policies and procedures.

➤ The CAB ToR covers the following areas: goals and objectives, scope, structure and resources, assessing priority and impact, quorum for approval, frequency of meetings, communication and documentation, management reporting, terms and definitions.

➤ The CAB/EC ToR covers the following areas: goals and objectives, scope, structure and resources, assessing priority and impact, quorum for approval, frequency of meetings, communication and documentation, management reporting, terms and definitions.

➤ A Projects (ToR) was developed to outline project definitions, roles and responsibilities, the project flow diagram, project charter and the project initiation and registration.

2.4.3 Computer and Telecommunication Services Meetings, Forums, Workgroups, Task Teams

Aside from CTS's involvement in institutional committees and bodies, quarterly departmental meetings are held, which involves all CTS staff. One-on-one sessions between the director and section managers are held once a month, followed by a monthly Management meeting. Sections meetings are held at least twice a month to deal with operational and strategic activities within sections. There are also several workgroups and

forums within CTS which deal with day-to-day operational and strategic matters.

The following are examples of the types of meetings held:

➢ **Computer and Telecommunication Services Management meetings**

  ➢ CTS Management meetings are held once a month to report on activities ranging from staff matters (restructuring, leave, performance management, recruitment, Executive Management matters), financial operations and contracts, policies and procedures and projects.

  ➢ The CTS director, section managers and some tier three staff (Project officer and Quality officer) attend these meetings.

➢ **Departmental meetings**

  ➢ Departmental meetings are held once per term and all staff members within CTS, are invited to attend the meeting.

  ➢ These meetings are held to deal with staff matters, general operational and strategic activities within the department.

  ➢ The CTS director will first give his report-back on the broad issues within CTS, followed by section managers' report back on their areas of responsibility. This is also an opportunity for staff to pose questions or comments.

➢ **Section meetings**

  ➢ Section meetings are held twice per month and deal with day-to-day activities within each section. Staff members are requested to report back on their areas of responsibility.

➢ **Service Desk meetings**

  ➢ Service Desk meetings are held twice a month, chaired by the Client Services manager.

  ➢ Staff attending Service Desk meetings are representatives of all sections within CTS, consisting of tier two section managers, tier three co-ordinators/supervisors and technical staff.

- The Client Services manager chairs and minutes these meetings.

- Issues relating to support calls are reported on as well as general items relating to the day-to-day activities of the Service Desk.

- Reports on Service Desk calls with more than two-hour response time, vs. calls logged per day over a particular period, are made available for these meetings.

- Reports on all calls logged over a sixteen-hour period are also produced. These include the following information: call log dates, call log times, groups assigned to calls, a unique case identification number, caller identification number (staff number), case details, response dates, response details, technicians' names and status.

- **Change Advisory Board (CAB) meetings**

  - Change Advisory Board (CAB) meetings are scheduled twice a month, where Requests for Change (RFC's) are approved, reviewed and closed.

  - The main goal of the CAB is to ensure that all changes are recorded, evaluated, authorized, prioritized, communicated, planned, tested, implemented, documented and reviewed in a controlled manner.

  - CAB member representation spans across all five sections within CTS and comprises tier two section managers, tier three co-ordinators/supervisors and technical staff.

  - All sections are required to be represented when RFC's are authorised.

  - The Change manager chairs and minutes the CAB meetings.

  - A Deputy Change manager fulfils these roles in the absence of the Change manager.

  - CAB meeting minutes reflect the attendance per section representation at the meetings, general activities relating to the change management process, review of the change

management process, review of existing RFC's within the system and the approval of new RFC's.

➢ A Forward Schedule of Changes (FSC) is produced, containing all changes, with a reference number for each unique RFC, details of the change, the person responsible for the change, start/end dates for changes and the status of the changes. Provision is also made for comments to capture additional information relating to each change.

➢ The Change Manager forwards the FSC to the Client Services manager who is responsible for publishing it on the CTS webpage for users to view the status of changes that are currently in the system.

➢ CAB meeting minutes, meeting agendas, FSC reports and any documentation required for CAB meetings, are circulated to staff via email before meetings and also made available in a shared repository or folder in the corporate email system.

➢ Items which cannot be resolved by the CAB, is escalated by the Change manager to the CTS management meetings for attention.

➢ **Project Management meetings**

➢ As part of the project management activity within the department, several Workgroup meetings are scheduled as and when the need arises, to deal with activities where interdependencies exist between technical teams.

➢ Feedback and progress is reported at Management meetings, Service Desk meetings, CAB meetings and Task Team meetings.

➢ **Task Team/Workgroup meetings**

➢ Several Task Team/Workgroup meetings are held, with some being scheduled while others are conducted on an ad hoc basis.

➢ These meetings deal with both technical/operational and strategic matters.

> ➢ In most instances these meetings are arranged or scheduled to deal with activities where dependencies or interrelationships exist between technical teams.

> ➢ Some of these meetings also deal with project-type activities, for example, Disaster Recovery (DR). Task Team meetings are scheduled meetings that deal with DR-related activities.

2.5 STRATEGIC FOCUS WITHIN STRATEGIC AND ADMINISTRATIVE SERVICES SECTION

The Strategic and Administrative Services (SAS) section within CTS is responsible for strategic activities and processes within the department. These activities and processes include Customer Service, Project Management, Quality Management and the adoption of IT best practice frameworks. IT Financial Management is one of the areas within this section that is currently being developed. This section is also responsible for managing and co-ordinating the workgroup and task team meetings within CTS.

The following meetings are chaired by role-players within this section:
➢ Service Desk meetings.
➢ CAB meetings.
➢ DR Task Team and Workgroup meetings.

The SAS section is also responsible for participating in committees and IT-related bodies within the institution. Currently membership and participation exists within the following committees and IT-related bodies within the institution:
➢ Audit Committee.
➢ Data Quality Committee.
➢ ICT Committee.
➢ ICT Operational Workgroup.
➢ ECM Project Forum/Task Team.

> ➢ RIMMS Project Team.

> ➢ Registration Project Team.

2.5.1 Client Services

The Client Services office is responsible for all user requests and/or incidents reported at the services desk. This office also represents the "face" of the department as it is the first point of contact with users and customers. The staff is also responsible for conducting user satisfaction surveys. The switchboard operators also report into this function. Reports are generated regularly to monitor requests and/or incidents.

2.5.2 Project Management

The Project office is responsible for managing and co-ordinating projects, both internal and external to CTS. As part of the 2010/2011 budget cycle, CTS also introduced Projects as a budgetary item to manage the budgets for IT-related projects. Some of the major projects managed to date, include: Stabilisation Project, Registration Project, ECM Project and the SAN Cleanup Project as part of the Disaster Recovery Project.

The project workflow as per CTS Project ToR, is as follows:

Project Initiation
Project Business case or project brief and approval within section

Project Charter
Complete Project Definition document Authority and responsibility for project set. Register Project

Project Planning
Create project plan with work breakdown structures, milestones and section approval. (Approve baseline)

Project Delivery
Project tracking and controlling Changes and variations

Project Closure
Project Review

Figure 2.8: Computer and Telecommunication Services Project Workflow (Source: CTS Project Terms of Reference)

2.5.3 Quality Management

The Quality office is responsible for managing and co-ordinating the day-to-day activities relating to quality within CTS. These activities include:

➢ Adopting quality management principles and guidelines for managing quality within CTS.

➢ Developing and maintaining the CTS Quality Handbook and Quality Improvement Plan (QIP) for both internal and external Quality audits and reviews.

➢ Defining procedures for the control and documentation of records

➢ Providing a central repository for all quality related documentation and evidence.

➢ Co-ordinate activities for resolving Quality audit findings.

➢ Develop and maintain checklists/reports to monitor progress of activities relating to Quality audit findings.

➢ Communicating on activities relating to quality within CTS.

In addition to the quality-related activities, the Quality office also co-ordinates the activities to resolve findings specific to CTS, as part of resolving CPUT Financial audit findings. Some of the roles and responsibilities relating to ITSM are also managed and co-ordinated by this office. Furthermore it assumes the role of managing certain projects, such as the DR project.

2.5.4 Best Practice Frameworks

Over the past few years, since the merger, CTS adopted ITIL as an IT best practice framework. ITIL version 2 has been adopted, consisting of two domains within the IT Service Management Framework. These are Service Support and Service Delivery. The diagram below (figure 2.9) illustrates the two domains, including the function and processes of each.

Figure 2.9: Information Technology Infrastructure Library v2 Information Technology Service Management Framework

The following function and processes within the Service Support domain were adopted by CTS:

➢ Service Desk function.

➢ Incident Management process.

➢ Problem Management process (to a lesser extent).

➢ Change Management process.

➢ Release Management process (to a lesser extent).

➢ Configuration Management process (to a lesser extent).

The following processes within the Service Delivery domain, were adopted:

➢ Service Level Management process (to a lesser extent).

➢ IT Financial Management process (to a lesser extent).

➢ IT Service Continuity Management process.

The two remaining processes, Availability Management and Capacity Management, have not been formally adopted as yet.

2.6 INFORMATION TECHNOLOGY SERVICE MANAGEMENT PROCESSES WITHIN COMPUTER AND TELECOMMUNICATION SERVICES

The following section deals with the various ITSM processes adopted by CTS. It covers the Service Desk, Incident Management, Problem Management, Change Management, Release Management, Configuration Management, Service Level management and IT Service Continuity Management.

2.6.1 Service Desk and Incident Management

The CTS Service Desk is one of the most mature functions in the environment and also the longest in existence. The Service Desk is the only function within the ITIL framework and is not regarded as a process. The Client Services manager assumes the role of Incident Manager and is also responsible for chairing Service Desk meetings. Incident management is part of this function within CTS, where incidents are logged and escalated. The Service Desk operators log incidents onto the in-house developed Service Desk Client, and escalate them to the various technical teams within the department. Service Desk meetings are held to monitor and report on incidents. The Client Services manager assumes the role of Incident Manager.

2.6.2 Problem Management

The Problem Management process has been adopted but not formally implemented. Procedures have been defined for its interrelationships with the Service Desk and Change Management, but due to the absence of an integrated ITSM solution, very little progress has been made. The Client Services manager assumes the role of Problem Manager.

2.6.3 Change, Release and Configuration Management

Change Management is another ITSM process which is regarded as a fairly mature process within CTS. The Quality officer assumes the role of Change Manager and is also responsible for chairing CAB meetings. CAB meetings cover the general aspects of the day-to-day Change Management process, the review of changes, the approval of new changes and the review of the Change Management process itself. Both the CAB and CAB/EC ToR are followed in the Change Management process. Members of the CAB comprise of section managers from the respective functional areas, supervisors and co-ordinators from the respective functional areas, technical staff, Service Desk staff and the Project officer. Some of the representatives are permanent members of the CAB and others are representing on an ad hoc basis. The Change manager is responsible for co-ordinating the approval of RFC's and to ensure that all changes are monitored throughout its lifecycle. An in-house Change Management system on OPA has been developed to submit RFC's for approval. Any activity which cannot be resolved at the CAB level is escalated by the Change manager to the management team of CTS, which also serves a Steering Committee for the CAB.

Three change procedures are followed:
➢ Normal Change Procedure,
➢ Emergency Change Procedure, and
➢ Standard Change Procedure

These procedures follow a particular process for the request for change, approval, status update, review and closure.

Release and Configuration Management processes are dealt with as part of the Change Management process. In terms of Release Management, testing and user sign-off is only applicable for changes within the BAS environment. Configuration Management is addressed as part of the

closure of RFC's. Documentation reflecting soft- and hardware configurations are submitted with each RFC. Other configuration changes are in the form of procedural documentation, network layout diagrams, etc. There are no roles assigned for the Release and Configuration Management processes.

2.6.4 Service Level Management (SLM)

The CTS Service Portfolio comprises of services offered by CTS. It includes a unique service number, service category and sub-category, service status and service owner. The following services categories are contained in the Service Portfolio: Integrated Administrative System, Printing, Email, Internet, Local Area Network (LAN), Directory Services, Novell, Desktop Management, Security, Facilities, Telephony, Backups, Online Personal Access (OPA), e-Learning hosting (Blackboard), Service Desk, Video Conferencing, Registration, Cross-functional and Administration, Library support, Academic support, IT Centre, Apple MAC support, Bulk SMS, Audit support and Service Level Management (SLM). Each service category is split up into subcategories. Some of these services are internal to CTS and others are external, i.e. for users or customers.

Service levels are contained in Service Level Agreements (SLA) for certain services and are managed at the Service Desk. A draft SLA framework has been developed and needs to go through the process of approval. Some of the roles relating to SLM are assigned to different designations within the SAS section. These roles and responsibilities are also not clearly defined.

2.6.5 Information Technology Service Continuity Management

A Business Impact Analysis (BIA) and Risk Assessment (RA) were conducted by an independent consultant in 2009. A Disaster Recovery

Task Team was formulated to manage the process of Disaster Recovery (DR). The Quality officer was assigned the responsibility for managing the DR project. A DR project plan was developed and regular DR Task Team meetings are conducted to monitor progress. DR project plan reports are compiled on a regular basis for each of the functional areas within CTS, to monitor the progress of activities. These reports are updated by conducting workgroup meetings with assigned staff from the relative functional areas. Updates from these reports are filtered through to the DR project plan to ensure that the project plan is updated and current. A Disaster Recovery Communication Plan has been developed and presented to Executive Management for approval. CTS reports to various committees on DR related activities and progress. A DR Plan (DRP) was developed and approved by Executive Management and presented to the Audit Committee. CTS is in the process of developing a DR Test Plan for the implementation of a final DRP.

2.7 INITIATIVES IN THE ADOPTION OF BEST PRACTICE METHODOLOGIES

Adopting an IT best practice framework, such as ITIL, requires extensive knowledge and experience to implement. CTS staff had to be trained in ITIL at various levels, i.e. foundation, practitioners and managers. Figure 2.10 below illustrates the different levels of certification within the ITIL version 2 framework.

Figure 2.10: Information Technology Infrastructure Library v2 Certification

2.7.1 Information Technology Infrastructure Library Training

TENET, which is the Internet Service Provider (ISP) for Higher Education (HE) institutions, addressed the need for staff to be trained in ITIL. CPUT was nominated as one of the institutions which would benefit from this initiative.

Staff from various functional areas within CTS were nominated and trained at the various levels within the ITIL v2 framework. SAS staff was the first to be trained as the co-ordination and implementation of these processes would fall within their field responsibility. Some of the processes would also be management from within this section. This training was followed by nominating staff from within the technical and operational areas. Table 2.1 below illustrates the number of staff trained at the various levels.

Table 2.1: Computer and Telecommunication Services staff trained in Information Technology Infrastructure Library

Course Description	No of Staff
ITIL v3 Foundation	36
ITIL v2 Practitioners	3
ITIL v2 Managers	3
TOTAL	**42**

On the ITIL Foundation course, thirty six staff members from across the various functional areas were trained. The next level, which is the Practitioners course, allowed for only three staff members from specific functional areas, to be trained. Finally, three staff members, of whom two are from the SAS section, were trained at Managers level. A total of 42 staff members, out of approximately 60 permanent staff, were trained at the various levels. This gave CTS a jump-start in the adoption of ITIL as a best practice framework.

2.7.2 Other Tertiary Education and Research Network of South Africa (TENET) Initiatives

Apart from the ITIL training initiatives, TENET also initiated initiatives which included Service Support conferences as part of their DITCHE programme, thus creating opportunities for networking and forming practising communities from and between various institutions, and solicit sponsorships for staff from various institutions to attend international conferences for IT practitioners in Higher Education.

In addition to this, they afforded institutions the opportunity to expand their IT libraries by sponsoring books and reading material related to ITSM and other IT best practice methodologies.

Further, TENET nominated staff to be trained in PRINCE2 Project Management framework, one of which, a staff member from SAS, has been trained to date.

2.8 CONCLUSION

In this chapter a holistic perspective has been provided of the issues relating to the research environment. The research environment was explained in detail and some of the areas which need to be addressed were highlighted. The structure of CTS, reporting of CTS within the institution, emphasis on strategic areas within CTS, strategic focus within SAS, ITSM processes within CTS and initiatives in the adoption of best practice methodologies, were elaborated upon in detail.

In Chapter 3, a literature review will be undertaken on the research objectives as well as the research problems.

CHAPTER 3: EVALUATING MECHANISMS FOR INFORMATION COMMUNICATION TECHNOLOGY (ICT) SERVICE IMPROVEMENT – LITERATURE REVIEW

3.1   INTRODUCTION

There are several best practice mechanisms for improving services and processes. In this study, ICT services and processes will be evaluated to ascertain process maturity, as well as determining service levels. In this chapter, the researcher will evaluate and review several best practice mechanisms that could assist in improving ICT processes and services. The main focus of the chapter will be to investigate various quality management techniques to improve quality. It will elaborate on aspects relating to continuous improvement, highlight the relationships between process and service, utilise project improvement mechanisms to achieve quality, evaluate IT best practice frameworks with specific reference to areas affecting the improvement of the Service Desk function, Incident Management Process and Service Level Management Process.

3.2   QUALITY MANAGEMENT SYSTEMS AND TECHNIQUES

In this section, various concepts relating to quality management systems and techniques are elaborated upon. It emphasises the management of documentation as one of the key elements in a managing quality.

3.2.1 Defining Quality

According to Tricker and Sherring-Lucas (2001:4), the following items are contained in their definition of quality: a standard which can be accepted by both the supplier and the customer, giving complete satisfaction to the customer, comply consistently with an agreed level of specification, provide an acceptable product (or service) at an acceptable price to the customer and cost to the supplier, provide a product (or service) which is

"fit for the purpose", the totality of features and/or characteristics of a product (or service) that bear on its ability to satisfy a given need.

According to Tenner and DeToro (1992:63-64), citing Garvin (1987:101-109), their definition of the eight dimensions of quality can be used at a strategic level to analyse quality characteristics.

In summary, the eight dimensions are as follows:
➢ **Performance**: this involves the product's primary operating characteristics.
➢ **Features**: these are the secondary aspects of performance, normally referred to as the "bells and whistles" supplementing basic functions.
➢ **Reliability**: is the probability of successfully performing a specified function for a specified period of time under specified conditions.
➢ **Conformance**: this is the extent to which the product design and operating characteristics meet established standards.
➢ **Durability**: this is a measure of the product's life and is defined as the amount of use obtained before it deteriorates to either being replaced or repaired.
➢ **Serviceability**: deals with the speed, courtesy, competence and ease of repair.
➢ **Aesthetics**: this includes how the product looks, feels, sounds, tastes or smells, and is for the best part a matter of personal judgement and individual preference.
➢ **Perceived quality**: this is referred to as reputation and may be based on comparing brands and/or noting consumer reports.

According to Goetsch and Davis (2006:469), a Quality Management System (QMS) is a management system to direct and control an organization with regard to quality. Emphasis is placed on the documentary requirements of a quality management system and includes: quality policy, quality manual, quality objectives, quality procedures and records. The documentation contained in the QMS, thus falls into four

categories, namely, policies, procedures, practices (work instructions) and proof (records). It is used to ensure consistency in the organisation's operations and processes, which also being used in the auditing process for compliance. There are two international quality initiatives, currently being applied, one being ISO 9000 and the other, Total Quality Management (TQM). There is a strong relationship between the two, in that ISO 9000 incorporated the eight TQM principles in the ISO 9001:2000 release. These principles are as follows: customer focus, leadership involvement with people, process approach, system approach to management, continual improvement, factual approach to decision making and mutually beneficial supplier relationships.

3.2.2 Total Quality Management (TQM)

Wilkinson and Witcher (1991:44-5) cited by Wilkinson, Redman, Snape & Marchington (1998:11), describes TQM as a general business management philosophy to continuously improve customer satisfaction through quality-led, company-wide management, which becomes a way of living which filters through every aspect of the organisation.

Tenner and DeToro (1992:32-35) describe a model for implementing Total Quality Management, which is built on three fundamental principles of total quality.

The three fundamental principles are:
➢ **Customer focus**: This is concerned with customer requirements, needs and meeting expectations. Customer requirements should be collected, analysed, understood, accepted and met.
➢ **Process improvement**: Continuous improvement implies that all work is the result of a series of interrelated steps and activities that culminate in output. It is essential that variability is reduced in the output at each step in the process. The process should produce the desired output at all times, with no variation. This will ensure

improved reliability in the process and is regarded as the first objective in continuous improvement.

➤ **Total involvement**: Is concerned with active leadership of senior management. It involves efforts that utilise the talents of all employees in the organisation. In order for problems to be solved, processes to be improved and customers to be satisfied, all employees should be empowered to improve output.

In addition to the three main principles, Tenner and DeToro (1992:32-35) identify six supporting elements in this model. These are:

➤ **Leadership**: The role of senior managers in the implementation of TQM is important, as they need to lead by example – being advocates, teachers and leaders. They need to apply the tools and language required to lead by example. In order to achieve continuous quality improvement, senior managers must understand that total quality management is a process comprised of principles and supporting elements.

➤ **Education and training**: Education and training is essential for employees to ensure that they understand the mission, vision, direction and strategy of the organisation. They need the necessary skills to ensure quality improvement and to resolve problems. Through training, employees will also understand the common language and common tools, which will be utilised throughout the organisation.

➤ **Supportive structures**: Support may be required from external consultants to assist in bringing about change required to implement the quality strategy.

➤ **Communications**: In order to achieve successful communication within the quality environment, managers should meet with employees on a personal level to circulate information, provide direction and to respond to queries.

➤ **Reward and recognition**: It is important to give recognition and possibly reward employees who successfully adhere to and apply the

quality processes. This will also send out a clear message to the organisation, in terms of what is expected.

➢ **Measurement**: The use of data is very important in the quality management process. This can be achieved by measuring customer satisfaction to determine their perception of whether their needs are being met.

3.2.3 Documenting the Quality Management System

Another key component in managing quality is the documentation which is defined by the organisation's quality requirements, size and complexity of its processes. The documentation may include standards, procedures and requirements, as well the procedures required to produce and maintain quality management system documentation.

According to Born (1994:263-275), there are certain standards and regulations which organisations need to adhere to in order to provide a code of practice or regulatory framework. In order for organisations to adhere to standards and regulations, procedures and instructions are documented to ensure compliance. It also serves as a mechanism for implementing objectives and policies. Procedures and instructions should be written clearly in order for staff to understand. It provides a framework for improvement in activities. Legally binding documents, such as contracts, also contribute to delivering services, in that it provides a framework for work to be undertaken. Data and reports can also lead to quality improvement as the results of the analysis can be applied to improve processes. Important requirements for quality documentation include clarity and comprehension, correctness, structure of the documentation set, compliance with standards and regulations and its suitability for audit purposes.

Meticulously keeping quality documentation and records up to date, plays an important role in the success of a QMS. Applying the International

Standard's ISO 9001:2008, documentation for a QMS, shall be controlled and documented according to a defined procedure. This implies that a documented procedure for the control of records has to be developed. Established and maintained records provide evidence or proof of conformance to the requirements and effective functioning of the organisation's QMS (International Standard ISO 9001:2008, 2009:3).

3.3 CONTINUOUS IMPROVEMENT AS A MEANS FOR IMPROVEMENT

In this section, the planning for continuous improvement and the responsibility of management in this regard, are discussed. It also covers Deming's PDCA cycle, which is a popular technique in addressing continuous improvement.

3.3.1 Planning for Continuous Improvement

According to Burrill and Ledolter (1999:470-473), continuous improvement can be achieved by adjusting the organisation's strategic and operational planning processes. This adjustment will also contribute towards quality improvement, accomplished by adopting a project by project approach. It does, however, require goals to be set for quality improvements, the projects which will achieve these goals, resources required and measures for success. Embarking on such an undertaking would involve establishing the current status before planning what is intended to achieve. It also requires documenting the process before being able to improve it, i.e. documenting current procedures and practices. Process owners are responsible for quality improvements and quality assurers are responsible for providing suggestions and guidance. Quality Assurance, as a resource, could also be responsible for teaching quality concepts and facilitate efforts for improvement.

Furthermore, according to Burrill and Ledolter (1999:470-473), part of the planning process would also involve setting certain objectives which are interrelated and coordinated in order to achieve improvements. It includes two types of objectives viz. maintenance and improvement objectives. Maintenance objectives are concerned with the business results, reflected in profit, market share and products. The focus is on "today" and the need for performance are similar to those objectives set by top management. Improvement objectives, on the other hand, are established in order to promote system improvement for a better system quality. It is also referred to as cross-functional objectives as it requires the co-ordination of activities between different units within the organisation. It is a key component in meeting competitive pressures on quality, cost and on-time delivery. Specific action programs (means); in the form of policies, are required to achieve these objectives (ends). The process of implementing plans for improvement is known as policy deployment, directly through line managers and indirectly through cross-functional organisations. Thus, it cuts across line functions to achieve cross-functional goals, assisting in deploying policies for improvement.

3.3.2 Management responsibility

Management involvement and direction is important in enabling quality improvement. This is followed by empowering staff with appropriate training and equipment.

According to Burrill and Ledolter (1999:479), the following provisions are essential for quality improvement:

➢ **Direction**: management goals must be expressed and process improvement should be part of every function – it should be part of the organisation's culture.

➢ **Support**: training, support services and tools should be made available in order to bring about improvement – management

- **Empowerment**: employees should have the necessary information, resources and backing which will empower them to make suggestions and changes.
- **Recognition**: management should recognise and show their appreciation for quality improvement efforts – this could be in the form of a small gift, positive remarks of recognition at departmental meetings, vouchers, etc.

According to Burril and Ledolter (1999:479), "Improvement is an unending continuous loop of finding problems, prioritising problems and solving problems". Problems are identified in various ways, such as talking to customers, understanding process, studying product requirements and standards, measuring performance, etc. Problems may also be as a result of poor process flow, vague or unclear communication of tasks, inferior inputs, technical factors, insufficient documentation and insufficient training. Problems are often selected by listing the known ones, determining the worst problem areas and then prioritising some.

In the article, "Generating a culture focused on continuous improvement," Fraser (1995:6) outlines his approach to achieving continuous improvement. It starts with strategic considerations to create a culture in the organisation, focused on continuous improvement in which the purpose, aims and values are communicated. Introducing the continuous improvement process, raised important issues relating to leadership, which had to be addressed. Performance objectives had to be closely aligned to include continuous improvement and quality objectives. Furthermore, the aim with regards to quality, is a commitment expected from all employees to deliver services which, not only meet the needs of customers, but exceed their expectations. Project teams were formed to include staff from all sections of the organisation. They should all play an active role in order to understand problems and processes, collect data and analyses related

to processes, generate and test for non-conformances and design, implement and test solutions. Communication throughout the organisation was achieved by means of team briefing sessions, a staff magazine and duty manager schemes. Customer feedback is regarded as being of utmost importance and is achieved by means of customer surveys and feedback leaflets. This also provides a platform to establish which aspects of the service could be improved.

3.3.3 Deming's Plan, Do, Check, Act (PDCA) Cycle

Deming's PDCA cycle or Deming's wheel, also known as the Shewhart cycle, according to Juran and Godfrey, **s.a**.:4.4, is used as a feedback loop which is divided into four steps.

The steps in the PDCA cycle are explained as follows:

➢ "**Plan**" involves choosing a control subject and setting goals. In this step, a decision is made as to whether the changes are desired, whether the data that is available, and if it is, planning is done to implement the change or improvement. At this stage a decision is also made on how to use the observations.

➢ **"Do"** involves running the process and carrying out the change or improvement as decided upon. It is recommended that it is first done on a smaller scale.

➢ **"Check"** involves sensing and observing the efforts of the change or improvement.

➢ **"Act"** involves simulating in order to take corrective action. In this instance, the results are studied, lessons leant and predictions made.

➢ Finally, the cycle is repeated continually to refine the changes or improvements.

The diagram below (Figure 3.1) is an illustration of the PDCA cycle indicating the activities at each stage in the cycle.
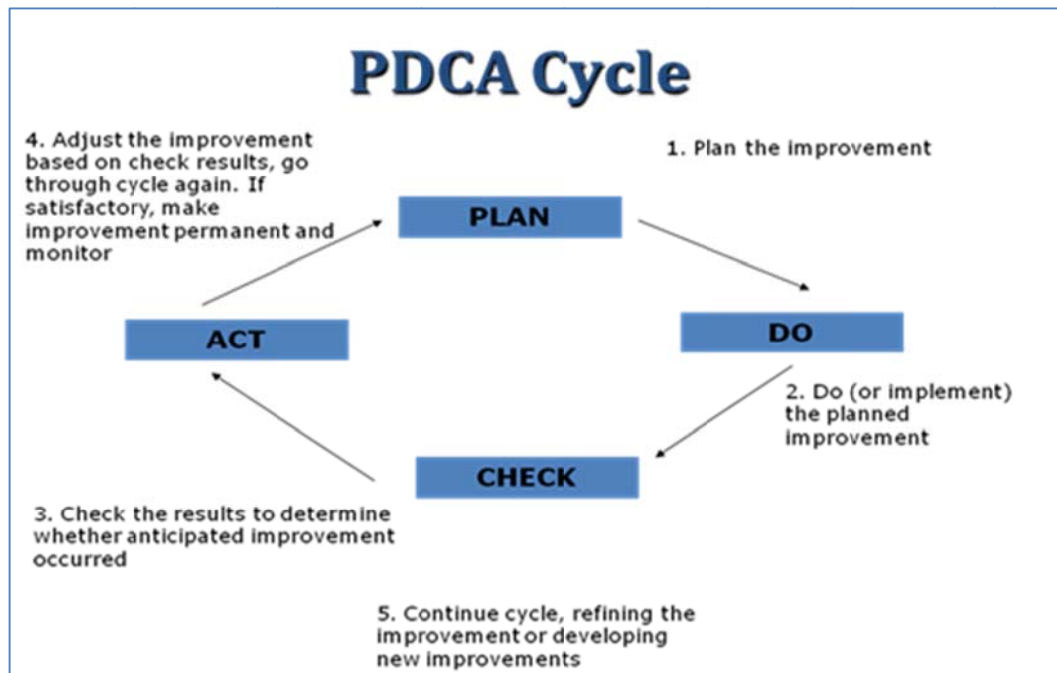
Figure 3.1: Deming's Plan, Do Check, Act (PDCA) Cycle (Source: Goetsch and Davis, 2002:105)

According to Burrill and Ledolter (1999:500), Juran was the first American quality guru who formulated ten steps to achieve quality improvement.

It comprises of the following:

➤ Build awareness of the need and opportunity for improvement.

➤ Set goals for improvement.

➤ Organise to reach the goals (establish a quality council, identify problems, select projects, appoint teams and designate facilitators).

➤ Provide training.

➤ Carry out projects to solve problems.

➤ Report progress.

➤ Give recognition.

➤ Communicate results.

➤ Keep score.

➤ Maintain momentum by making annual improvement part of the regular systems and processes of the company.

3.4   THE RELATIONSHIP BETWEEN PROCESS AND SERVICE FOR SERVICE IMPROVEMENT

In this section, the relationship between processes and services are defined. It follows with a breakdown of process management and roles within process management. Service quality, but more specifically, IT service quality, is defined. It includes techniques for process improvement, such as benchmarking.

3.4.1   Process and Service defined

According to Goetsch and Davis (2002:40), all work is accomplished through processes and every task has its process. It further defines a process approach as being derived from Total Quality Management (TQM) and that it requires the organisation to view its operations as a series of interrelated and interacting processes. Aside from just managing the processes and interactions, attention should be focused on customer satisfaction which is also a key element in continual improvement.

Furthermore, according to Goetsch and Davis (2002:17-24), a service is defined as work done or duties performed for others, and everything done, is part of a process. Services are provided through processes. Quality is considered to be an integral characteristic or component part of a service. A service may also be the provisioning of the whole process of supplying, installing, maintaining, repairing, etc. As a result, what is observed and evaluated by the customer is the act of providing the service or process. In order for processes to be understood and followed, it is important for processes to be documented, which in turn ensures consistency. In defining a service, the first element is for it to be fit for use, which also applies to the process of providing the service. The second element is meeting or exceeding customer requirements, as the customer determines whether the quality of service is acceptable. The third element is meeting or exceeding customer expectations related to customer requirements. In

this instance, that which is not required, but expected and greatly appreciated when provided. It also distinguishes the best service providers from others who are merely adequate. These "extras," in providing the service, takes the supplier beyond customer satisfaction to customer delight. There are quality characteristics in delivering a service which can be used to monitor service quality.

These characteristics are:
➢ Facilities, capacity, number of personnel, quantity of materials.
➢ Waiting time, delivery time, process time.
➢ Hygiene, safety, reliability, security.
➢ Responsiveness, accessibility, courtesy, comfort, aesthetics of the environment, competence, dependability, accuracy, completeness, state of the art, credibility and effective communication.

In order to identify process improvement opportunities, quality characteristics which are important to customers, should be tracked, monitored and analysed (Goetsch and Davis, 2002:17-24).

3.4.2 Process Management

According to the itSMF (2002:25-28), for an organisation to realise its vision, mission, objectives and policies, it has to undertake the appropriate activities to achieve these. These activities should be arranged in a way that each group of activities contributes to objectives of the organisation – these grouped activities are referred to as processes. In this instance, a process is a logically related series of activities, conducted towards a defined objective. It entails what has to be done, the results expected, measuring processes to deliver the expected results, and finally, how the results of one process affect the other processes. This is also referred to as the relationship between processes. A process-based approach is normally followed as illustrated in the process improvement model in figure 3.2 below.
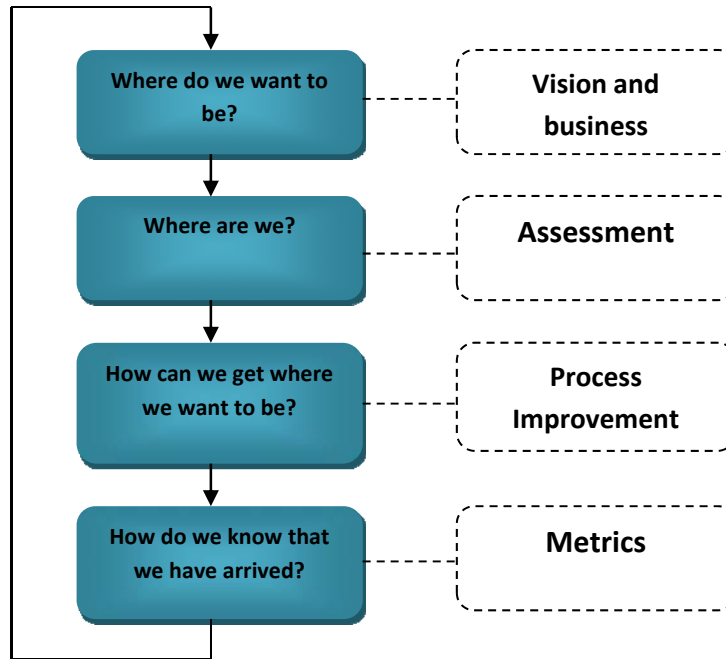
Figure 3.2: Process Improvement Model (**Source**: itSMF, 2002:25)

According to the itSMF (2002:25-28), activities are carried out to convert input into output. Quality characteristic and standards are used to provide information about the results that need to be obtained and associates the input and output of each of the processes. Chains of processes indicate what is happening in the organisation as well as indicating monitoring points to monitor quality of products and services provided by the organisation. In the diagram below (figure 3.3), the process diagram illustrates the standards or policies, measurements and control linked to the process. The process has to conform to the objectives as well as the standards, in order for the process to be effective. The process is deemed efficient if the activities within the process are carried out with minimum effort and cost.
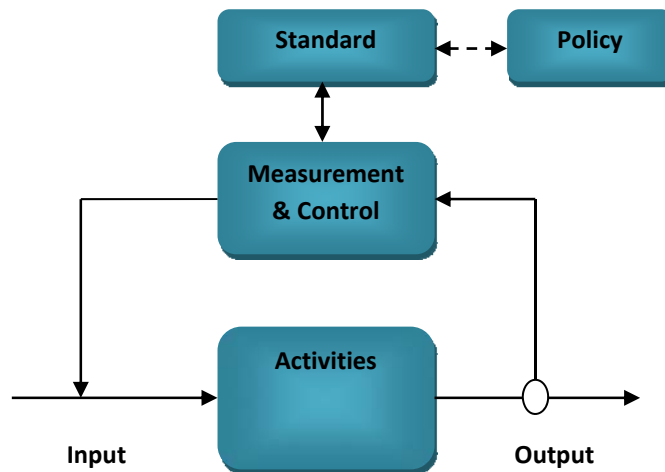
Figure 3.3: Process Diagram (**Source**: itSMF, 2002:26)

3.4.3 Roles within Process Management

The itSMF outlines the various roles within processes, as follows: "The process owner is responsible for the process results. The process manager is responsible for the realisation and structure of the process, and reports to the process owner. The process operators are responsible for defined activities and these activities are reported to the process manager" (itSMF: 2002:26).

3.4.4 Service Quality

To understand the attributes of service quality, Tenner and DeToro (1992:64-65), citing Berry, Parasuraman and Zeithaml (1985:44-52), elaborates on the Ten Determinants of Service Quality to compliment the eight dimensions offered by Garvin and summarises it as follows:

➢ **Reliability**: Is described as the consistency of performance and dependability – performing the right service right the first time. It also includes honouring promises and accuracy.

➢ **Responsiveness**: Employees providing the service should be willing and ready, as well as timely.

➢ **Competence**: Involves the skills and knowledge to perform the service.

- ➢ **Access**: Includes ease of access, waiting time and hours of operation.

- ➢ **Courtesy**: Is concerned with the friendliness, politeness, respect and consideration for contact personnel.

- ➢ **Communication**: Involves listening to customers, communicating with customers in a language that they understand, explaining the service itself and how problems will be handled.

- ➢ **Credibility**: Consists of the personal characteristics of personnel, trustworthiness, honesty and the reputation of the company.

- ➢ **Understanding the customer**: Involves an understanding of the customer's specific needs and requirements as well as providing individualised attention to customers.

- ➢ **Security**: Involves confidentiality, freedom from danger, risk and physical safety.

- ➢ **Tangibles**: These include the physical evidence of the service, facilities, appearance of personnel, tools and equipment used to provide the service.

3.4.5 IT Service Quality

According to the IT Service Management Forum (itSMF: 2002:13-17), the IT service provider needs to focus on the quality of services provided to the organisation – it can longer only focus on the technology, due to the demands for IT to align itself to the business objectives. Organisational maturity is vital in how the IT organisation is managed. The European Foundation for Quality Management (EFQM) model (Figure 3.4) identifies the major areas to be considered when managing an organisation.
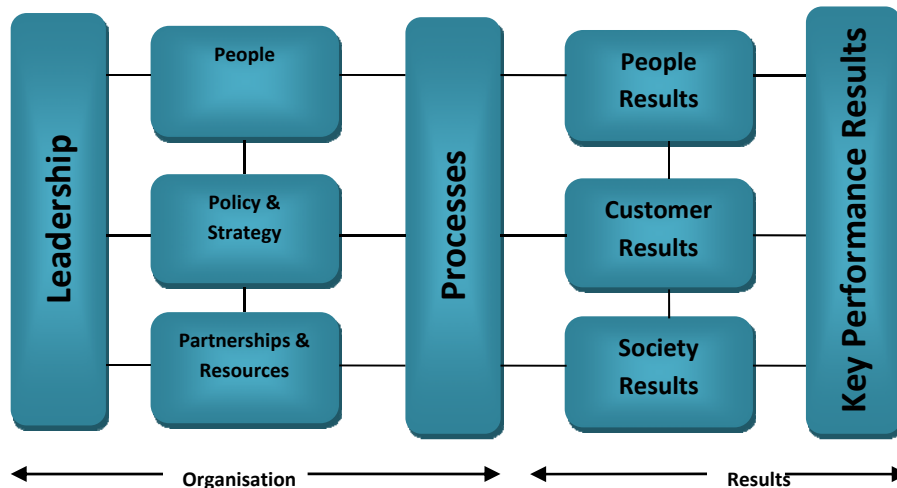
Figure 3.4: European Foundation for Quality Management (EFQM) Model (**Source**: itSMF, 2002:17)

Services and quality are inter-linked in that it refers to the extent to which the service fulfils the requirements and expectations of the customer. It is therefore important for the service to be continuously assessed to ascertain the customer's experience and expectations for the future. The results of these assessments can be used to determine whether or not the service should be modified. One of the most challenging aspects in providing a service, is consistent quality in providing the service. The overall quality of the service is the result of a number of component processes which, together, form the service. These processes are linked and the effective co-ordination thereof requires adequate quality and consistency (itSMF: 2002:13-17).

3.4.6 Process Improvement through Benchmarking

According to Goetsch and Davis (2006:681), benchmarking is another approach that can be followed for improving processes. It follows a sequential fourteen-step approach to changing processes and to continually improve it. These steps include:

➢   Obtain management commitment.

➢   Baseline own processes.

➢   Identify your strong and weak processes and document them.

➢   Select processes to be benchmarked.

➢   Form benchmarking teams.

➢   Research the best-in-class.

➢   Select candidate best-in-class benchmarking partners.

➢   Enter into agreements with benchmarking partners.

➢   Collect data.

➢   Analyze data and establish the gap.

➢   Plan action to close the gap or surpass.

➢   Implement change.

➢   Monitor.

➢   Update benchmarks and continue cycle.

3.5   PROJECT MANAGEMENT AS A MECHANISM FOR IMPROVEMENT

According to Burrill and Ledolter (1999:501), Juran also popularised the concept of solving problems on a project-by-project basis. This involves identifying needs, defining projects, prioritising them, obtaining authorisation and funding, assigning responsibility and undertaking the projects in order to bring about quality improvements. Quality problems are interdepartmental by nature, and require interdepartmental project teams. Therefore, anyone who directs quality improvement efforts, should have a solid understanding of projects and project management.

3.5.1   Improvement through Projects

According to Burrill and Ledolter (1999:480), improvement is achieved through carefully planned projects that may be either small or large and are carried out by individuals or groups. Finding solutions through projects should be as a result of it being useful to the organisation. Clear boundaries, reporting, team members and commitment should be established. In selecting the appropriate team, experience, attitude, technical skill and the ability to work together, should be carefully

considered – a team leader should also be selected. Without a project plan being developed prior to starting the project, it would probably be poorly managed and exceed time and budget constraints. A plan strategy should be established in order to achieve the major objectives. Part of managing the project, involves monitoring accomplishments and adjustments, if necessary. At the close of the project, a final report should be compiled to review findings, with emphasis on the contributions. The project itself should be reviewed to ensure improvement of the project process.

3.5.2 Planning of Projects

According to Capper (1998:83-92), planning is important when embarking upon, or starting any new project which may involve a new service, new product or new process. It is also of utmost importance to involve all key stakeholders and role players early in the planning process. The methodology used in planning projects, involve three stages, starting with a pre-project meeting (referred to as stage 0), chaired by the project champion and including the project leader and quality advisor. The champion should give them background on the project and brief them about the scope, exclusions, benefits for realising the project and timescales. Team members, all other stakeholders that should be involved, logistics and resource requirements should be identified. The second stage (referred to as stage 1) is concerned with the project planning meeting led by the project leader with the assistance of the quality advisor. Team members, together with all other role players and stakeholders are also invited. The final stages (referred to stages 2 – 6) in the process involve carrying out the project, and comprises of five parts in the methodology. The project leader and team members carry out the project with the assistance of the quality advisor who assists with the methodology and techniques. In the diagram below, a breakdown of the stages is illustrated, together with the sub-activities for each stage (Capper, 1998:83-92).

Table 3.1: Overview of planning methodology (**Source**: Capper, 1998:85)

STAGE 0 – Hold the pre-project meeting
STAGE 1 – Hold a project planning meeting and establish the project plan
1.1   Clarify remit and purpose
1.2   List the major actions for the project
1.3   Identify the anticipated benefits
1.4   Plan to obtain customer data
1.5   Identify other influences and factors
1.6   Identify possible problems and obstacles
1.7   Prepare a project plan
1.8   Plan communications
1.9   Explain how the plan will be managed
STAGE 2 – Monitor, update and revise the project plan
2.1 Evaluate options
2.2 identify key performance indicators and critical success factors
STAGE 3 – Prepare for a pilot
3.1 Determine the appropriate type of pilot
3.2 Prepare an implementation plan for the pilot
3.3 Anticipate resistance to change
3.4 Prepare contingency plans
3.5 Plan to measure the pilot
3.6 Present proposals to the steering group
STAGE 4 – Carry out the pilot and review
4.1 Monitor the pilot
4.2 Review the pilot
4.3 Evaluate success
STAGE 5 – Implement on a permanent basis
5.1 Plan for full-scale implementation
5.2 Error proof
5.3 Write new procedures and work instructions
5.4 Update documentation
5.5 Identify ongoing training requirements
5.6 Determine responsibility for monitoring and management
5.7 Anticipate misuse
5.8 Plan for post-implementation glitches
5.9 Present implementation proposals to steering committee
5.10 Plan for launch day
STAGE 6 – Close down the project
6.1 Tie up loose ends
6.2 Review the project
6.3 Make a final report to the steering committee
6.4 Thank people involved
6.5 Celebrate

3.5.3 The role of the Project Manager

Burke (2006:11-12) emphasizes the importance of the selection and appointment of a project manager and that such a decision can influence the success or failure of a project. The project manager is regarded as the single point of responsibility, since in this role, he/she is responsible for guiding the project to successful completion. He/she also assumes responsibility for the integration and co-ordination of all contributions to the project. Project management attributes are important and the role of the project manager should be outlined in the project charter.

According to Burke (2006:11-12), the following serves as a recommendation for some of the attributes a project manager should have:

➢ Ability to select and develop an operational team.
➢ Leadership and management ability.
➢ Ability to anticipate problems, solve problems and make decisions.
➢ Ability to integrate the project stakeholders.
➢ Operational flexibility.
➢ Ability to plan, expedite and get things done.
➢ Ability to negotiate and persuade.
➢ Understand the environment within which the project is being managed.
➢ Ability to review, monitor and apply control.
➢ Ability to administer the contract, the scope of work and scope of changes.
➢ Ability to manage within an environment of constant change.
➢ Ability to keep the client happy.

3.5.4 The Project Life Cycle and documentation

As far as the project life-cycle is concerned, Burke (2006:28-29) divides the project life-cycle into four main phases, namely, the concept and

initiation phase where the need or opportunity is established; the design and development phase which is concerned with the guidelines of the feasibility study, building methods and schedules; the implementation phase which covers the implementation of the project as per the baseline plan; and finally, the commissioning phase which confirms that the project has been implemented, built and then terminating the project. The project life-cycle then divides the project into project phases which in turn are subdivided into input-process-output format. A number of activities and milestones are contained in each of these phases which are helpful in assisting the team to retain focus and induce control. Project control can simply not be accomplished without setting the scope and requirements for reporting on progress.

According to Burke (2006:213-216), there are several areas covered within the project life-cycle where reporting is done in the form of planning documentation and control documentation. The following list contains examples of planning and control documentation for each category:

➢ **Scope management** defines what needs to be delivered or the Scope Of Work (SOW). Planning documentation should include a project charter, work breakdown structure (WBS), activity list, contract, etc. The control documentation should also consist of project communications, impact statements, change requests, concessions, close-out report, etc.

➢ **Technical support** is concerned with the client's brief and addresses the day-to-day problems with statutory regulations. Planning documentation should include client's brief, statutory regulations, specifications, building method, etc. Control documentation should include configuration control, impact statements, commissioning, etc.

➢ **Time management** outlines the sequence and timing of the SOW. Planning documentation should include a network diagram, schedule bar chart, milestone schedule, etc. Control documentation should include progress reporting (actual vs. planned), Gantt chart, trend documents, etc.

- ➢ **Procurement management** identifies all the bought-in items according to specifications, time schedule and budget. Planning documentation should include procurement schedule, Material Requirement Planning (MRP), procurement budget, etc. Control documentation should include purchase order, expediting status report, revised procurement schedule and budget.

- ➢ **Resource management** integrates the SOW, and the resource estimate with the schedule to produce resource forecast. Planning documentation should include resource forecast, resource availability, etc. Control documentation should include time sheets and revised manpower histogram.

- ➢ **Cost management** is the allocation of a budget and cash flows to the work. Planning documentation should include a cost breakdown structure, activity budgets, departmental budgets and cash flow statements. Control documentation should include expenditure reports (actual vs. planned), revised budgets, earned value, etc.

- ➢ **Change control** is concerned with the SOW being revised and controlled. Documentation should include project communication, impact statements, Non-Conformance Reports (NCR), change requests, drawing revisions, specification and configuration revision, etc.

- ➢ **Quality management** outlines how planned results will be achieved. Planning documentation should include a project quality plan, quality control plan, etc. Control documentation should include inspection reports, NCR's, concessions, change requests, operation manuals, etc.

- ➢ **Communication** *management* is concerned with disseminating information and instructions to responsible parties. Planning documentation would include lines of communication, distribution lists, schedule of meetings and agendas, etc. Control documentation should include transmittals, minutes of meetings, etc.

- ➢ **Human resource management** sets the framework for human factors. Planning documentation should include the project

organisation structure, responsibility matrix, job descriptions, work procedures, etc. Control documentation should include time sheets and performance evaluations.

➢ **Environmental management** is concerned with external factors that could possibly impact on the project. Planning documentation should include laws and regulations, environmental issues and stakeholder analysis. Control documentation should include environmental reports.

3.5.5 Control of Project documentation

From the list of planning and control documentation elaborated upon in the previous section, it is evident that documentation control in the context of projects, is important to ensure that key documentation is afforded timeous attention and that there is an audit trail for proof of delivery.

In addition to the control of documentation, project meetings also play an important role in the management of projects. Handover meetings will ensure that projects commence in a formal fashion and would include clients, senior management, project team members, stakeholders and all other interested parties. Handover meeting agendas would typically include the following items: project charter, SOW, communication, reporting, instructions, meeting schedules, documentation control, payments, etc. Project progress meetings will follow handover meetings to ensure momentum is maintained. These meeting are conducted on a weekly basis to monitor progress and guide the project to successful completion. It also provides an ideal platform for the project manager to liaise with parties involved. Progress meetings should include the following agenda items: minutes of previous meetings, actions from the previous meetings, progress reports by work package, configuration and scope changes, NCR's, claims and payments (Burke, 2006:280-282).

3.6 INFORMATION COMMUNICATION TECHNOLOGY GOVERNANCE

In their article on ICT governance, Ziolkowski and Clark (2005:77) makes a distinction between "governance" and "corporate governance". In the first instance, governance is a system of power by which organisations are controlled and directed, whereas corporate governance is the wealth creation and supply system of such power. Corporate governance is also concerned with a host of issues resulting from the requirement of management to ensure that organisational units are effective and efficient in carrying out their functions. It is further explained that ICT governance is a subset of corporate governance. The role of ICT and issues relating to ICT have become increasingly important and ICT governance has become a major factor in organisational success. This is also attributed to the fact that information has become one of the most valuable assets within organisations. Ziolkowski and Clark (2005:87), citing Brown (1998:177-195), concludes with ICT governance being understood and managed in a coherent, integrated and balanced way at all levels within the organisation. This will result in ICT goals being matched to sound policies, clear accountabilities, plans and the effective management of ICT as an organisational investment.

3.7 INFORMATION TECHNOLOGY SERVICE MANAGEMENT (ITSM) BY MEANS OF INFORMATION TECHNOLOGY BEST PRACTICE FRAMEWORKS

The following sections deal with the most important element in the research. It covers the topic of IT Service Management, the benefits thereof, and the use of the ITIL framework as an ITSM solution. It concludes with the function and processes in the Service Support and Service Delivery domains of ITIL.

3.7.1 Information Technology Service Management defined

In the article, IT Service Management, it is described as a tool used to measure service provision in order to make it more efficient and effective. It is further explained that the identification of roles pertaining to service level management needs to be defined, followed by the development of a service catalogue. The service catalogue contains all the IT related services and an audit should be conducted to establish an inventory of service level agreements with clients (Burger, 2009:22). There is a divide between IT and the business due to the jargon used by IT which intimidates the business people (Vlok, 2009:26). In the adoption of an ITSM solution, there is no "one size fits all" approach as it requires alignment to business processes throughout the organisation (Bornhütter, 2009:26).

3.7.2 Benefits of Information Technology Service Management

A significant advantage in adopting ITSM, is that it allows IT staff to conduct their work in a more planned manner and not be reactive to problem solving (Gubbins, 2009:20). In the same article, emphasis is on the importance of the Service Desk is emphasised and it is reiterated that the establishment of service level management is critical. Service Desks serve as the entry points to report all incidents, requests and changes. Without its presence, it would be difficult to control other disciplines involved in service provision and service levels would be affected, as it would be difficult to measure the effectiveness of the services. He further emphasizes that the implementation of ITSM moves an organisation away from ad hoc delivery of services. This change will allow people to become proactive rather than reactive (Batohi, 2009:22).

Obtaining buy-in from appropriate stakeholders is important for the success of ITSM, as the process is then owned by everyone who has a role to play in the provision of the service (Brindley, 2009:22).

3.7.3 Information Technology Customer Relationship Management as part of Information Technology Service Management

IT Customer Relationship Management (CRM) forms an important part in the provision of IT services, as it provides the basis for making and updating agreements. It liaises and forms a relationship with customer organisations at a strategic, tactical and operational level. One of the major challenges in CRM is to ensure that there is good relationship between the IT organisation and customer organisations, at all levels. An important element in CRM is the Service Desk and the control of service levels based on Service Level Management (itSMF, 2002:23-24).

3.7.4 Information Technology Infrastructure Library as an Information Technology Service Management Framework

According to Mohamed, Ribière, O'Sullivam and Mohamed (2008:315), the ITIL approach to service management is based on the interrelationships and synchronization of processes. It is also stated that the ITIL framework puts very little emphasis on Knowledge Management (KM), but notes that IT service management frameworks and KM processes are interrelated. This would include activities such as discovery, capturing, assimilation, sharing and utilisation of processes. They propose that a systematic approach be adopted for combining the principles of KM and cross-functional teams, to enhance knowledge flows which results in organisational performance in terms of cost, time and quality.

The itSMF (2002:28-29) is of opinion that ITIL is the best IT Service Management approach and that it is not prescriptive for the type of organisation. Its emphasis is on the relevance of activities in processes, as well as the relations between them. ITSM also addresses the provisioning and support of IT services, customised to the needs of the organisation.

There are two key domains in the ITIL framework, each with its own processes and/or functions. These two domains are known as Service Support and Service Delivery.

3.7.5 Service Support function and processes

According to the itSMF (2202:37-38), the service support domain in the ITIL framework is concerned with how customers can access appropriate services to support their businesses. It is divided into the following function and processes:

➤ **Service Desk**: Is the initial point of contact that the user has with the IT organisation and is responsible for carrying out activities belonging to several processes in the ITSM framework.

➤ **Incident Management**: The main aim of this process is to resolve incidents and restore the service as quickly as possible. The quality of incident records, in terms of how it is recorded, will determine the effectiveness of other processes.

➤ **Problem Management**: Is concerned with identifying the root cause of problems, that could possibly be as a result of incidents, and implement preventative measures.

➤ **Configuration Management**: Addresses the control of changing IT infrastructure, identifies configuration items, collects and manages documentation about the IT infrastructure, and finally provides information about the IT infrastructure to other processes.

➤ **Change Management**: Addresses the controlled implementation of changes to the IT infrastructure and aims to implement changes with minimum adverse disruption or impact to the IT services. It is also responsible for ensuring traceability of changes and the effective coordination of changes throughout the organisation.

➤ **Release Management**: Is a set configuration of items that are tested and introduced into the environment together. The main objective is to ensure the successful rollout of releases, including integration,

testing and storage. This will result in only tested and correct versions of authorised software and hardware being provided.

3.7.6 Service Delivery processes

According to itSMF (2002:35-36), this domain describes the services needed by the customer and what is needed to provide these services. It is divided into the following processes:

➢ **Service Level Management**: The main objective is to establish agreements with the customer for IT services. Information on the customer needs facilities provided by the IT organisation and the financial resources available, are required. It is customer-focussed and creates services based on customer needs rather than what is technically feasible. It also covers how services will be monitored, defines Service Level Agreements (SLA), Operational Level Agreements (OLA) and Underpinning Contracts (UC).

➢ **Financial Management for IT Services**: It addresses the provision of IT services and enables proper consideration of costs and benefits when deciding on IT infrastructure and IT services.

➢ **Capacity Management**: It is concerned with resource management, performance management, demand management, modelling, capacity planning, load management and application sizing. It is to ensure that agreed service levels are fulfilled in future.

➢ **Availability Management**: It ensures the appropriate deployment of resources, methods and techniques which support the availability of IT services as agreed with the customer. It is also concerned with optimising maintenance and design measures to minimise incidents.

➢ **IT Service Continuity Management**: It is concerned with the planning and preparation for disaster recovery measures for IT services in the case of a business interruption. It plans and coordinates, as agreed with the customer, technical, financial and management resources which are needed to ensure continuity of services after is disaster.

3.8   CONCLUSION

From the literature cited in this literature review, it is evident that to bring about IT service improvement, requires the adoption of several IT best practice methodologies, such as Project Management, Quality Management and IT Service Management.

In the next chapter, the staff and student user satisfaction survey and structured interview design and methodology, will be expanded upon.

CHAPTER 4: INFORMATION COMMUNICATION TECHNOLOGY PROCESSES AND SERVICES: INTERVIEW AND SURVEY DESIGN AND METHODOLOGY

4.1 INTRODUCTION AND THE SURVEY ENVIRONMENT

Computer and Telecommunication Services (CTS) is the Information Communication Services (ICT) department at Cape Peninsula University of Technology (CPUT). Like most ICT organisations, CTS strives to deliver services which are driven by sound ICT best practice processes. As part of the restructuring process within CTS, a newly formed section, Strategic and Administration Services (SAS), was introduced to oversee and manage ICT best practice methodologies and to manage IT service levels within the institution. This section is responsible for the Service Desk, Quality, Project Management, Change Management, Service Level Management and a host of other activities within the Quality domain. CTS also deliver a wide range of IT services to several sites, ranging from email, Internet, Printing, ITS (Integrated Tertiary Software), which is the ERP system, Service Desk, etc. These services are contained within the department's Service portfolio and make provision for Service Category, Sub Category, Service Status (i.e. Design, Implement, Active or Retired), Service Owner (i.e. Section Manager or person responsible for service), Target Audience (i.e. Staff or Students) and Service Hours.

CTS deliver these services to the two main campuses, Bellville and Cape Town, as well as to several remote sites, e.g. Wellington, Mowbray, Athlone, Tygerberg Hospital, Grootte Schuur Hospital, Granger Bay, etc. It is perceived that service offerings and support are different at the remote sites, due to resource constraints in the form of staffing and bandwidth issues. Some of these remote sites are more than 50 kilometres from the main sites, and are dependent on the support and technology hosted at the main sites.

User categories are divided into staff and students, respectively. Staff is further divided into two sub categories, namely, Administrative and Academic. Service offerings and support differ for these categories of staff, as their requirements are different, due to the nature of their work. Students are divided into Diploma, BTECH and Post Graduate, which are further divided into Full-time and Part-time offerings. Service offerings and support also differ for each of the student sub categories, as their requirements are different, due to the nature of their course work.

4.2   AIM OF THIS CHAPTER

The aim of this chapter and the survey contained therein, is to determine the level of service offered to CPUT staff and students, spread across different main campuses and remote sites, as well as within different categories of user and offerings. In addition to determining the level of service offered by CTS, it also aims to determine the degree to which CTS conforms to IT best practice methodologies within the ambit of the Service Desk, Service Level Management, Project Management and Quality Management. The level of service will be determined by conducting a CTS User Satisfaction Survey, and the process capabilities will be ascertained by means of structured interviews. The ultimate objective being to solve the research problem as defined in Chapter 1, Paragraph 1.4, and which reads as follows:

"Computer and Telecommunication Services are adversely impacted upon by non-prioritised requests and uncoordinated approaches to process delivery".

4.3   THE TARGET POPULATION / CHOICE OF SAMPLING METHOD

Watkins (2010:54), (citing Collis and Hussey 2003), a "sample" is made up of some of the members of a "population" (the target population), the latter referring to a body of people or to any other collection of items under

consideration for the purpose of the research. A "sample frame" refers to a list or any other record of the population from which all the sampling units are drawn.

The "staff" target population forming the sampling frame, is made up of 1760 permanent CPUT staff. The sample itself, consists of 64 CPUT staff. The "student" target population forming the sampling frame is made up of 32569 CPUT students, while the sample consists of 172 CPUT students. The method of nonprobability sampling used, is convenience sampling, also known as "accidental sampling". It does not identify a subset of a population and uses people that are "readily available". The user satisfaction survey was distributed to 300 potential staff and student respondents.

The sampling frames were specifically selected in order to validate the practicality of the concepts presented here.

Another method of gathering data was by means of structured interviews. According to Watkins (2010:60), (citing Cooper and Schindler 2006), structured interviews are similar to questionnaires and guides the question order and the specific way in which the questions are asked, but the questions generally remain open-ended.

Structured interview questions were formulated within the ambit of four processes and functions within CTS, namely, Service Desk, Service Level Management, Project Management and Quality Management. Within each of these processes and functions, structured, open-ended questions covered the following focus areas: roles and responsibilities, objectives, process or function activities, management activities, metrics, interrelationships with other processes or functions and documentation requirements.

4.4   DATA COLLECTION

The primary data collection methods used in this survey are self-administered questionnaires/surveys and personal interviewing.

4.5   MEASUREMENT SCALES

According Watkins (2010:162), (citing Emroy and Cooper 1995), the Likert scale (Likert, 1932:1-55) is used, whereby respondents are asked to respond to each of the statements by choosing one of the five agreement choices. It is commonly used by business research students. Typical agreement choices used in the Likert scale are:

➢   Strongly Agree.

➢   Agree.

➢   Undecided.

➢   Disagree.

➢   Strongly Disagree.

Furthermore, the advantages in using the popular Likert scale are as follows:

➢   Easy and quick to construct.

➢   Each item meets an empirical test for discriminating ability.

➢   The Likert scale is probably more reliable than the Thurston scale, and provides a greater volume of data than does the Thurston differential scale.

➢   The Likert scale is also treated as an interval scale.

Interval scales, *per se*, have the benefit that the scale data can be analysed by virtually the full range of statistical procedures. Interval scales facilitate meaningful statistics when calculating means, standard deviation and Pearson correlation coefficients.

4.6   THE SURVEY DESIGN

According to Watkins (2010:140), (citing Leedy and Ormrod 2001), "...a survey is simple in design. The researcher poses a series of questions to willing participants; summarizes their responses with percentages, frequency counts, or more sophisticated statistical indexes, and then draws inferences about a particular population, from the responses of the sample".

Watkins (2010:144), (citing Collis & Hussey 2003), expresses the opinion that research should be organised in order to make the best of opportunities and resources available. Furthermore, to provide a coherent and logical route to a reliable outcome, research must be conducted systematically, using appropriate methods to collect and analyse the data. The survey should be designed according to the following stages:

➢ **Stage one**: Identify the topic and set some objectives.
➢ **Stage two**: Pilot a questionnaire to find out what people know and what they see as important issues.
➢ **Stage three**: List the areas of information needed, and refine the objectives.
➢ **Stage four**: Review the responses to the pilot.
➢ **Stage five**: Finalise the objectives.
➢ **Stage six**: Write the questionnaire.
➢ **Stage seven**: Re-pilot the questionnaire.
➢ **Stage eight**: Finalise the questionnaire.
➢ **Stage nine**: Code the questionnaire.

The statements within the survey should be concise and unambiguous, and designed with the following principles in mind:

➢ Avoidance of double-barrelled questions or statements.
➢ Avoidance of double-negative questions or statements.
➢ Avoidance of prestige bias.
➢ Avoidance of leading questions or statements.
➢ Avoidance of assumption of prior knowledge.

4.7 THE RESEARCH QUESTIONNAIRE

There are two questionnaires for this survey, namely:
- ➢ CTS User Satisfaction Survey for Staff.
- ➢ CTS User Satisfaction Survey for Students.

The questions in the research questionnaires for both staff and students, are listed below, for ease of reference.

4.7.1 Computer and Telecommunication Services User Satisfaction Survey for Staff

The objective of this survey is to investigate and analyse the level of service offered to staff at CPUT. The results of the survey will provide input into improving the quality of IT services offered to staff at CPUT.

Staff were informed that:
- ➢ The information provided in the survey will be handled with the utmost confidentiality.
- ➢ Their anonymity will be guaranteed.
- ➢ They select the appropriate campus and staff category provided on the survey.
- ➢ Their agreement or disagreement to each of the statements, is to be indicated by means of a check mark or tick in the appropriate box provided.
- ➢ If they have any queries relating to the survey, that they forward an email with comments to the email address provided on the survey document.

The questions for the staff are listed in Table 4.1 below, for ease of reference.

Table 4.1: Computer and Telecommunication Services User Satisfaction Survey for Staff

Q1:	CTS provide an acceptable Internet service in terms of availability.
Q2:	CTS provide an acceptable GroupWise (email) service in terms of availability.
Q3:	CTS provide an acceptable Printing service in terms of availability.
Q4:	CTS provide an acceptable ITS service in terms of availability.
Q5:	Calls received at the CTS Service Desk are answered at an acceptable rate in terms of availability.
Q6:	CTS provide a reliable Internet service.
Q7:	CTS provide a reliable GroupWise (email) service.
Q8:	CTS provide a reliable Printing service.
Q9:	CTS provide a reliable ITS service.
Q10:	CTS Service Desk is reliable in terms of calls being resolved at the Service Desk before being escalated to technical support groups.
Q11:	CTS provide an acceptable Internet service in terms of performance.
Q12:	CTS provide an acceptable GroupWise (email) service in terms of performance.
Q13:	CTS provide an acceptable Printing service in terms of performance.
Q14:	CTS provide an acceptable ITS service in terms of performance.
Q15:	CTS Service Desk operates at an acceptable rate in terms of performance.
Q16:	CTS technical staff resolving incidents relating to the Internet service, are competent.
Q17:	CTS technical staff resolving incidents relating to the GroupWise (email) service is competent.
Q18:	CTS technical staff resolving incidents relating to the Printing service is competent.
Q19:	CTS technical staff resolving incidents relating to ITS, are competent.
Q20:	CTS Service Desk staff resolving incidents, are competent.
Q21:	Incidents logged at the Service Desk are responded to within 2 hours.
Q22:	Incidents logged at the Service Desk are resolved within 16 working hours.

The survey questions were divided into five categories, namely:

➢ **Availability:** Proportion of time a user can access the service: Questions one to five covered the availability category.

- ➢ **Reliability:** Ability of the service to perform the required function: Questions six to ten covered the reliability category.
- ➢ **Performance:** Degree to which the functional and operational requirements of the service are being met: Questions eleven to fifteen covered the performance category.
- ➢ **Competence:** Ability of staff to resolve incidents within agreed service levels: Questions sixteen to twenty covered the competence category.
- ➢ **Service Level Agreements (SLA):** Level of service offered to users: Questions twenty one and twenty two covered the SLA category.

4.7.2 Computer and Telecommunication Services User Satisfaction Survey for Students

The objective of this survey is to investigate and analyse the level of service offered to students at CPUT. The results of his survey will provide input into improving the quality of IT services offered to students at CPUT. It should be noted that there are no formalised Service Level Agreements (SLA) with students.

Students were informed that:
- ➢ The information provided in the survey will be handled with the utmost confidentiality.
- ➢ Their anonymity will be guaranteed.
- ➢ They select the appropriate campus and staff category provided on the survey.
- ➢ Their agreement or disagreement to each of the statements, is to be indicated by means of a check mark or tick in the appropriate box provided.
- ➢ If they have any queries relating to the survey, that they forward an email with comments to the email address provided on the survey document.

The questions for the students are listed in Table 4.2 below, for ease of reference.

Table 4.2: Computer and Telecommunication Services User Satisfaction Survey for Students

Q1:	CTS provide an acceptable Internet service in terms of availability.
Q2:	CTS provide an acceptable GroupWise (email) service in terms of availability.
Q3:	CTS provide an acceptable Printing service in terms of availability.
Q4:	Calls received at the CTS Service Desk are answered at an acceptable rate in terms of availability.
Q5:	CTS provide a reliable Internet service.
Q6:	CTS provide a reliable GroupWise (email) service.
Q7:	CTS provide a reliable Printing service.
Q8:	CTS Service Desk is reliable in terms of calls being resolved at the Service Desk before being escalated to technical support groups.
Q9:	CTS provide an acceptable Internet service in terms of performance.
Q10:	CTS provide an acceptable GroupWise (email) service in terms of performance.
Q11:	CTS provide an acceptable Printing service in terms of performance.
Q12:	CTS Service Desk operates at an acceptable rate in terms of performance.
Q13:	CTS technical staff resolving incidents relating to the Internet service, are competent.
Q14:	CTS technical staff resolving incidents relating to the GroupWise (email) service, are competent.
Q15:	CTS technical staff resolving incidents relating to the Printing service, are competent.
Q16:	CTS Service Desk staff resolving incidents, are competent.
Q17:	Incidents logged at the Service Desk are responded to within an acceptable time period.
Q18:	Incidents logged at the Service Desk are resolved within an acceptable time period.

The survey questions were divided into five categories, namely:

➢ **Availability:** Proportion of time a user can access the service: Questions one to four covered the availability category.

- ➤ **Reliability:** Ability of the service to perform the required function: Questions five to eight covered the reliability category.
- ➤ **Performance:** Degree to which the functional and operational requirements of the service are being met: Questions nine to twelve covered the performance category.
- ➤ **Competence:** Ability of staff to resolve incidents within agreed service levels: Questions thirteen to sixteen covered the competence category.
- ➤ **Service Level Agreements (SLA):** Level of service offered to users: Questions seventeen to eighteen two covered the SLA category.

4.8   STRUCTURED INTERVIEWS

In addition to conducting the staff and student surveys (4.7.1and 4.7.2) structured interviews were also conducted within the ambit of the following functions and/or processes within CTS:

- ➤ **Interview 1:** Assessment of CTS Service Desk function.
- ➤ **Interview 2:** Assessment of CTS Service Level Management process.
- ➤ **Interview 3:** Assessment of CTS Project Management function.
- ➤ **Interview 4:** Assessment of CTS Quality Management function.

The main focus areas being assessed as part of each of the structured interviews are as follows:

- ➤ Roles and responsibilities.
- ➤ Objectives.
- ➤ Process and/or function.
- ➤ Management activities.
- ➤ Metrics.
- ➤ Interrelationships with other processes and/or functions.
- ➤ Documentation requirements.

A set of structured interview questions were sent to the staff responsible for each of the processes and/or functions, in order for them to respond.

4.9   CONCLUSION

In this chapter, the "CTS User Satisfaction Survey for Staff" and "CTS User Satisfaction Survey for Students," design and methodology were addressed under the following functional headings:

➢   Survey environment.

➢   Aim of the chapter.

➢   Target population / Choice of sampling method.

➢   Data collection.

➢   Measurement scales.

➢   Survey design

➢   Research questionnaires.

    ➢   CTS user satisfaction survey for staff.

    ➢   CTS user satisfaction survey for students.

➢   Structured Interviews.

In Chapter 5, the results from the survey and structured interviews will be analysed in detail, and subsequent conclusions drawn.

CHAPTER 5: INTERPRETATION OF DATA AND ANALYSIS OF RESULTS

5.1   INTRODUCTION

Data analysis is "the process of bringing order, structure and meaning to the mass of collected data" (de Vos 2002:339). This chapter discusses the statistical analysis of the questionnaire compiled by the researcher for the purpose of obtaining Magister Technologiae: Quality in the Faculty of Engineering at the Cape Peninsula University of Technology. The aim of this study is to evaluate mechanisms for the improvement of ICT services at CPUT, with the following secondary objectives:

➢   Does the CTS Service Desk function and incident management process meet the requirements of ITSM best practice methodologies?

➢   Does the CTS service level management process meet the requirements of ITSM best practice methodologies?

➢   Does the project management activity within CTS meet the requirements of best practice methodologies?

➢   Does the quality management activity within CTS meet the requirements of best practice methodologies?

➢   How do users perceive the service levels of core services offered by CTS?

➢   What are the user's perception and expectation of the CTS' Service Desk function, incident management process and service level management process?

In this chapter the data obtained from the completed questionnaires will be presented and analysed.

In most social research, the analysis entails three major steps, done in the following order:

➢   Cleaning and organising the information that was collected, called the data preparation step.

➢ Describe the information that was collected (Descriptive Statistics).

➢ Testing the assumptions made through hypothesis and modelling (Inferential Statistics).

The responses to the questionnaire, developed by the researcher for the purpose of obtaining information regarding the CTS Service Desk function, incident management process, service level management process, project management activity and quality management activity, and whether all these functions, activities and processes meet the requirements of best practice methodologies and the users' perceptions and expectations of these functions /processes, have been analysed, by using SAS software.

5.2   METHOD OF ANALYSIS

5.2.1   Validation of Survey Results

A descriptive analysis of the survey results returned by the respondents are reflected below. The responses to the questions, obtained through the questionnaires, are indicated in table format, for ease of reference. Data validation is the process of ensuring that a program operates on clean, correct and useful data. The construct validation, however, can only be taken to the point where the questionnaire measures what it is suppose to measure. Construct validation should be addressed in the planning phases of the survey and when the questionnaire is developed. This questionnaire is supposed to measure availability, reliability, performance, competence and service level agreements of the CTS department within CPUT in the Western Cape. Students, as well as staff of CPUT from different campuses, form part of this survey.

5.2.2   Data Format

The data was received in completed questionnaires, which were coded and captured on a database that was developed on Microsoft Access, for

this purpose. These questionnaires are captured twice and then the two sets of data are compared to ensure that the information captured, is correct. When the database was developed, use was made of rules, with respect to the questionnaire, that set boundaries for the different variables (questions). For instance, when the Likert scale is used, the following:

➢ Strongly disagree is coded as 1.

➢ Disagree is coded as 2.

➢ Neutral is coded as 3.

➢ Agree is coded as 4.

➢ Strongly agree is coded as 5.

A boundary is set on Microsoft Access at less than 6. This means, if the number 6 or more than 6 is captured, an error will show until a number less than 6 is captured. It was then imported into SAS-format through the SAS ACCESS module. This information which, was double checked for correctness, is then analysed by the custodian of this document.

5.2.3 Preliminary Analysis

The reliability of the statements in the questionnaire posed to the respondents of the survey at CPUT, is measured by using the Cronbach Alpha tests. (See paragraph 5.3.1). A Uni-variate descriptive analysis is performed on all the original variables; displaying frequencies, percentages, cumulative frequencies, cumulative percentages, means, standard deviations, range, median, mode etc. These descriptive statistics are discussed in paragraphs 5.3.2 and 5.3.3. (See computer printouts in Annexure B & C).

5.2.4 Inferential Statistics

Inferential statistics that will be used are:

➢ Cronbach Alpha test: Cronbach's Alpha is an index of reliability associated with the variation accounted for by the true score of the

"underlying construct". Construct is the hypothetical variables that are being measured (Cooper & Schindler, 2001:216-217). Another way to put it would be that Cronbach's Alpha measures how well a set of items (or variables) measures a single uni-dimensional latent construct. When data has a multidimensional structure, Cronbach's Alpha will usually be low.

➢ Chi-square tests for nominal data: The Chi-square (two-sample) tests are probably the most widely used nonparametric test of significance, that is useful for tests involving nominal data. But it can be used for higher scales as well, such as cases where persons, events or objects are grouped in two or more nominal categories such as 'yes-no' or cases A, B, C or D. The technique is used to test for significant differences between the observed distribution of data among categories and the expected distribution based on the null hypothesis. It has to be calculated with actual counts rather than percentages (Cooper & Schindler, 2001:499).

➢ Kruskal-Wallis test for interval data with more than 2 independent samples: The *Kruskal-Wallis one-way analysis of variance* by ranks, is a non-parametric method for testing equality of population medians among groups. Intuitively, it is identical to a one-way analysis of variance, with the data replaced by their ranks. It is an extension of the *Mann-Whitney U test* (Wilcoxon Two-Sample Test) which compares two groups to 3 or more groups. Since it is a non-parametric method, the Kruskal-Wallis test does not assume a normal population, unlike the analogous one-way analysis of variance. However, the test does assume an identically-shaped and scaled distribution for each group, except for any difference in medians.

➢ Mann-Whitney U test or Wilcoxon rank-sum test for ordinal data with two independent samples: The **Mann-Whitney *U*** test (also called the **Mann-Whitney-Wilcoxon** (**MWW**), **Wilcoxon rank-sum test**, or **Wilcoxon-Mann-Whitney** test), is a non-parametric test for assessing whether two samples of observations come from the same

distribution. The null hypothesis is that the two samples are drawn from a single population, and therefore, that their probability distributions are equal. It requires the two samples to be independent, and the observations to be ordinal or continuous measurements, i.e. one can at least say, of any two observations, which is the greater. In a less general formulation, the Wilcoxon-Mann-Whitney two-sample test may be thought of as testing the null hypothesis that the probability of an observation from one population exceeding an observation from the second population, is 0.05.

➢ The SAS software computes a P-value (Probability value) that measures statistical significance when comparing variables with each other, determining relationship between variables or determining association between variables. Results will be regarded as significant if the P-values are smaller than 0.05, because this value presents an acceptable level on a 95% confidence interval ($p \leq 0.05$). The P-value is the probability of observing a sample value as extreme as, or more extreme than, the value actually observed, given that the null hypothesis is true. This area represents the probability of a Type 1 error that must be assumed if the null hypothesis is rejected (Cooper & Schindler, 2001:509).

➢ The P-value is compared to the significance level (α), and on this basis the null hypothesis is either rejected or not rejected. If the p-value is less than the significance level, the null hypothesis is rejected (if p-value < α, reject null). If the p-value is greater than or equal to the significance level, the null hypothesis is not rejected (if p-value $\geq \alpha$, don't reject null). Thus with α = 0.05, if the p-value is less than 0.05, the null hypothesis will be rejected. The p-value is determined by using the standard normal distribution. The small p-value represents the risk of rejecting the null hypothesis.

➢ A difference has statistical significance if there is good reason to believe the difference does not represent random sampling fluctuations only. Results will be regarded as significant if the p-

values are smaller than 0.05, because this value is used as cut-off point in most behavioural science research.

5.2.5 Assistance to Researcher

The conclusions made by the researcher, is validated by the statistical report. Help is given to interpret the outcome of the data. The final report written by the researcher has been validated and checked by the statistician to exclude any misleading interpretations.

All inferential statistics are discussed in paragraph 5.3.4.

5.2.6 Sample

The target population is employees and students at CPUT. A convenient sample of 200 students and 100 staff members was drawn in the target population, and the sample realization was 172 students and 64 staff members.

5.3 ANALYSIS

Note: Analysis (Refer paragraph 5.3, Chapter 5) pertaining to Reliability Testing, Descriptive Statistics, Uni-Variate Graphs, Inferential Statistics and Annexures pertaining to this research, are contained in Volume 2 of this dissertation, due to the voluminous nature thereof.

5.4 INTERVIEWS

Structured interview questions were drafted and circulated to staff responsible for the following processes and/or functions within CTS:

➢ CTS Service Desk function: Client Services Manager responded to structured interview questions.

> CTS Service Level Management process: Strategic and Administrative Support Services Manager responded to structured interview questions.

> CTS Project Management function: Project Officer responded to structured interview questions.

> CTS Quality Management function: CTS Director responded to structured interview questions.

The following categories were assessed for each of the processes and/or functions:

> Roles and responsibilities.
> Objectives.
> Process and/or function.
> Management activities.
> Metrics.
> Interrelationships with other processes and/or functions.
> Documentation requirements.

5.4.1 Assessment of Computer and Telecommunication Services Service Desk Function

The following structured interview questions were directed at the Customer Services manager, followed by a summary of responses:

5.4.1.1 Question 1: Are roles and responsibilities clearly defined and assigned within the CTS Service Desk function and Incident Management process, and what are the KPI's for these roles?

Response to Question 1
> The Service Desk operators, Service Desk coordinator / Incident manager and Customer Services manager roles have been defined and assigned.

- There is some overlap of responsibilities due to lack of staffing resources. The Service Desk coordinator is also assuming the role of Incident manager. The Incident Management process has not been fully defined. The Service Desk coordinator is also performing the duties of the Service Desk operators. The Customer Services manager also assumes the role of Problem manager and performs certain Incident Management roles.

- Key Performance Indicators for the Service Desk are as follows: Single Point of Contact (SPoC) for all staff and students to log IT related queries, Incident logging for both staff and students, provides first level support to all staff and students, escalation of incidents, communication to promote IT services, manage and control service communication to customers, suppliers and the institution, coordinate incident management activities, manage people, processes and technologies that form the contact infrastructure, provide management information about Service Desk quality and operations.

5.4.1.2 Question 2: What are the objectives of the CTS Service Desk function and Incident Management process?

Response to Question 2:

The main objectives of the Service Desk are as follows:

- Providing a SPOC for all IT customers.
- Logging of incidents/requests and ensuring follow up for all requests.
- Ensuring customer satisfaction.
- Communicating downtime of services and CTS procedures to CPUT community.
- Escalation of urgent request and queries to second and third tier support staff and CTS management.

5.4.1.3 Question 3: How does the CTS Service Desk deal with Incidents throughout its lifecycle within the following areas?

Response to Question 3:

➢ **Incident Handling:** All incidents are logged with the Service Desk operators on the CTS in-house developed Service Desk tool. Incidents are assigned to a specific section responsible for resolving the incident. Technical staff take ownership of the incident from the time is assigned, up until it is resolved.

➢ **Incident Status:** Incident status and responsibilities are as follows: Assigned (Service Desk staff), Responded (Technical staff), In Progress (Technical staff), Resolved (Technical staff), Re-assigned (Service Desk staff / Technical staff), Re-opened (Service Desk staff), Cancelled (Service Desk staff / Technical staff), Closed (Service Desk Staff). The Service Desk does not take ownership for incidents during the Responded or In-progress status.

➢ **Incident Escalation:** Incidents are escalated to the appropriate CTS Section Manager, Supervisor and CTS Director. These incidents would have to fall within one of the following categories: urgent, no response to logged incident, incidents that have exceeded the two-hour response or sixteen-hour resolve time, service level, server or service being down when a user complaint about service received. Escalations are conducted manually via telephone or electronic mail.

➢ **Incident Prioritisation:** There is currently no prioritisation of incidents via the system and it is performed manually. It is done when many users are affected in that they are unable to perform their work or when it affects top management.

➢ **Incident Ownership:** Once an incident is logged with the Service Desk, it is assigned to the appropriate section or technical team responsible for the service. The ownership resides with the technical staff dealing with the incident. All technical staff are informed of logged incidents on the Service Desk tool's notifier, which has also been developed in-house.

➢ **Incident Monitoring:** The current system does not cater for monitoring the status of calls. However, reporting is done on a

weekly basis or as the need arises, via a third-party tool called Oracle Discoverer. This is also a manual process.

➢ **Incident Tracking:** Tracking of incidents is also conducted manually via the Oracle Discoverer tool.

➢ **Incident Communication:** Once an incident is logged, the user who had logged it, will receive an automated email notification with the Case details and a Case Identification number. As soon as the incident has been resolved on the system, another email is sent to the user, notifying the user that the incident has been resolved.

5.4.1.4 Question 4: How does the CTS Service Desk and Incident Management process cater for ongoing management activities/operations, reviews (are objectives being met?), management reporting, training of staff and auditing for compliance?

Response to Question 4:

➢ Management reporting is done on a daily, weekly and fortnightly basis. Reports are sent to all CTS management staff as well as the CTS Director.

➢ The following reports are generated: List all escalations with status updates, unresolved incidents per section per month/year statistics, total number of incidents logged and resolved per month/year, detailed list of all incidents having exceeded the sixteen hour resolve time per section, details of logged incidents escalated to management.

➢ Reports are also extracted on an ad hoc basis depending on requests from sections.

➢ Service Desk meetings are held every second week, where items affecting the Service Desk and users, are discussed. Each of the sections are represented at these meetings. A report is sent to the CTS director where outstanding items on the minutes are escalated, including attendance of representatives.

> Service Desk is also responsible for regular communication to the CPUT community on downtime of servers/services.

> Staff training is very limited. Most staff have been trained on ITIL Foundation course.

5.4.1.5 Question 5: What are the metrics used for measuring success and/or failures of the CTS Service Desk function and Incident Management process?

Response to Question 5:

> Currently there are no metrics except for the reporting on Oracle Discoverer.

> It is also dependent on complaints received from users.

5.4.1.6 Question 6: How does the CTS Service Desk and Incident Management process interrelate with other processes?

Response to Question 6:

> The Service Desk interrelates with Change Management where representatives from the Service Desk and Incident Management process form part of the Change Advisory Board (CAB). Any changes which impact on the users, are communicated to the Service Desk staff.

> It also interrelates with the Problem Management process in that any incidents resulting in problems, are immediately reported to CTS management. The Incident manager and Customer Services manager document the sequence of events as they follow, related to the problem.

5.4.1.7 Question 7: What documentation, if any, is in place for the Service Desk function and Incident Management process?

Response to Question 7:

The following documentation exists and is communicated to technical sections:

- Internal Service Level Agreements (SLA) for Response to and Resolve of Incidents (two-hour response time and sixteen-hour resolve time of most Incidents). For Urgent requests and password changes, there is a ten-minute response and fifteen-minute resolve time.
- Procedure for Re-assignment of calls from one section to another.
- Procedure for Resolving a call when technicians cannot get hold of a user who logged the call.
- Interrelationship between Service Desk and Problem Management.
- New Network Account request form.
- Manual Log Form (in the case of the Service Desk system being offline).
- User Manual for CTS users.
- User Manual for CTS technical staff (with information on how to log a call, using the notifier and procedures).

5.4.2 Assessment of Computer and Telecommunication Services Service Level Management Process

The following structured interview questions were directed at the SAS manager, followed by a summary of responses:

5.4.2.1 Question 1: Are roles and responsibilities clearly defined and assigned within the CTS Service Level Management (SLM) process and what are the Key Performance Indicators (KPI) for these roles?

Response to Question 1:

- There is no formal Service Level Management process in place. Roles are not formally assigned, Operational Level Agreements

(OLA) are not in place and no monitoring is in place in order for CTS to negotiate Service Level Agreements (SLA).

➢ The only activity in place is an informal agreement with users that calls will be responded to within two hours and resolved within sixteen hours. This agreement has not been negotiated with users and there are also no penalties in place should CTS not meet these times.

➢ There are no roles identified within SLM and no KPI's exist.

5.4.2.2 Question 2: What are the objectives of the CTS Service Level Management process?

Response to Question 2:

➢ When CTS implements SLM process, the following objectives should be addressed as a minimum:
  ➢ Manage the user expectation by finding a middle ground between what the user expects and what CTS can deliver on, providing there is sufficient budget allocation.
  ➢ Have a formal process in place of reviewing and improving each service with users and CTS, on an annual basis.
  ➢ To inform/market services to the users as per the Service Portfolio.
  ➢ Ensure proper monitoring of services to be informed of OLA limited capabilities.
  ➢ Formalised and documented SLA's.
  ➢ Proper SLM roles and responsibilities integrated into job descriptions and performance management contracts.
  ➢ To have a formal process in place for new service development and service retirement.
  ➢ Incident Management integration to ensure that support procedures are in place and communicated to staff and support staff of the Service Desk.

> ➢ Change Management integration to ensure that planned downtime and maintenance are taken into account, and to establish revert back availability criteria when considering/approving new requests for change.
>
> ➢ Introducing Availability Management.

5.4.2.3 Question 3: How are SLAs structured?

Response to Question 3:

➢ There are not bronze, silver or gold options per service, due to the fact that services are charged.

➢ SLAs would have to be drafted according to groups, for example, staff or students. Provision would also have to be made for important business periods, such as registration, which requires different service provision standards.

5.4.2.4 Question 4: Are SLAs referenced or contained in the CTS Service Catalogue or Portfolio?

Response to Question 4:

➢ SLAs are not referenced or contained in the CTS Service Catalogue/Portfolio.

5.4.2.5 Question 5: What information is contained within SLAs?

Response to Question 5:

➢ There are no formal SLAs in place.

➢ The following information would be included: target groups, service criteria, communication/liaison channels, defaults/penalties, charging, support procedures, escalation procedures, review dates, etc.

5.4.2.6 Question 6: How does the Service Level Management process cater for ongoing management activities/operations, reviews [e.g. are

objectives being met, is there a Service Improvement Plan (SIP) in place to aid improving the levels of service delivered to customers, if yes, what is contained in the SIP?], management reporting , training of staff and auditing for compliance?

Response to Question 6:

➢   Not in place as process is not formalised.

5.4.2.7 Question 7: What are the metrics used for measuring success and/or failures of the CTS Service Level Management process?

Response to Question 7:

➢   There are no metrics in place as the process is not formalised.
➢   CTS should include user feedback by means of surveys, monitoring results, Service Level manager reports, relevant documentation, such as SLA's and OLA's, how downtime is addressed, catering for Disaster Recovery (DR), Service Improvement Plan (SIP) implementation and whether it was done on time and successful.
➢   Failed changes, amount of escalations per service.
➢   Additional budget spending per service not catered for. Relevance of service – is it actually being used?
➢   Problem manager reports.

5.4.2.8 Question 8: How does the CTS Service Level Management process interrelate with other processes?

Response to Question 8:

➢   At the moment there is no integration as the process is not formalised.
➢   It would have to integrate with Incident Management (to support), Problem Management (to resolve), Change Management (to change), Configuration Management (from a monitoring perspective) as a minimum, Disaster Recovery, Availability and Capacity

Management (to ensure maturity) and IT Financial Management if services are charged for.

5.4.2.9 Question 9: What documentation, if any, is in place for the Service Level Management process?

Response to Question 9:

➢ Currently there is only a CTS Service Catalogue/Portfolio in place.

5.4.3 Assessment of Computer and Telecommunication Services Project Management Function

The following structured interview questions were directed at the Project officer, followed by a summary of responses:

5.4.3.1 Question 1: Are roles and responsibilities within the CTS Project Management activity clearly defined and assigned and what are the KPI for these roles?

Response to Question 1:

➢ Yes, below is an extract from the "CTS Project Management – Terms of Reference" document. This extract covers the assigning and defining of roles and responsibilities. The KPI's for these roles are **mostly** defined within the extract, EXAMPLE: (PE) – Business case & project mandate document.

➢ **(PE) Project Executive (Sponsor / Driver):** Ultimately responsible for the project. Ensures focus throughout its life cycle. The Project Executive ensures that the project gives value. The executive owns the business case and produces the project mandate. The Project Executive organises and chairs project board meetings.

➢ **(PM) Project Manager:** Produces Project Definition document. Plans and monitors the detailed baseline project plan. Prepares and

communicates reports to the Project Board on progress and required approvals.

- **(PB) Project Board (Project team):** Project Board is a group of people responsible for direction and management of the project and has responsibility within the project mandate. Approves various project stages, appointment of Project Manager and project assurance staff. Approves all major changes. The Project Board consists of the Project Executive, Project Manager, Project stakeholders, Assurance Manager (if required) or anyone with vested interest in the project.

- **Project Stakeholders:** This group of people could include end users or people with a vested interest in the particular project.

- **Project Assurance Manager:** This person must be independent of the Project Manager since he/she is a counter check for the Project Manager who checks items such as: Is Business Case being adhered to, Are risks being controlled, etc.

- **Team Manager:** Controls agreed plans / processes with Project manager, for sections of work, and reports on the progress.

- **Project staff:** Any person involved in the project, manufacturing or implementation.

- It must be noted that most internal projects of CTS within the internal departments of CTS, do not conform to this, unless the project happens to run the internal departments of CTS, i.e. DR Project.

5.4.3.2 Question 2: Does CTS have a Project Management Framework and if so, what is covered in the framework (e.g. user department participation, project initiation, project team membership and responsibilities, etc.)?

Response to Question 2:
- Yes, the CTS Project Terms of Reference makes provision for the following: defining a project, project personnel, project flow, project initiation and project charter.

> Membership, responsibilities and participation is **mostly** covered in "Project personnel" section as in question 1.

5.4.3.3 Question 3: Does the Project Management activity ensure that all plans are developed for each project? e.g. Master plan, project risk plan, test plan, training plan, post-implementation review plan, etc.

Response to Question 3:

> In most of the projects, separate plans are not developed. The main or master plan does, however, incorporate most of the above plans in it.

> The test and training plans would, under most circumstances form part of the main plan, but would be a component within the main plan.

> Risk is identified up front in the project initiation phase (initiation form) and is also mostly dealt with in the main project (as much as possible), unless new risks arise. This would then cause an adaption of the main plan to cater for the new risk or risks.

> Some larger projects may require the splitting of the master plan, as insinuated in the question, but this is not currently the norm.

> As far as post-implementation review plan is concerned, this is unfortunately only done on some projects.

5.4.3.4 Question 4: How is the Project Management activity integrated into other activities within the institution?

Response to Question 4:

> Unfortunately the Project Management activity is only integrated into other activities within the institution on request from the person outside of CTS.

> This could possibly be due to the following:

> ➢ The institution currently does not have a centralised project office to deal with projects throughout the institution.

> ➢ CTS is required to do a substantial amount of the actual work within the project.

➢ Currently the Project Management activity is supposed to be a CTS only (internal) activity. Job descriptions and job titles do not cater for projects outside of CTS.

5.4.3.5 Question 5: What documentation, if any, is in place for the Project Management function?

Response to Question 5:
➢ Terms of Reference or Framework document
➢ Project Initiation Form – Filled in and approved before a project is approved

➢ Project registration list – Current projects

➢ Other documents – these are created within the different projects, as required, and would include documents such as lists, minutes, role definitions etc.

5.4.4 Assessment of Computer and Telecommunication Services Quality Management Function

The following structured interview questions were directed at the CTS director, followed by a summary of responses:

5.4.4.1 Question 1: Are roles and responsibilities clearly defined and assigned within the CTS Quality Management activity?

Response to Question 1:

➢ Yes, a staff member has been assigned to manage quality in the department. Additionally, there are quality roles for each section in the department.

5.4.4.2 Question 2: Is there a Quality Plan in place for CTS? If so, what is contained or covered in the Quality Plan?

Response to Question 2:

➢ The Quality Improvement Plan has been developed. It is based on the outcome of an internal assessment and an external quality review.

➢ The plan takes the strategic objectives of the institution and department into account, as well as risk and limitations of the department in delivering service. It has now been linked to ITIL processes.

5.4.4.3 Question 3: Are quality reviews or audits conducted? If so, what are the requirements or criteria?

Response to Question 3:

➢ As per institutional policy, quality review must take place once every three years. The CTS department is adhering to this policy, with the next review planned for 2012.

➢ Additional reviews are also planned internally for the department. Audits are completed annually by the external auditors.

➢ A recent ITIL maturity audit has also been completed by the department. The requirements of the reviews are based on services offered by the department. Performance is based on measurement of targets. The audit requirements are governed by the auditors and are relevant to financial risk.

5.4.4.4 Question 4: Are there standards or a Systems Development Life Cycle methodology in place for major changes to existing or new technology?

Response to Question 4:

➢ The department has a mature change management activity covering all major aspects of departmental changes.

➢ The incremental elements of a System Development Life Cycle methodology are not well documented.

5.4.4.5 Question 5: Is there a process in place for the co-ordination and communication between customers and CTS?

Response to Question 5:

➢ The CTS department has defined roles for who has to communicate. The official mouthpiece is via the Service Desk.

➢ Section managers have the role of communicating information relevant to users through this process.

➢ Other processes, like project and change management, also use this method of communication.

➢ The CTS department also gathers information on user perceptions through surveys, which are scheduled to run every year.

5.4.4.6 Question 6: What documentation, if any, is in place for the Quality Management function?

Response to Question 6:

➢ The documentation covers all audits, items of risk, procedures of operation and a Disaster Recovery Plan.

➢ The Quality Improvement plan has also been developed. Performance management is being implemented over time.

5.4.4.7 Question 7: How does the CTS strategic objective align with institutional objectives?

Response to Question 7:
➢ The CTS strategy flows directly from the institutional strategy.
➢ All objectives are linked back to the strategic objectives of the institution.
➢ Currently, with the institutional strategy being under review, the ICT strategy of the institution is also being reviewed. The CTS department is an active player in this review

5.5 DISCUSSIONS AND CONCLUSION

As for the results obtained through the survey, on availability, reliability, performance and competence of CTS, with regard to different services they provide, the following analogies can be drawn from the survey:

➢ The GroupWise (email) service that CTS provides, seem to be the service that is perceived by staff as well as students, as the best of the services with regard to availability, reliability, performance and competence.
➢ The Internet services and Printing services were also perceived in a positive light, but less than the GroupWise services.
➢ The CTS Service Desk was the service that was perceived positive, but as the least, with respect to availability, reliability, performance and competence.
➢ Regarding the SLA, the outcome was also positive with respect to an acceptable time it took to respond to a incident and resolve it. Note should be taken of the large number of students who were neutral on these statements. The staff, however, was more negative with

respect to the time it took to respond to an incident. They were a bit more positive with the time it took to resolve an incident.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1 THE RESEARCH THUS FAR

In chapter one, the scope of the research contained within the ambit of this dissertation was elaborated upon. In chapter two, a holistic perspective of the research environment was provided. In chapter three, a literature review was conducted on mechanisms for service improvement within ICT. In chapter four, the staff and student user satisfaction survey design and methodology, provided detail of the process of data collection. In chapter five, data gleaned from the survey conducted in chapter four, was analysed and interpreted. In this chapter, final analogies will be drawn and recommendation made to mitigate the research problem.

6.2 RESEARCH SURVEY FINDINGS

If the statements for the different measurements were combined, the students were more positive than the staff with respect to the SLA variable (q21n+q22n). This may be due to the fact that the students are not bound by a service level agreement. The main factor for this difference, is that most of the staff did not think that incidents are responded to within 2 hours.

When all the responses, whether they were from the staff or from the students, were compared with respect to the campus they were from, respondents from the remote campuses were more positive than the respondents from the main campus, with respect to the following aspects:

➢ Availability of CTS services.
➢ Reliability of CTS services.
➢ Competence of the CTS technical staff.
➢ Service Level Agreements.
➢ Printing services.
➢ CTS Service Desk.

This was also confirmed when the comparisons with regard to each statement were done. The respondents from the remote campuses agreed more to the following statements, than the respondents from the main campuses:

➢ CTS provides an acceptable Printing service in terms of availability.
➢ CTS provides reliable Printing service.
➢ CTS provides an acceptable Printing service in terms of performance.
➢ CTS's technical staff resolving incidents relating to Printing, are competent.
➢ Incidents logged at the Service Desk are responded to in an acceptable time period within 2 hours.

For the student survey the students who did a diploma course agreed more to all the statements than the students who were studying BTech.

The full-time students also agreed more than the part-time students with regard to:

➢ CTS provides reliable Printing service.
➢ CTS provides an acceptable GroupWise service in terms of performance.
➢ CTS provides an acceptable Printing service in terms of performance.
➢ CTS technical staff resolving incidents relating to Printing are competent.

Note should be taken that a large proportion of the part-time students were neutral.

The non-academic appointed staff agreed more than the academic staff with respect to:

➢ CTS provides an acceptable Internet service in terms of availability.
➢ CTS provides an acceptable GroupWise service in terms of availability.

- ➤ CTS provides an acceptable Printing service in terms of availability.
- ➤ CTS provides reliable Internet service.
- ➤ CTS provides reliable GroupWise service.
- ➤ CTS provide reliable Printing service.
- ➤ CTS Service Desk is reliable in terms of calls being resolved at the Service Desk before being escalated to technical support groups.
- ➤ CTS technical staff resolving incidents relating to Internet, are competent.
- ➤ CTS technical staff resolving incidents relating to GroupWise, are competent.
- ➤ Incidents logged at the Service Desk are resolved within 16 working hours.

6.3 RESERACH INTERVIEW FINDINGS

In addition to the data analysis conducted in chapter five, structured interviews were conducted. The findings from the interviews from the four respondents within CTS are summarized in point format for ease of reference:

6.3.1 Computer and Telecommunications Services Service Desk function findings

- ➤ Although roles have been defined for the Service Desk Operators, Service Desk Coordinator and Customer Service manager, there is some overlap in responsibilities between these roles. Refer to paragraph 5.4.1.1.
- ➤ The Service Desk staff only provide first level support. This could be an indication of staff not being properly trained in order to enhance or improve their skills, knowledge or expertise. Refer to paragraph 5.4.1.1.
- ➤ There are no objectives set to evolve the Service Desk into a second level support function. By doing so, the Service Desk staff would be able to enhance their career paths and it could possibly create

opportunities to handle more advanced or complex incidents. Refer to paragraph 5.4.1.2.

➢ Technical staff take ownership of incidents from the time the incident is assigned up to the point where it is resolved. According to IT best practice frameworks, such as ITIL, the Service Desk should take ownership of all incidents throughout its life cycle. Refer to paragraph 5.4.1.3.

➢ Incidents are escalated manually, due to the current Service Desk tool or utility not allowing for automatic escalations. This could have an effect on the turnaround time for closing off incidents. Incidents that have to be escalated urgently, could take some time before it is detected by means of manual processes. Refer to paragraph 5.4.1.3.

➢ There is no prioritisation of incidents, and these are also performed manually. It could pose problems for urgent incidents requiring higher priorities. Refer to paragraph 5.4.1.3.

➢ The current Service Desk tool does not allow for incident monitoring status of incidents. Reporting is done manually, which is time consuming. Refer to paragraph 5.4.1.3.

➢ Incident tracking is done manually, which is time consuming. Refer to paragraph 5.4.1.3.

➢ Users are not notified throughout the incident life cycle of its status. They are only notified when it is initially logged and when resolved. Refer to paragraph 5.4.1.3.

➢ Management information reporting is generated manually. Not all the staff on the Service Desk have been trained on ITIL Foundation. Refer to paragraph 5.4.1.4.

➢ There are no metrics in place to measure the performance of the Service Desk operations as a whole (e.g. how incidents have been logged, how incidents have been responded to, the competence of Service Desk staff). Refer to paragraph 5.4.1.5.

➢ The Service Desk only interrelates with the change and problem management processes. There is no interrelationship with the

existing IT Service Continuity or Service Level Management processes. Refer to paragraph 5.4.1.6.

➢ Not all procedures required by the Service Desk are documented and made available. There are a few documented procedures. Refer to paragraph 5.4.1.7.

6.3.2 Service Level Management (SLM) process findings

➢ There is no formalised SLM process. Therefore, roles and responsibilities have also not been introduced formally. Refer to paragraph 5.4.2.1.

➢ There are no formal Service Level Agreements (SLAs), Operational Level Agreements (OLAs) or Underpinning Contracts (UC's) and no formal negotiations with customers on service levels.

➢ KPI's have not been set as there are no roles defined.

➢ No objectives have been set, although there is a clear indication of what those objectives should be, once the process is formally introduced. Refer to paragraph 5.4.2.2.

➢ There is no structure for SLAs. Refer to paragraph 5.4.2.3.

➢ SLAs are not referenced in the CTS Service Catalogue/Portfolio. Refer to paragraph 5.4.2.4.

➢ No management activities are in place (e.g. measurement or review of process, Service Improvement Plan, auditing for compliance, etc.). Refer to paragraph 5.4.2.6.

➢ There are no metrics in place to measure the success or failure of the process. Refer to paragraph 5.4.2.7.

➢ There is no integration with other existing IT Service Management (ITSM) processes. Refer to paragraph 5.4.2.8.

➢ There is no documentation available, other than the Service Catalogue/Portfolio. Refer to paragraph 5.4.2.9.

6.3.3 Project Management function findings

➢ Separate plans are not developed but are contained or incorporated into master plans. Post-implementation plans are only developed for some projects, not all. Refer to paragraph 5.4.3.3.

➢ Integration with other functions and/or processes takes place on request only. The institution does not have a centralised projects office to deal with institutional projects. Refer to paragraph 5.4.3.4.

➢ CTS is required to conduct a substantial amount of the actual work and activities for institutional projects. Issues of ownership of projects are to be clearly defined. Refer to paragraph 5.4.3.4.

➢ CTS project office job descriptions do not make provision for projects outside of CTS. Refer to paragraph 5.4.3.4.

➢ Any additional documentation is only created on request. Refer to paragraph 5.4.3.3.

6.3.4 Quality Management function findings

➢ The Systems Development Life Cycle has not been well documented. Refer to paragraph 5.4.4.4.

6.4   THE RESEARCH PROBLEM RE-VISITED

The research problem formulated and researched within the ambit of this dissertation, reads as follows: *"Computer and Telecommunication Services are adversely impacted upon by non-prioritised requests and uncoordinated approaches to process delivery"*.

In chapter two, an overview of the CTS structure is expanded upon, as well as the reporting structure of CTS within the institution. Strategic areas within CTS are emphasised upon, with specific reference to IT best practice initiative adopted. The challenges for bringing about continuous improvement, are also highlighted in this chapter.

In chapter three, various quality management techniques, for the improvement of quality, are investigated and elaborated upon, on aspects relating to continuous improvement. The relationship between process and service is highlighted as well as the use of project management mechanisms to achieve quality. Finally, an evaluation is done on IT best practice frameworks with specific reference to areas affecting the improvement of identified functions and/or processes within CTS.

In chapter four, the survey environment, target population, sampling methods, data collection, measurement scales, survey design and structured interviews, are elaborated upon.
In chapter five, the data is analysed and interviews are summarised.

In the opinion of the author that the research problem can be mitigated, should the recommendations, set out in this chapter, be implemented.

6.5 THE RESEARCH QUESTION RE-VISITED

The research question, as part of this dissertation reads as follows: *"How can the evaluation of stringent mechanisms in Information Communication Technology (ICT) improve service delivery?"*

According to Tenner and DeToro (1992:63-64), citing Garvin (1987:101-109), there are eight dimensions of quality to be used at strategic level, to analyse quality characteristics. These would include performance, features which are secondary to performance, reliability, conformance, durability, serviceability, aesthetics and perceived quality.

According to Goetsch and Davis (2006:469), emphasis should be on the documentation requirements of a quality management system. Documentation is categorised into four areas, namely, policies, procedures, practices (work instructions) and proof (records, which provide evidence of conformance).

Tenner and DeToro (1992:32-35) highlights three fundamental principles for implementing Total Quality Management (TQM). The first is customer focus, which is concerned with customer requirements and needs, and meeting their expectations. Secondly, process improvement, as all work is accomplished by means of a serious of interrelated steps and activities. It also emphasises that the process delivers the desired results or output at all times with no variation. In turn, this will ensure reliability of the process. The third principle is total involvement, which requires active leadership of senior management. In addition, it should also involve the efforts that utilise the talents of all employees within the organisation. The three main principles are also supported by six elements, namely, leadership, education and training, supportive structures, communications, reward and recognition, and measurement.

Continuous Improvement is achieved by adjusting the organisation's strategic and operational planning processes. It involves identifying goals for quality improvements, identifying the projects by which these will be achieved, resource needs and measures for success. It also requires documenting the process before improving it, and convince owners to take responsibility for quality improvements (Burrill and Ledolter, 1999:470-473). According to Fraser (1995:6), creating a culture which is focussed on continuous improvement, should be part of the strategic considerations in the organisation. This can be achieved by aligning performance objectives to include continuous improvement and quality objectives.

According to Goetsch and Davis (2002:17-24), a service is defined as work done or duties performed for others, and everything done, as part of a process. Services are provided through processes, and quality is considered an integral characteristic of a service.

According to the itSMF (2002:25-28), for an organisation to realise its vision, mission, objectives and policies, it has to undertake the appropriate activities to achieve this. These activities would have to be arranged in such a way that each group of activities contributes to objectives of the

organisation. These grouped activities are referred to as processes. It entails what has to be done, what results are expected, measuring processes to deliver the expected results, and finally, how the results of one process affect the other processes. This is also referred to as the relationship between processes. A process-based approach can be used for process improvement, and the following questions are posed:

➢ Where does the organisation want to be (vision)?

➢ Where is it (assessment)?

➢ How can the organisation get to where it wants to be (process improvement)?

➢ How does the organisation know that it has arrived (metrics)?

Roles and responsibilities for each of the processes have to be assigned, and the process owner is responsible for the process results (itSMF: 2002:26).

Tenner and DeToro (1992:64-65), citing Berry, Parasuraman and Zeithaml (1985:44-52), elaborates on the Ten Determinants of Service Quality to compliment the eight dimensions offered by Garvin. These are: reliability, responsiveness, competence, access, courtesy, communication, credibility, understanding the customer, security and tangibles. According to the IT Service Management Forum (itSMF: 2002:13-17), the IT service provider needs to focus on the quality of services they provide to the organisation – it can longer only focus on the technology due to the demands for IT to align itself to the business objectives. Services and quality are inter-linked in that it refers to the extent to which the service fulfils the requirements and expectations of the customer. It is therefore important for the service to be continually assessed to ascertain the customer's experience and expectations for the future. The results of these assessments can also be used to determine whether or not the service should be modified.

According to Burrill and Ledolter (1999:501), Juran also popularised the concept of solving problems on a project-by-project basis. This involves identifying needs, defining projects, prioritising them, obtaining authorisation and funding, assigning responsibility and undertaking the projects, in order to bring about quality improvements. Quality problems are interdepartmental, by nature, and require interdepartmental project teams. Burke (2006:11-12) emphasizes the importance of the selection and appointment of a project manager, in that it influences the success or failure of a project. The project manager is regarded as the single point of responsibility and also takes responsibility for the integration and coordination of all contributions to the project.

Ziolkowski and Clark (2005:87), citing Brown (1998:177-195), is of the opinion that ICT governance needs to be understood and managed in a coherent, integrated and balanced way, at all levels within the organisation. This will result in ICT goals being matched with sound policies, clear accountabilities, plans and the effective management of ICT as an organisational investment.

A significant advantage of adopting ITSM, is that it allows IT staff to conduct their work in a more planned manner and not be reactive to problem solving (Gubbins, 2009:20). Obtaining buy-in from appropriate stakeholders is important for the success of ITSM, as the process is owned by everyone who has a role to play in the provision of the service (Brindley, 2009:22).

An important element in CRM is the Service Desk and the control of service levels based on Service Level Management (itSMF, 2002:23-24). According to Mohamed, Ribière, O'Sullivam and Mohamed (2008:315), the ITIL approach to service management is based on the interrelationships and synchronization of processes. The itSMF (2002:28-29), is of the opinion that ITIL is the best IT Service Management approach, and that it is not prescriptive, irrespective of the type of

organisation. Its emphasis is on the relevance to the organisation, of activities in processes, as well as the relations between them.

According to the itSMF (2202:37-38), the service support domain in the ITIL framework is concerned with how the customer can access appropriate services to support their business. This should include Service Desk, incident management, problem management, configuration management, change management and release management. According to itSMF (2002:35-36), this domain describes the services needed by the customer and what is needed to provide these services This should include service level management, financial management for IT services, capacity management, availability management and IT service continuity management.

According to Burke (2006:213-216), there are several areas covered within the project life cycle where reporting is done in the form of planning documentation and control documentation. These would include control documentation for each of the following categories: scope management, technical support, time management, procurement management, resource management, cost management, change control, quality management, communication, human resource management and environmental management.

The findings from the survey and interviews lead to the conclusion, (see paragraph 6.2) amongst others, that:
➢ The GroupWise (email) service that CTS provides, seems to be the service that is perceived by staff as well as students, as the best of the services with regard to availability, reliability, performance and competence.
➢ The Internet services and Printing services were also perceived in a positive light, but less than the GroupWise services.

- ➢ The CTS Service Desk is the service that was perceived positive, although as the least with respect to availability, reliability, performance and competence.

- ➢ With respect to the SLA, the outcome was positive with respect to an acceptable time it took to respond to a incident and resolve it. However, note should be taken of the large number of students who were neutral on these statements. The staff, however, was more negative with respect to the time it took to respond to an incident. They were a bit more positive with the time it took to resolve an incident.

6.6   INVESTIGATIVE QUESTIONS RE-VISITED

The investigative questions researched in support of the research question, read as follows:

- ➢ Do the CTS Service Desk function and Incident Management process, meet the requirements of ITSM best practice methodologies?

In this respect, refer to paragraph 5.4.1, Chapter 5, and recommendations resulting from the structured interview for CTS Service Desk function in paragraph 6.8.

- ➢ Does the CTS Service Level Management process meet the requirements of ITSM best practice methodologies?

In this respect, refer to paragraph 5.4.2, Chapter 5, and recommendations resulting from the structured interview for CTS Service Level Management process in paragraph 6.8.

- ➢ Does the Project Management activity within CTS meet the requirements of best practice methodologies?

In this respect, refer to paragraph 5.4.3, Chapter 5, and recommendations resulting from the structured interview for the Project Management function in paragraph 6.8.

➢ Does the Quality Management activity within CTS meet the requirements of best practice methodologies?

In this respect, refer to paragraph 5.4.4, Chapter 5 and recommendations resulting from the structured interview for the Quality Management function in paragraph 6.8.

➢ How do users perceive the service levels of core services offered by CTS?

In this respect, refer to analysis resulting from the staff and student surveys to ascertain user perception of the CTS Service Desk function, Incident Management process and Service Level Management process in chapter 5 in paragraph 5.3, Chapter 5 (also refer to paragraph 6.2 in this chapter for research survey findings).

➢ What are the users' perceptions and expectations of the CTS' Service Desk function, Incident Management process and Service Level Management process?

In this respect, refer to the analysis resulting from the staff and student surveys to ascertain user perception of the CTS Service Desk function, Incident Management process and Service Level Management process in paragraph 5.3, Chapter 5 (also refer to paragraph 6.2 in this chapter for research survey findings).

6.7 KEY RESEARCH OBJECTIVES RE-VISITED

Key research objectives for this dissertation are as follows:
➢ To assess the Service Desk function and Incident Management process as part of CTS' adoption of ITSM.

In this respect, refer to the recommendations resulting from the structured interview for CTS Service Desk function, in paragraph 6.8.

> To assess the Service Level Management process as part of CTS's adoption of ITSM.

In this respect, refer to recommendations resulting from the structured interview for CTS Service Level Management process in this chapter in paragraph 6.8.

> To assess the Project Management activity as part of CTS' adoption of best practice methodologies.

In this respect, refer to recommendations resulting from the structured interview for CTS Project Management function, in paragraph 6.8.

> To assess the Quality Management activity as part of CTS's adoption of best practice methodologies.

In this respect, refer to recommendations resulting from the structured interview for CTS Quality Management function, in paragraph 6.8.

> To establish user perception of service levels for core services offered by CTS.

This aspect was elaborated upon in detail within the ambit of Chapter 5, resulting from the staff and student user satisfaction surveys conducted.

> To establish user perception and expectations of CTS's adoption of the Service Desk function, Incident Management process and Service Level Management process.

This aspect was elaborated upon in detail within the ambit of Chapter 5, resulting from the staff and student user satisfaction surveys conducted.

6.8 RECOMMENDATIONS

Recommendations to mitigate the research problem and to provide an answer to the research question and the associated investigative questions, the following:

➢ By formalising and introducing the Service Level Management process, CTS would be able to resolve many of its service support and service delivery problems. Introducing and formalising SLAs, will provide CTS with a platform to negotiate service levels with customers. CTS would know exactly what the customer requirements and expectations are. In turn, service levels can be measured and CTS would know exactly when service levels are not meeting customer requirements and agreed targets. It will provide opportunities for continuous improvement, and will highlight new or desired services required by customers. As part of the SLM process, the introduction of OLAs and UCs would also contribute to effective SLA negotiations with customers. Technical groups internal to CTS and suppliers, would also have to meet these requirements, and targets will be set accordingly. By developing a Service Quality plan in for the SLM process, CTS would be in a position to set process parameters, identify the management information required and also identify KPIs. In addition to the Service Quality Plan, CTS should also consider developing a Service Improvement Plan which is fully integrated into other ITSM processes, to improve service levels. This should create a "Service Culture" amongst senior management, role players and stakeholders.

➢ Roles and Responsibilities should be clearly defined and introduced. This will eliminate overlap of responsibilities and allow for ownership to be taken. The finalisation of the CTS restructuring process should prioritise assigning roles and responsibilities, specifically relating to the adoption of IT best practice methodologies.

➢ In order for CTS to succeed in their continuous improvement initiatives, documentation requirements should be met. These should range from the development and implementation of policies, procedures, work instructions to records being kept. This would provide evidence of whether CTS is meeting the necessary audit and/or regulatory requirements as required by IT best practice methodologies.

- Acquiring an integrated ITSM solution, CTS would be able to integrate all its processes and/or functions. It would also automate reporting, as most of the reporting is done manually, and is somewhat time consuming. The integrated toolset would allow for proper monitoring of systems and services, which will improve the turnaround time for resolving incidents. It would also prevent rework, due to possible flaws in manual processes.

- The Service Desk should take ownership of all incidents throughout the incident life cycle – from the time incidents are logged up until the time it is closed. This would allow for users to be informed throughout the process. Should there be any non-conformance, it will be detected centrally and the necessary actions taken to resolve the matter.

- All Service Desk staff should be trained in ITIL Foundation as a minimum. Additional training or shadowing second level support staff, would contribute to increasing skills, experience and competence. It could also provide possible career paths for Service Desk staff.

- The performance of the Service Desk operations should be measured so as to highlight any strengths, shortcomings and/or weaknesses.

- A centralised Project Office for CPUT will assist in the proper management of large-scale institutional projects. Roles, responsibilities and ownership within these projects should be assigned clearly so as to eliminate confusion and CTS being inundated with responsibilities falling outside its domain.

- CTS should finalise documenting its Systems Development Life Cycle (SDLC) to ensure proper release management.

6.9   FINAL CONCLUSION

The research was conducted over a one-year period. During this period, the researcher has engaged in discussion with numerous stakeholders internal and external to CPUT (academic and non-academic staff,

students, suppliers, etc.). In reviewing the research problem formulated and researched within the ambit of this dissertation, the researcher is of the opinion that, should CTS adopt IT best practice methodologies in its entirety, with the necessary roles, responsibilities, objectives, process requirements, management activities, metrics, interrelationships between processes and documentation, it would bring about improvement to IT service support and service delivery.

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