Cape Peninsula
University of Technology

AN ASSESSMENT OF THE CAPACITY MANAGEMENT PROCESS OF THE INFORMATION TECHNOLOGY INFRASTRUCTURE LIBRARY (ITIL) FRAMEWORK IN DELIVERING VALUE IN PUBLIC SECTOR

by

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DECLARATION

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

Signed **Date**

ABSTRACT

In Information Technology (IT) service management, the Information Technology Infrastructure Library (ITIL) has been established as a standard and framework for managing IT services within private and public sector. However, in South African public sector, the value of this framework including the capacity management process has not been determined. The aim of the study was to assess the capacity management process within the service design stage of the ITIL framework in managing IT services at a selected public organisation in South Africa. Assessing capacity management in the context of this research was to judge whether it adds value to the organisation. Main questions asked were: to what extent has ITIL been implemented in the public sector in South Africa?, what benefits have been achieved through the implementation of ITIL in the public sector in South Africa? and how effective is the capacity management process of ITIL in the South African public sector? The study adopts a qualitative approach based on primary and secondary data. A purposive sampling method was used to collect data through interviews of ICT officials in Pretoria and Western Cape regions. It is evident in terms of the findings that capacity management within the organisation is practiced, but the organisation still has challenges in managing the process. Findings reveal challenges around user account management, ICT skills shortage and capacity constraints, information, network monitoring tools, and ITIL implementation. DeLone and McLean theoretical framework was used to analyse the capacity management process to explain the findings. A lack of clear ICT planning among the leadership is a contributing factor. Lack of adhering to standards, procedures and processes make it almost impossible to manage capacity. Efforts to address the technical and organisational challenges such as technical skills and stakeholders immediately reporting the users that need to be terminated on systems prohibit the success of capacity management process. Drawing the conclusion, it is recommended that efforts to address challenges should move beyond just ICT, into a comprehensive action by all stakeholders in respective of inter departmental units and executive who make decisions. Solutions should be embedded with ICT being able to manage technology, auditing of processes, and capacity to ensure excellence through reduced risk, increased efficiency, confident forecasts, and cost effectiveness is essential.

Key words: ITIL, service design, capacity management, public sector, processes, assessment

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DEDICATION

To Peter and Dorah Mosweu, my beloved parents – I am thankful for the critical role they have played not only in my upbringing, but also in the upbringing of my siblings. I am thankful to my dad for his exceptional qualities, a standard-bearer, and an excellent provider. Education for his children was one of his highest priorities. Not only had he envisioned this, he also provided for this, even beyond his passing. It is painful that he has not lived to witness the harvest of his cultivation. He will always be remembered. My mom, a virtuous woman, sacrificed her life for our wellbeing. She facilitated the process of ensuring that we receive education from primary level to our first tertiary qualification. Her passion for education is beyond imagination and it will forever be engraved in our hearts. Lastly, I give all the glory to my Lord and Saviour Jesus Christ. I would not have succeeded if it were not for His grace and strength that carried me through.

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LIST OF ABBREVIATIONS

IT	Information Technology
ITIL	Information Technology Infrastructure Library
CS	Computer Science
IS	Information Systems
ITIM	Information Technology Infrastructure Management
ITSM	Information Technology Service Management
ITGov	Information Technology Governance
COBIT	Control Objective and Related Information Technology
HDD	Hard Disk Drive
CCTA	Central Computer and Telecommunications Agency
OGC	Office of Government Commerce (OGC)
Val IT	Value from IT Investments
TOGAF	The Open Group Architecture Framework
PRINCE2	Projects in a Controlled Environment
CIO	Chief Information Officer

CLARIFICATION OF TERMS

Software	Any set of machine-readable instructions that directs a computer's processor to perform specific operations
Hardware	Physical parts or components of a computer, such as the monitor, mouse, keyboard, computer data storage, hard drive disk (HDD)
System	A collection of elements or components organised for a common purpose
Process	A series of actions or steps taken to achieve a particular end
Storage	A device for recording and storing information
Database	A collection of information that is organised so that it can be accessed, managed, and updated easily
Data	Information that has been translated into a form that is more convenient to move or process; normally referred to as raw information
Information	Knowledge communicated or received concerning a particular fact or circumstance; a sequence of symbols that can be interpreted as a message
Information Technology Infrastructure Library	A set of practices that focuses on aligning IT services with the needs of business
Control Objective and Related Information Technology (COBIT)	A framework for information technology management and IT governance
Information Technology Infrastructure Management (ITIM)	Management of essential operation components such as policies, processes, equipment, and data
Information Technology Service Management (ITSM)	Refers to all managerial aspects of IT businesses; it includes models for IT planning, support, delivery, security, and infrastructure for better customer service
Information Technology Governance	A subset discipline of corporate governance, focused on information technology and its performance and risk management

CHAPTER ONE: INTRODUCTION

1.1 Introduction

This chapter introduces the topic that was investigated. The main purpose is to demonstrate that the problem proposed is sufficiently significant to warrant the investigation that has been conducted, that the research method used is appropriate and realistic, and that the results are a proof of investigation and contribute to the body of knowledge.

The success of the Information Technology Infrastructure Library (ITIL) framework has been demonstrated in many government departments of different countries (Brenner, 2006). However, in the South African public sector ITIL is still not proven to be consistently improving customer service; rather, it is incidental (Marnewick & Labuschagne, 2011a). ITIL has been implemented in South African government departments, including IT governance, but it is not sustainable (DPSA, 2013). This study explores the capacity management process in the service design stage of ITIL v3 to assess the value it adds to the South African public sector. The level of performance of the capacity management process affects all the processes directly and eventually determines the performance of ITIL.

1.2 Research background

A large number of organisations have applied service design mainly on service level management and IT service continuity management processes. However, only a few have carried out availability, capacity, and service-based financial management processes (Favelle, 2012). Service design is a second stage within ITIL v3 that provides guidance on the planning of IT services and incorporates IT practices, processes, and policies to support the strategy to ensure quality service delivery, cost effective service, and customer satisfaction (Arraj, 2010). It also highlights the main areas, namely processes, people, products, and partners (Greiner, 2007). Processes refer to a set of activities, people refer to roles and responsibilities, products refer mainly to technology and management systems, while partners refer to vendors, manufacturers, and suppliers (Thorn, 2007). If IT knows what needs to be done, what the process is, and which people have to conduct this process, then infrastructure, tools, methods, and techniques are needed to deliver optimal results (Bon, 2007). Without a skilled and competent workforce involved in managing and providing IT services, organisations will not be able to attain quality service delivery and customer satisfaction (Bernard, 2011). Managing and providing IT services brings about the subject of capacity management as a process within service design to support the business and reduce costs in IT services by streamlining IT resources with business demands (Dutton, 2010).

The most fundamental aspect of capacity management is that it plays a key role in negotiating SLAs and in support such as availability management, service level management, and financial and problem management (Rae, 2016). For this reason, the researcher's interest was to explore the capacity management process in managing IT services with the focus only on ITIL v3 at the selected South African public organisation.

1.3 Aim, objective, and research questions

1.3.1 Aim

The aim of the study was to assess whether the capacity management process within the service design stage of ITIL in managing IT services adds value to the South African public sector. The following section presents the objective research for the study.

1.3.2 Objective

The success or failure of organisations today depends mostly on the efficiency of ICT capacity to achieve predefined goals and to assist the organisations in meeting their business objective. It has been observed throughout academic literature that most organisations invest in IT frameworks such as Information Technology Infrastructure Library (ITIL) in managing IT services and processes to be able to achieve their goals and business objective. Given investment in these IT frameworks and the exorbitant budget amounts allocated, organisations still find it challenging to show return on investment in overall ICT. The objective of this study was to determine how widespread the use of ITIL is in the public sector, the benefits of ITIL, and assessing whether the capacity management process of ITIL adds value to the South African public sector. The following section presents the research questions for the study.

1.3.3 Research questions

1.3.3.1 Main research question

What is the value of the capacity management process within the service design stage of ITIL in managing IT services in the South African public sector?

1.3.3.2 Research sub-questions

- To what extent has ITIL been implemented in the public sector in South Africa?
- What benefits have been achieved through the implementation of ITIL in the public sector in South Africa?
- How effective is the capacity management process of ITIL in the South African public sector?

1.4 Rationale for the study

The South African Social Security Agency (SASSA) is a national agency of the South African Government. Like many other organisations, SASSA relies mainly on information that is processed by information technology in order to achieve the smooth running of its daily functions. The organisation has aligned its business with applying the Control Objectives for Information and Related Technology (COBIT) framework for the implementation of ICT governance and the Information Technology Infrastructure Library (ITIL) framework as a practice for IT Service Management (ITSM) that ensures IT services are aligned with the needs of the business. It was therefore an appropriate case to study, considering that one of the departments has deployed ITIL. The focus of the study was to assess the capacity management process of ITIL in delivering value in the public sector.

1.4.1 Statement of research problem

Despite ITIL being established as a standard for managing IT services within the South African public sector, the value of the key process of capacity management has not been determined. Without this assessment, the government faces challenges in accounting for the investment in technology.

1.5 Contribution of the study

The contribution of this study includes communicating the findings of the study with participants, sharing the findings with IT service professionals, and providing recommendations in respect of addressing the issues. A further contribution is that the researcher established the value of the capacity management process within the service design stage of ITIL in managing IT services in the South African public sector.

1.6 Gap in Literature

The literature emphasises more technical and service aspect of the capacity management i.e system quality, service quality, information quality, use, user satisfaction, and net benefits. The auditing of the capacity management process, which is lacking in extant literature, would have added more value. The more the process is audited the more it gets perfected and thus being stable and continuously improved.

1.7 Limitations of the study

The study could not cover all the regions within SASSA; it was limited to a purposive sample in the Cape Town and Pretoria regions. The study could furthermore not cover the middle management of the business; only senior an executive management were targeted due to time constraints. While this is sufficient to provide an exploratory insight into the subject at

hand, covering more regions and involving middle management could have shared more insight into to the subject.

1.8 Research structure

1.8.1 Introduction of chapters

Chapter 1: Introduction

This chapter introduces the topic that was investigated. The main purpose of the chapter is to demonstrate that the problem proposed is sufficiently significant to warrant the investigation that has been conducted, that the research method used is appropriate and realistic, and that the results are a proof of investigation and contribute to the body of knowledge. The following section presents the literature review for the study.

Chapter 2: Literature review

The literature review expands on the background of the ITIL framework and its evolution and provides a comparison of the different versions and stages of ITIL v3. The service design stage that forms part of ITIL v3 is discussed, and capacity management is introduced as a process within the service design stage. This has led to the introduction of the topic for the study, namely assessing the capacity management process in the public sector.

Chapter 3: Theoretical framework

This chapter provides an overview of the underpinning theory for the study and introduces the theoretical aspects, practical mechanisms as well as how it has been applied to the study to explain its relevance.

Chapter 4: Research design and methodology

This chapter gives an overview of the research design that has been adopted for the study. It identifies the research philosophy, research approach, research strategy, and research methods used. It provides a discussion on the sampling and data analysis techniques used as well as the practical approach adopted to achieve the objectives, aim, and questions. The research philosophy applied in the study is interpretivism, with qualitative research as approach and case study as research strategy since it is distinguished by its ability to investigate the phenomenon of SASSA in assessing capacity management in the public sector. The research method used to collect data was interviews.

Chapter 5: Data analysis and findings

This chapter presents the outcome of the findings of the data analysis. Interviews were conducted to collect data from ten respondents, and thematic analysis was applied to

analyse and associate related codes into categories. The categories were analysed to find similarities that form themes or patterns. The themes were used to explore the capacity management process of ITIL in the selected public South African organisation.

Chapter 6: Discussion of findings

In this chapter, the interpretations of the findings are discussed. This includes an explanation of the implications of the findings and contributes to future enquiry. With the main focus being to answer the research questions posed, it is explained how the results support the answers and how the answers are aligned to existing literature on the topic. The discussion is considered the heart of the research and it usually requires rigorous attention.

Chapter 7: Conclusions and recommendations

In this chapter, the study is summarised and the main points are highlighted. The research findings are evaluated and the research problem, objectives, and questions are revisited. Recommendations are provided based on the findings and conclusions are drawn based on the study. The study investigated the capacity management process of ITIL in the public sector, how the process has been implemented, and whether it adds value to the organisation. Unlike most studies on ICT processes which focus mainly on implementation and budget, this study also focused on auditing ICT processes. Because if this inclusion, ICT senior management, the executive heads of different units, and the ICT auditor were interviewed to obtain adequate information on ITIL and the capacity management process.

1.8 Summary

This chapter has explained the rationale of the study. The problem statement, aim, objectives, and questions were detailed and addressed. Furthermore, the research contribution, limitations, and research structure were identified.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction to the study

This chapter examines the literature relevant to the study by expanding on the background of the Information Technology Infrastructure Library (ITIL) framework and its evolution, and comparing different versions and stages of ITIL v3. The service design stage which falls under ITIL v3 introduces capacity management, a process within the service design stage. This has led to the introduction of the topic for the study, namely assessing the capacity management process in the public sector.

A literature review is an investigation related to a specific topic or selected area of study or interest (Randolph, 2009). The main purpose of a literature review is to provide the background of the topic and assist the researcher in defining, summarising, assessing, and simplifying the study (Randolph, 2009). The literature review can be used to point out what is known or unknown of the topic by formulating a debate, and can also assist with constructing questions that need an on-going investigation (Bolderston, 2008).

This section introduces the key points of the study and provides an in depth background as well as summary of these points, which include ITSM, IT frameworks (ITIL), service design, and capacity management. In developed countries economies have shifted, transitioning from agriculture and manufacturing economies to service-based economies—including IT—with services constituting more than 75% of the economy (Galup, Dattero, Quan & Conger, 2009). Given the wide range of new and continuous IT developments, Cater-steel and Pollard (2007) highlight that IT service providers can no longer afford to focus on technology only; they should also consider the quality of the services they provide and their relationship with customers. Failure to deliver quality IT services is not an option. To this effect, IT service providers are revising their roles in business and devising innovating ways in which they can improve the quality of the services they offer (Ray, Muhanna & Barney, 2005, 2005). Information Technology Infrastructure Library (ITIL) has since evolved as a significant framework in ITSM to meet this objective (Brenner, 2006). It is not clear to what degree IT governance has been adopted by South African organisations and whether ITIL draws lessons to all aspects of ITSM (Marnewick & Labuschagne, 2011a). For instance, capacity management in the service design stage is meant to support the business and reduce the costs of IT services by streamlining and aligning IT resources with the business demands, but whether this has indeed be accomplished, is not clear (Dutton, 2010).

2.2 Information Technology (IT)

Information Technology (IT) refers to an academic discipline where fields such as Computer Science (CS) and Information Systems (IS) empower students with problem solving competencies and in-depth computing skills (Stockman, Leung, Nyland & Said, 2006). The discipline thus serves as a driver of knowledge and technical innovations in a number of ways. Firstly, CS and IS supply the technology industry and the economy with a competent workforce. In other words, students are taught relevant knowledge and the skills they need to be technically literate, productive, and innovative (University of Pretoria, 2012). For example, with a constant supply of skilled software developers, technical skills shortages and related unemployment will be reduced (Youssfi, Boutahar & Elghazi, 2014). A direct advantage for the IT sector is improved productivity and competitiveness from competent workers. Technical skills are also associated with increased innovations, which ultimately encourages inventions, exports, and, ultimately, economic growth (Chung, Rainer & Lewis, 2003). Secondly, the IT discipline advances research, scholarship, and enquiry into new knowledge which guide new advancements in various aspects of modern life (Iden & Eikebrokk, 2014). In effect, research advancement is the most critical role in the IT discipline (Vidas-Bubanja & Knežević, 2011); it is the basis upon which modern technological developments are built. In other words, skilled graduates can apply scientific expertise to explore, experiment, and develop new innovations, thereby driving continuous progress in the sector and beyond (Joshi, Meza, Costa, Perin, Trout & Rayamajih, 2013). Research advancements extend beyond the productivity and competitive aspect; it informs further innovative improvements on existing technologies or on inventions into new solutions (Uriona-Maldonado, Dos Santos & Varvakis, 2012). As a field of practice, private and public sectors do not only benefit from productivity, it also extends far beyond this as IT is usually understood and measured (Nikoloski, 2012). Not only can the application of IT provide value in established processes for producing goods and delivering services, it can also reframe and redirect the expenditure of human effort, thus generating unanticipated payoffs of exceptionally high value (Petter, DeLone & McLean, 2008).

2.3 Information technology services

The Oxford dictionary defines a *service* as the action of helping or doing work for someone (English Oxford Living Dictionaries, 2017a). Irrespective of how hard organisations try, mistakes still happen in services, for example, delayed flight or missed delivery, thereby compromising the effectiveness of the business (Hart, Heskett & Sasser, 1990). However, organisations need to recover from such mistakes by identifying the actual cause of problem, thus rectifying and learning from the same repeated mistakes in order to enhance service delivery and increase customer satisfaction (Jayachandran, Sharma, Kaufman & Raman,

2005). IT as a service helps businesses and organisations to grow and become more successful by assisting them to communicate and operate smoothly with managing accounts and access, backup and storage, applications communications, and support and training (Ray et al., 2005). IT as a service has also become the support for businesses and organisations to the point where it would be impossible for many to function and succeed without it (Chitambala, 2006). This highlights the importance of managing IT services, considering that it involves day-to-day operations support, which includes computer systems, applications, and networks to ensure business excellence and effective IT service delivery within an organisation (Prasad, Heales & Green, 2010). This opened many development opportunities and gave birth to the concept and robustness of IT Infrastructure Management (ITIM), IT governance, and IT Service Management (ITSM) (Sallé, 2004). Best practices and processes as well as ensuring that IT is well managed must be in place to improve IT services (Kanapathy, 2012).

2.4 Information Technology Infrastructure Management (ITIM)

ITIM is a process mainly concerned with the collection of technical assets shared throughout the organisation with the IT personnel who manage such assets to bring about reliable services (Xia & King, 2002). The main focal point is integrating technology to support the needs of business and aligning IT plans to business objectives, architecture, and IT personnel (Chung et al., 2003). IT Infrastructure evolved in recent years to a point where it accounts for more than 50% of the organisation's IT budget, thus emphasising the need to manage it commendably (Byrd & Turner, 2000).

2.5 IT governance

IT governance is a concept concerned with how the organisation optimises the use of IT to achieve a set business value (Brown, 2015). Furthermore, IT governance sets a tone by providing a structure whereby objectives of the organisation are determined and performance is monitored to ensure defined objectives are not only determined but also achieved (Kooper, Maes & Lindgreen, 2011). It is also used to govern the implementation of IT related projects, with non-adoption of governance principles or non-compliance contributing to IT project failure (Marnewick & Labuschagne, 2011a). Further to the support and service performed by IT, there is also a need to manage and govern IT properly (Coertze & Von Solms, 2014). A high level of management involvement is key in achieving successful IT governance with other stakeholders such as board members, internal clients, and departments (e.g. Finance) providing input in the decision making process (Prasad et al., 2010).

2.6 Information Technology Service Management (ITSM)

ITSM ensures that IT services are of a good quality and aligned with the needs of the business (Tan, Cater-steel, Toleman & Seaniger, 2007). This is accomplished through IT service providers in collaboration with people, processes, and information technology (Al Mourad & Johari, 2014). As a set of processes and best practices, ITSM uses one of the standards, Information Technology Infrastructure Library (ITIL), in its pursuit to align IT services with the needs of the business and to manage the IT Infrastructure (Cater-steel & Pollard, 2007).

2.7 IT frameworks

2.7.1 Introduction to Information Technology Infrastructure Library (ITIL)

Due to the ever-growing dependence on IT and increasing need of productivity and success, a British company named Central Computer and Telecommunications Agency (CCTA), now called Office of Government Commerce (OGC), invented ITIL v1 in the 1980s to standardise ITSM (Cater-steel & Pollard, 2007). After the revision of ITIL v1, v2 was developed in 2001 with more standardised and usable structures, placing more emphasis on service support and service delivery (Nabiollahi & Sahibuddin, 2008). ITIL kept evolving with the introduction of v3 in 2007, with a feedback circle to improve the entire service lifecycle to incorporate service strategy, service design, service transition, service operation, and continual improvement. ITIL was once again revised in 2011, adding more processes and clarifying strategy (Planview Inc., 2008). A large number of organisations, including public institutions, make use of ITIL as one of the best practices to sustain not only an improved running of IT which is a vital aspect to the success of the organisational strategy, but also to promote the effective governance of IT activities (Axelos, 2014a). ITIL is defined as a world-wide approach, an improvement to customer service, and the best practice for ITSM (Kanapathy, 2012).

2.7.2 ITIL, elsewhere

ITIL is an ITSM framework with its adoption speedily disseminating throughout Canada, the Netherlands, South Africa, India, USA, and Australia (Brown, 2015). As a world-wide approach, ITIL shows that countries such as Germany, Australia, the United Kingdom, and New Zealand benefit from it through improved focus on ITSM, more predictable infrastructure, improved consultation with IT groups within the organisation, smoother negotiation of service level agreements, and continuous end-to-end service (Cater-steel & Pollard, 2007).

2.7.3 ITIL in South African organisations

There's a link between customer fulfilment, service excellence, and the use of ITIL in large ICT service organisations in South Africa (Marrone & Kolbe, 2010). More than 45% of organisations are projected to use ITSM frameworks, but there is little research on the benefits these frameworks bring to IT and the business (Marrone & Kolbe, 2011). ITIL is still not proven to be consistently improving customer service; rather, it is incidental (Potgieter, Botha & Lew, 2002). Only 21% of South African public institutions implemented IT governance, including ITIL; however, it is not sustainable (DPSA, 2013). Of the 21%, ITIL has been adopted by SASSA with many processes implemented—including capacity management—and this sparked the interest of the researcher to use SASSA as a case in this study. It is also not clear whether ITIL draws lessons to all aspects of ITSM best practice in South African organisations (Marnewick & Labuschagne, 2011b). Results also point out that as the maturity of implementation is on the rise, the perception of challenges declines, and the number of realised benefits and implemented ITIL processes increases (Marrone & Kolbe, 2011).

2.7.4 ITIL compared to other frameworks

Apart from ITIL there are also other frameworks to manage IT services, namely Controlled Objectives for Information and Related Technology (COBIT), Value from IT Investments (Val IT), International Standard Organisation (ISO), The Open Group Architecture Framework (TOGAF), Projects in Controlled Environment (PRINCE2) and balanced scorecards (Balanced Scorecard Institute, 2015). To draw a holistic approach in managing IT services and improving customer service, some of the best practice and standards such as COBIT and ISO are observed in enabling the effective management framework of policies, internal controls, and defined practices in comparison to ITIL (Năstase et al., 2009). The main distinction between COBIT and other frameworks is that COBIT is not only limited to the IT department, it also covers the entire enterprise and therefore includes single integration to corporate governance to ensure value through specifying roles, activities, and relationships (Youssfi et al., 2014). COBIT is also known to be a control framework rather than a process framework unlike ITIL and ISO; it guides organisations in terms of what to do, rather than how to go about doing it (Marnewick & Labuschagne, 2011b). In addition to the development of COBIT, Val IT was published in 2008 by the IT Governance Institute, focusing solely on assisting enterprises with optimising IT investments (Kozina & Popović, 2010). ISO provides procedures for implementing a uniform information security framework (Năstase et al., 2009), while TOGAF focuses on developing required architectures for defining IT and IS enterprise priorities and projects for the short, mid, and long term (Blevins, Spencer & Waskiewicz, 2004). PRINCE2 is used to effectively manage IT Projects (Court, 2006). Lastly, the

balanced scorecard is a strategic planning and management system that is used in organisations world-wide to align business to the vision and strategy of the organisation (Balanced Scorecard Institute, 2015), improving internal and external communications, and monitoring organisational performance against strategic goals (Burtscher, Manwani & Remenyi, 2009).

2.7.5 The evolution of ITIL

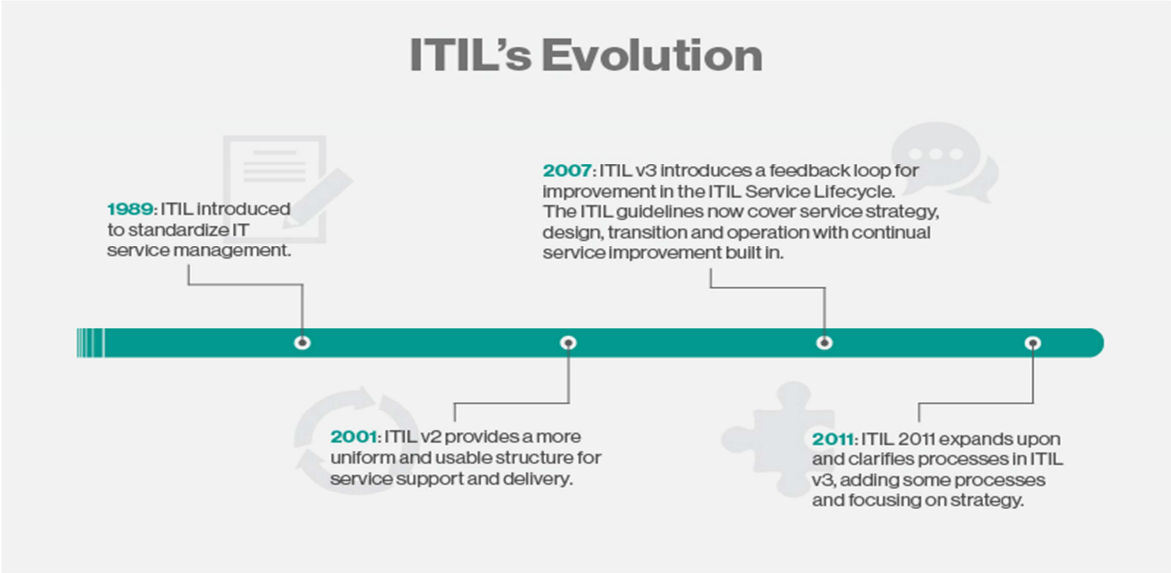

Figure 0.1: ITIL evolution

2.7.5.1 ITIL v1, v2 and v3

ITIL v1 was implemented merely to standardise ITSM through the effective use of IT resources. ITIL v1 comprised 42 separate books describing best practice of IT management (Mehravani & Hajiheydari, 2011). Without standard practice the government and private sector were individually creating their own IT management practices, thus duplicating work (Galup et al., 2009). At that stage, the best practices were mainly based on data centres running mainframes; experience on personal computers was limited as it was not yet common or widely used (Van Sante & Ermers, 2013). Like any other first version, ITIL v1 was not without faults, including process differences and work activities and organisational units not being clear (Favelle, 2012). ITIL v2 was launched in 2001, with the processes of ITIL v1 grouped together to reduce the number of books from 42 to only eight (Van Sante & Ermers, 2013). The books include service support, service delivery, ICT infrastructure management, security management, business perspective, application management, software asset management, and planning to implement service management (Thorn, 2007). The distinction of this version from the previous one was mainly highlighting the vital need of relationships with customer and supplier, thus being more service focused (Tan et al., 2007).

Unlike ITIL v2 that was mostly focused on IT service delivery and support, ITIL v3 has been extended to encompass the entire service life cycle management with only five publications (Nabiollahi, Alias & Sahibuddin, 2010). The publications include service strategy, service design, service transition, service operation, and continual improvement as indicated in the ITIL v3 diagram (McLaughlin & Damiano, 2007).

2.7.5.2 ITIL v3 stages

Service strategy decides on an approach to serve customers, which includes analysing the customer needs and the market place (Burtscher et al., 2009). It determines which services IT should offer and what capabilities need to be developed with the goal to empower IT to act in a strategic manner (Pollard & Cater-Steel; Tan & Toleman, 2009). **Service transition** is responsible for ensuring resistance free implementation and rollout of new and/or modified IT services (Axelos, 2013). This includes well-managed change management and the modification of existing IT services such as creation, testing, rollout, and end of lifecycle (Axelos, 2015). **Service operation** includes direction on achieving effectiveness and efficiency in the delivery and support of services to ensure value for the customer and the service provider (NBS, 2015). During this stage, organisations are given clear guidance on how to maintain stability in service operations, allowing for changes in design, scale, scope, and service levels (BMC Software Inc., 2017a). Lastly, **continual service improvement** is concerned with creating and maintaining value for customers through better design, introduction, and operation of services (Axelos, 2013). The main objective is to review, analyse, and recommend improvements in each lifecycle phase in order to retain services at all times (Planview Inc., 2008).

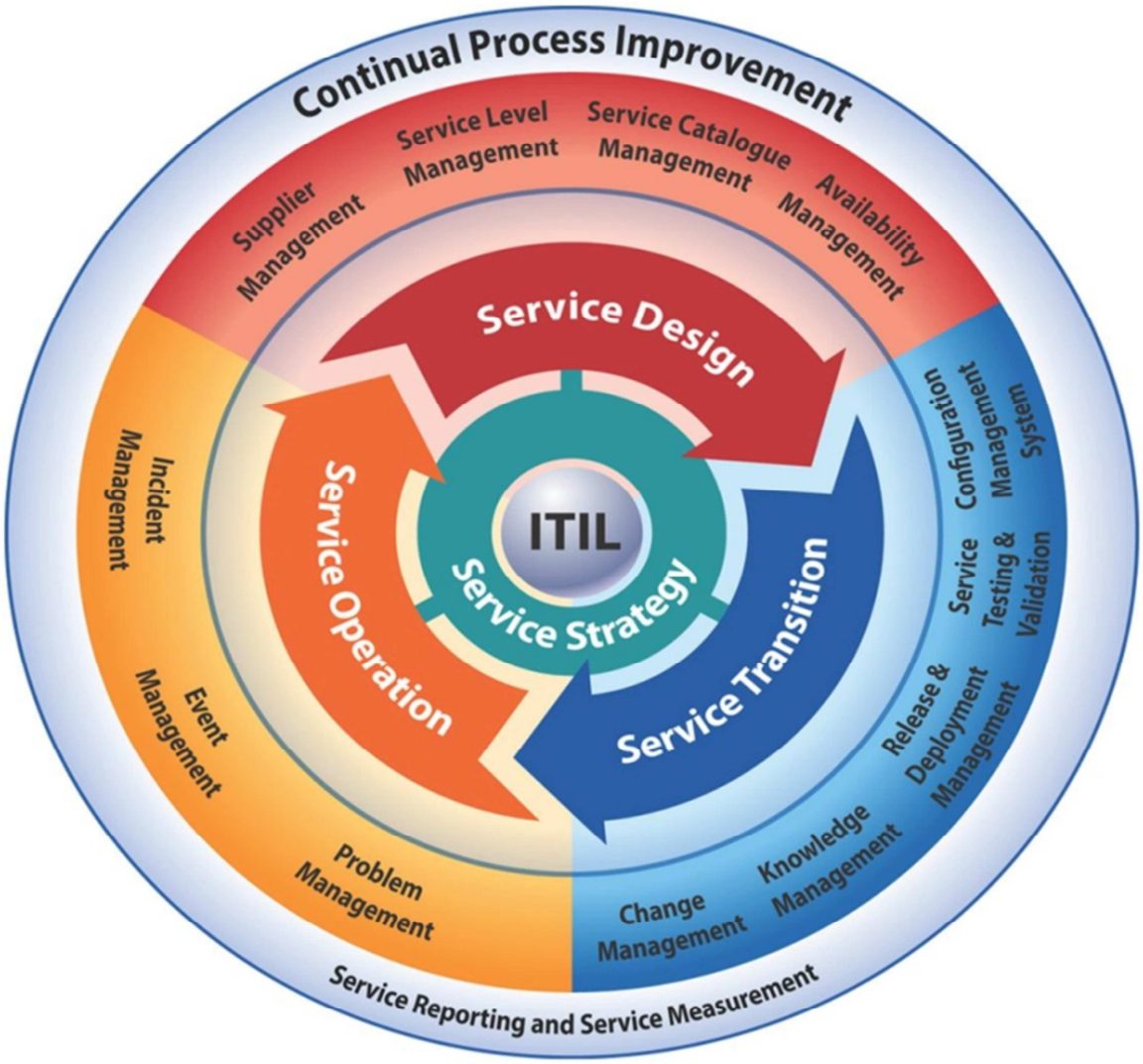

Figure 0.2: ITIL v3 stages

This study concentrates only on the use of the ITIL framework to manage IT services, with the focus on ITIL v3, targeting capacity management that falls within the service design stage. Figure 2-2, indicates where the Service Design fit on ITIL version 3.

2.8 Service design

2.8.1 Stage overview

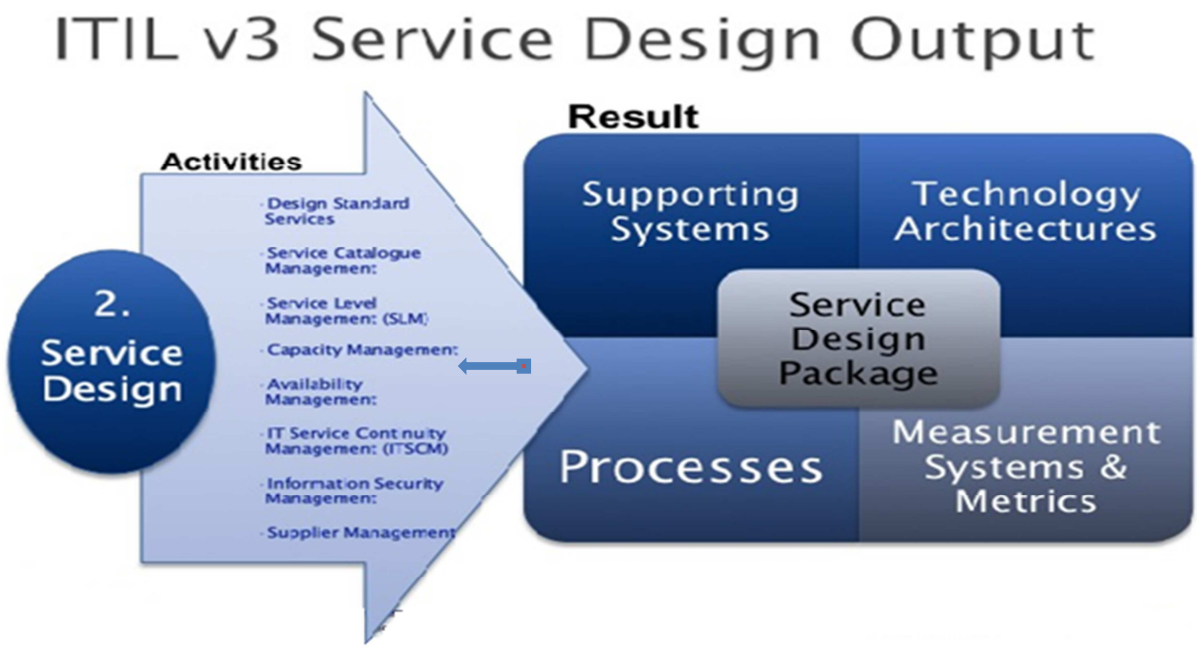

Figure 0.3: Service design

Without well-established service design, services will not be stable and will be costly to maintain, with business and the customer losing interest (Brewster, Griffiths, Lawes & Sansbury, 2012). The cost of correcting these deficiencies is almost always higher than the costs that would have been incurred if services were planned and deficiencies were prevented during the design stage (Brewster et al., 2012). The success or failure of a service is mainly dependent on its design. Poorly designed service may result in the service never being able to deliver the anticipated value (Ryder, 2009). Service design is the second stage of ITIL v3. It is a fundamental stage, often accountable for the success or failure of services beginning with customer requests, support to service strategy, and feeding into service transition (Rahman, 2015). Service design is not only focused on new services, it also includes the changes and improvements required to add value and support customers, improve services, and ensure continuity of services, achievement of service levels, and adherence to standards and regulations (Axelos, 2014b). In addition, it guides organisations on how to develop design competencies for service management (ITILNews.com, 2016). Service design outcomes include architectures, policies, processes, and documentation to meet present needs while planning for the future (Meziani & Saleh, 2010). The following section presents the five major aspects of service design.

2.8.2 Five major aspects of service design

When **designing services,** success does not only depend on **supporting systems**, but also on the management and **technological architecture**, the **processes** and skills that will be required to ensure it runs effectively, and the **metrics** that need to be provided to monitor and manage these services (Brewster et al., 2012). Placing emphasis only on the service solution will not be enough; other aspects need to be considered when designing new or changed services (Arraj, 2010). The service design package introduces new services, changed services, or the removal of services, detailing all aspects of the service through the stages of the service lifecycle (Farenden, 2012). The package consists of business and service requirements, service level agreements, design of the preferred solution, organisational readiness assessment, the service lifecycle plan to introduce the service, and service acceptance criteria including the business sign-off (Farenden, 2012). For supporting systems or tools used (e.g. a service desk call logging tool), it is require that a set of requirements are established and tools are acquired or developed to meet these requirements (NBS, 2015). Technology architectures are the tools and systems that must be in place to support the design of the infrastructure, data, and environments (ISACA, 2015). One of ITIL's recognised ways of 'doing things' is through processes (BMC Software Inc., 2017a). A process is a certain way of doing something; when there is an approved way of doing things in the organisation, the intended results are more likely to be achieved through uniformity and accuracy (Alghamdi, 2015). The measurement systems and metrics place more emphasis on designing a structure to combine the correct measurements and metrics able to reflect and govern services and the service management processes (NBS, 2015).

2.8.3 Four P's of service design

Service design considers a holistic approach that goes far beyond only infrastructure requirements; it incorporates people, processes, products, and partners managed internally or by an external service provider to support the overall business strategy (Zaino, Tainter, Likier, Drew, Perazzo, Willis & DuMoulin, 2008). If people are informed of what changes are about to happen, and why, they are much less likely to resist these changes, and if processes are not documented, inconsistencies will develop over time as people adapt to the changes (Agutter, 2012). Because partners provide imperative information for service measurements, IT has to incorporate these in their planning to ensure that the correct third-party suppliers are in place who are able to assist IT in providing and supporting the service (Farenden, 2012). Lastly, products are not only the services that result from the service design stage, but also refers to the technology and tools that are selected for the design or to support the service (Agutter, 2012).

2.8.4 Service design processes

There are seven processes within service design, namely service catalogue management, service level management, **capacity management**, availability management, service continuity management, information security management, and supplier management (Pereira & Mira, 2009). Service catalogue management is the process of ensuring that a service record is created and maintained with current information, including all operational services and those planned (Ryder, 2009). The main purpose of the service catalogue is to gain a common understanding of the IT services of the service provider among various stakeholders (Maass, 2009). While the service catalogue ensures that all services delivered by ICT are recorded and maintained, service level management (SLM) ensures that IT service targets are negotiated and agreed upon by the different service providers and the IT unit (Case, 2011). The purpose of SLM is to monitor service performance against the service level agreement (SLA) and produce reports on the ability of the service provider in delivering the agreed level of service (Tesone, 2010). Once services are recorded and service targets are negotiated, services have to be delivered as promised; availability management ascertains that the agreed upon services are available or surpass the current and future agreed upon needs of the business in a cost effective way (Ritchie, 2009). The aim of availability is to ensure that IT services are available and meeting the agreed upon availability needs and service level targets of the business (Ryder, 2009). Catalogue, SLM, and availability management processes ensure that services are recorded, monitored and available, while IT service continuity management is concerned with ensuring that the required IT services—including technical services—can be restored within the required and agreed upon business time spans (Helbig, Hrdinová & Canestraro, 2009). The aim is to ensure that the IT service provider can always provide the minimum agreed upon service levels and minimise disruptions (Jorstad, Van Thanh & Dustdar, 2004). Information security on the other hand aligns IT security with business security to ensure that information security is managed effectively in all activities of service management (Clinch, 2009). Its purpose is to ensure confidentiality and integrity, and that organisational assets, information, and data are available (Burtscher et al., 2009). Lastly, supplier management ensures that suppliers and the services they supply are managed to provide continuous quality IT service to the business, thus ensuring value for money (Hoisseninassab & Ahmadi, 2015). The aim of supplier management is to ensure that all contracts and agreements with suppliers support the needs of the business (Mamaghani, 2006). The following section presents the capacity management process.

2.9 Capacity management process

2.9.1 Introduction to the capacity management process

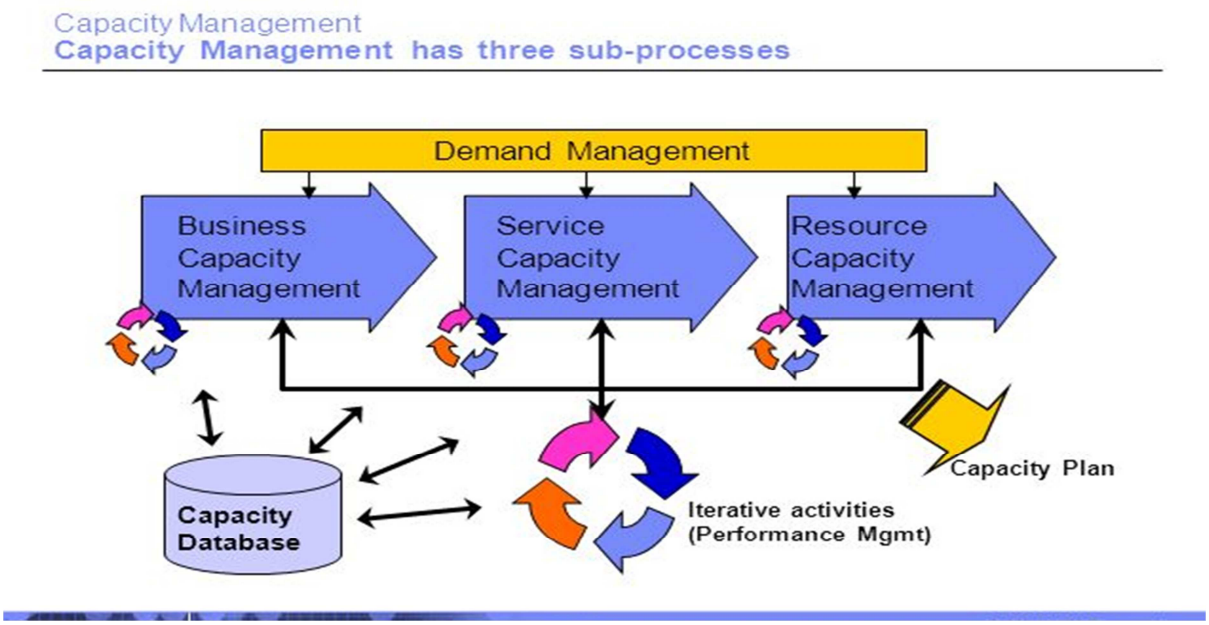

Figure 0.4: Capacity management

A lack of capacity means that something has run out of space. If a server runs out of capacity, or an organisation runs out of network bandwidth, it can lead to the performance of a service being negatively affected (Agutter, 2012). When resources run out of capacity, performance suffers, thus affecting the business (Brewster et al., 2012)**.** Eighty percent (80%) of critical service downtime is associated with human errors and process failures, while the other 20% is constituted by technology, environment failure, or disaster (Velitchkov, 2008). Such errors and failures are costly and could lead to disruptions and loss of the business' confidential data (Klosterboer, 2011). Additionally, if services are not protected from unauthorised changes, it could affect security, efficiency and compliance, thus having a significant impact on business operations (Saetang, 2011). According to Waschke (2009), capacity management is often overlooked; it is a process within the service design stage that focuses on the proactive management of resources and performance. It is not limited to technology alone; it is a process of placing policies and procedures in place to govern capacity (Mager & Sung, 2011). In order to understand how to utilise capacity, an organisation has to know the current capacity and how that capacity has been well used (Myiwa, 2009). Capacity management is a discipline of mastering and obtaining a balance between little and excessive (Klosterboer, 2011). Having little capacity could hamper business service delivery, while having excessive capacity could waste money (Klosterboer, 2011). As a result, capacity management is needed to ensure that the appropriate use of

available resources and future capacity needs are catered for in a cost-effective and timely manner (Waschke, 2009). The main aim is to ensure that IT capacity is cost justifiable in all areas of IT and that it is corresponding to the current and future agreed upon needs of the business in a timely manner (Bhatia, 2011). The output of capacity management also supports other processes such as informing change management of the need for additional capacity, or of the potential impact of a new service on current capacity levels (Brinkerhoff, 2010). Once more, capacity management is influential in ensuring compliance with service levels established through the SLM process (Few, Scott, Wooster, Avila & Tarazona, 2016). During the planning phase, features such as number of users, operational behaviour, software upgrades and implementations, growth of business transactions, and retirement of specific infrastructure elements must be considered (NBS, 2015). The following section presents the purpose of capacity management.

2.9.2 Purpose of capacity management

The main purpose of capacity management is to avoid wasting resources. Wasting money in the form of either time, computer resources, or human resources is to be avoided at all costs, hence capacity management addresses these challenges to ensure resources are not wasted (Klosterboer, 2011). While avoiding wasting resources can save money for the organisation, there are other reasons for implementing capacity management, which is to ensure that there is sufficient resources to cater for the current and future needs of the business (Brewster et al., 2010). This purpose introduces the aspects of supply versus demand and cost versus resources (Klosterboer, 2011). Supply versus demand denotes that adequate resources need to be available to support the business demand and meet agreed upon service targets, while cost versus resources denotes that spending on resources must be necessary and justifiable in terms of the need of the business, and resources must be used minimally (Brewster et al., 2010, 2012). Another purpose of capacity management is that it makes the implementation of new IT services less demanding by ensuring that adequate resources are available during deployment (Klosterboer, 2011). It also provides resource projections for budget planning accomplishments (Klosterboer, 2011).

2.9.3 Benefits of capacity management

When capacity is governed properly with the capacity management process in place, the performance of IT services will be improved and furthermore improve the availability of services (Agutter, 2012). Aligning the capacity to the business need by getting rid of unnecessary and spare capacity which is not needed to be maintained, saves costs and results in optimising capacity (ITILNews.com, 2016). Capacity management planning is critical, proving that planned buying is less expensive than repeated emergency buying,

which is expensive (Klosterboer, 2011). Another benefit of capacity management is that it interfaces with the Change Advisory Board (CAB), analysing the history or service change requests on existing capacity, thus reducing the risk of capacity problems caused by changes (ITILNews.com, 2016).

2.9.4 Why capacity management?

Although capacity management has been in existence for over 40 years, only a few organisations have implemented this (Potter, 2015). Favelle (2012) argues and confirms that many organisations have deployed service design, particularly on service level management and IT service continuity management; however, only a few have carried out financial management, availability, and capacity management. For this reason, the interest of the researcher has been sparked to explore the capacity management process in managing IT services, focusing only on ITIL v3, at a selected South African public sector organisation. Furthermore, capacity management provides critical support to other processes such as availability management, service level management, and financial and problem management (Axelos, 2014b).

2.9.5 Main aspects of capacity management

Constant and effective capacity management relies on three main aspects, **analytics**, **policies** and **planning,** to ensure accurate and reliable IT capacity calculations (European Medicine Agency, 2017). Analytics in capacity management is about forecasting the demand and requirements of the business by providing increased flexibility and productivity (Munusamy, 2013). There are four different types of analytics in capacity management, namely descriptive, diagnostic, predictive, and prescriptive analytics (Bauer, 2015). Firstly, descriptive analytics gathers information about current and past events, while diagnostics analytics analyses trends and identifies root causes (Bauer, 2015). Predictive analytics helps organisations to best plan for their future capacity requirements to ensure that sufficient capacity is available when the business needs it (Hill, 2016). When analysing capacity trends, it is necessary to assess usage pattern holistically and include mid- and long-term resource usage patterns rather than simply looking at peak and average activity (Mack, Jiang & Peterson, 2013). This type of information helps the IT department to form an idea of how workloads are currently emerging (Gartner, 2015). Lastly, prescriptive analytics is a proactive exercise that proposes solutions based on predictive analysis (Bauer, 2015). While analytics are more concerned with forecasting and providing for business demand, policies define infrastructure rules and business requirements to safeguard operations and the efficient provisioning of capacity (Klosterboer, 2011). Availability and disaster recovery requirements, regulatory compliance, and resource guidelines can be included when drafting capacity

policies for the organisation (European Medicine Agency, 2017). In contrast, planning without including predictions regarding future business user demands would result in the entire capacity planning determination being fruitless (BMC Software Inc., 2017b).

2.9.6 Activities in capacity management

Capacity management is a process that monitors the performance of IT services and the infrastructure that supports these services; this helps to diagnose problems before they negatively affect the customers and the business (Potter, 2015). It helps in analysing current demands on IT resources and then making forecasts for future requirements, and finally delivering a capacity plan that will be used by IT to meet the SLAs (Clinch, 2009). Analysis is the process of turning data into information; as a result, managers are informed and take appropriate actions (Potter, 2015). Subsequently, successful capacity management requires a detailed understanding of how business demand affects services and how demand affects performance, and this reflects on demand and performance management (BMC Software Inc., 2017b).

Demand management seeks and gathers information about business requests; it further seeks to interface with capacity management to ensure the service provider has the capacity to meet the demand (De Castro Melo & Alcantara, 2014). It is a critical aspect of ITSM. Poorly managed demand is a threat for service providers, considering that the need or requests cannot be anticipated (Burtscher et al., 2009). Demand monitoring is important because it enables IT to collect relevant data for specific components of services that can be presented to the business for good and effective decision-making (BMC Software Inc., 2017b). Its main objective is to make an impact on user and customer demand for IT services and manage the impact on IT resources (BMC Software Inc., 2017b). In addition, monitoring demand focuses on understanding how well IT supports its user demands for capacity through analysing how many users require which resource and how many resources each business activity consumes (Quichiz & Ore, 2017). It also provides input on the current capacity levels of resources and informs IT on how to manage new services when introduced into the environment as well as how new services affect current SLAs (Dutton, 2010). The data gathered when monitoring demand should be analysed to pinpoint trends and establish the average utilisation and service level or baseline (Waschke, 2009). Demand monitoring for capacity has become critical for organisations that want to mature and compete (Myiwa, 2009). Once the cost and expected demand of services have been identified, new data are needed to ensure that the service being built will have the necessary capacity for quality performance (BMC Software Inc., 2017b).

Performance management is the discipline of setting goals as well as monitoring and improving the performance of IT (Haanappel, 2011). It is a measure in terms of eminence of service, value added to the business, and the costs of service provided (Gomez & Pather, 2010). Performance management provides input into the financial management process through budget planning for either Infrastructure upgrades or the requisition of new components (Haanappel, 2011). Technology plays a vital role in the monitoring of thresholds and normal service levels. Should capacity exceeds thresholds, automated alerts can notify the Service Desk of the deviation so that the appropriate escalation procedure can be followed (Waschke, 2009).

Forecasting is an activity that allows the business to predict future growth and plan accordingly for capacity, depending on the technology in use (Waschke, 2009). Forecasting delivers a **capacity plan**, which is a process to put in place for the IT infrastructure to meet future workload demands (Hill, 2016). It is the critical function that translates business planning information into IT Infrastructure resource needs and predicts what resources need to be prioritised at a particular time to fulfil business needs (Bhatia, 2011). Failing to plan for capacity may result in organisations falling behind and be outplayed by their rivals who ensure that they do not only plan for capacity, but manage it as well (Myiwa, 2009). The main objective of capacity planning is all about optimisation; it is concerned with how to maximise the benefits of IT with less provisioning, thus balancing business productivity and IT costs (Brown, 2015). Once the demand and performance monitoring is in process and the capacity plan is in place, storage is needed for the information gathered, and this is where the Capacity Management Information System (CMIS) plays a critical role (Waschke, 2009). **CMIS** is a collection of IT infrastructure usage, capacity, and performance information compiled systematically and stored in one or more databases (Edman, 2011). CMIS maintains current resource catalogues which are used by all sub-processes within capacity management (Burtscher et al., 2009). CMIS information is not only stored, it also informs decisions, particularly for technical or management reporting, including the capacity plan (Potter, 2010). CMIS's accurate, all-inclusive IT infrastructure usage and performance information promotes error free reports, reduced costs, and better informed business decisions, and it is regarded as the basis for a successful capacity management process (Burtscher et al., 2009).

2.9.7 Capacity management sub-processes

Capacity management is a key process for designing every IT service and process, for instance, capacity constraints are indicated in incident management processes when incidents occur (Waschke, 2009). In change and release management, capacity

management must document any resources that are freed up to be made available for reuse in the next service, and also advises on how to use these assets in the future (Klosterboer, 2011). IT service continuity management should not only assist in recovering from disaster, but also stop the disaster from happening at all costs by providing disaster recovery capacity requirements for capacity planning (Few et al., 2016). Capacity management comprises three sub-processes, namely resource or component, service, and business capacity management (Velitchkov, 2008). **Resource capacity management**, also referred to as component capacity management, is the management of individual IT Infrastructure components and personnel (Rolia, Cherkasova, Arlitt & Andrzejak, 2005). It focuses on the management, control, performance prediction, utilisation, and capacity of technology components and devices such as hard discs, network interfaces, processors, printers, servers, switches, and routers (Rolia et al., 2005). In addition, the successful implementation of capacity management requires a team of professionals who are well trained and able to perform their roles (Klosterboer, 2011). **Service capacity management** focuses on the management, control, and prediction of end-to-end performance of live IT services usage and workloads (Axios Systems, 2017). It joins individual components such as email and telephony and measures performance by comparing it to requirements that are set in SLAs (Potter, 2015). Services are monitored to identify trends and indicate exceptions, while tools are used to detect peaks in service usage, load, and trends. In so doing, incidents can be prevented before they occur or data for incident resolution can be gathered when capacity-related incidents take place (BMC Software Inc., 2017b). **Business capacity management** is the highest level approach to capacity management, whereby business processes are mainly supported instead of the usage and performance of IT services (Potter, 2015). It ensures that the future business requests for IT services are reflected, calculated, and executed timeously (Waschke, 2009). This sub-process is directly connected to the demand of the business and ensures that the supply is in place when it is needed by the business (TechRepublic, 2014). It analyses business plans and needs and places them into an IT services perspective and architecture (Tech Republic, 2014). As customers' business changes, so are service requirements, thus affecting demand for capacity (Armistead & Clark, 1991). Business capacity predicts changing requirements for capacity demand and manages such demands on a strategic level (Gmach, Rolia, Cherkasova & Kemper, 2007). This compels the participation of capacity management in planning as well as financial and service level management (BMC Software Inc., 2017b). This way, information flow enables capacity management to plan and meet the future needs of the business (Potter, 2015).

2.9.8 Capacity management, elsewhere

Capacity management is executed for various reasons in different organisations, for example, ensuring high quality service and minimising system costs without compromising quality (Hwang, Gao & Jang, 2017). It enables ICT to plan ahead, manage utilisation, and respond timeously to business needs (TeamQuest, 2014). The process is not without challenges; one challenge is that ICT is battling to manage supply versus the demand, resulting in either wasting resources or having too little (TeamQuest, 2014). Managing supply versus demand has a direct influence on systems to achieve service quality and resource productivity targets (Armistead & Clark, 1991).

2.9.9 Capacity management in South Africa

IT departments in the public sector are faced with many challenges, including lack of appropriate skills, aging of equipment, underutilisation of IT services by user departments, duplication of IT resources within one organisation, lack of documented procedures, non-existence of IT strategies, inadequate network infrastructure, and contractors not performing according to contractual agreements (ITWeb, 2014). As part of redressing these issues, the State Information Technology Agency (SITA) was established to ensure that South Africa lives up to its promises of optimal public service delivery (Faling & Neilson, 2002). SITA introduced public-private partnerships (PPPs) to ensure IT Vendors are geared towards providing IT solutions that address government service delivery challenges (Faling & Neilson, 2002). In addition, the Presidential Review Commission (PRC) and Auditor-General (AG) reports identified a lack of political and strategic ICT leadership in the public service and as a result, the Department of Public Service Administration (DPSA) in collaboration with the Government Information Technology Officer Council (GITOC) and the AG developed the Corporate Governance of Information and Communications Technology Policy (DPSA, 2013). The framework was developed to enable political and strategic leadership to embrace ICT as integral support of the business (DPSA, 2013). The former president of South Africa, Thabo Mbeki during his office term in 2005, tasked the Governance and Administration (G&A) Cluster to assess capacity in the public service (DPSA, 2013). The assessment was concluded with some of the findings being the lack of correlation of ICT systems, immature monitoring and evaluation systems, and capacity not effectively used (De Villiers, 2005).

2.10 Summary

The literature assessed the implementation and use of ITIL processes in the public sector, with the focus on the capacity management process. This chapter highlighted the challenges the public sector encounters regarding ITIL and the factors affecting the capacity management process.

CHAPTER THREE: THEORETICAL FRAMEWORK

3.1 Introduction

Chapter Three provides an overview of the theoretical and conceptual framework for the study, introduces theoretical aspects and practical mechanisms, and discusses how these aspects and mechanisms are applied to the study to explain their relevance.

Theory is a methodical lens through which the study and its analysis can be based (Mlitwa, 2010). Theories should be used and treated not as a fixed source of truth but as helpful tools to understand the area of study (Mlitwa, 2010:77). The underpinning theory is a link between the theoretical aspects and practical mechanisms, creating a platform to inform researchers of the phenomenon that is investigated, to critique and extend existing knowledge within the limits of assumptions (Tubert-Brohman, Sherman, Repasky & Beuming, 2013).

This section introduces the selected theoretical framework for the study, summarising the framework's interrelated dimensions, key concepts, assumptions, limitations, updates, and criticisms. Additionally, the section highlights the relationship and guidance of the theoretical framework in relation to the study, which seeks to determine the information systems success, in particular the assessment of the capacity management process, in the South African public sector. Six leading variables—system quality, information quality, service quality use, user satisfaction, and net benefits—are the inputs, which are the key concepts in the theoretical framework chosen for the study. These key concepts are discussed in terms of how they are used in the study and in conjunction with the literature review. Furthermore, technology evaluation models and their significance are discussed briefly, considering that technology plays a major role in an organisation's productivity. The following section presents the evaluation models and information systems theoretical frameworks.

3.2 Technology evaluation models and information systems theoretical frameworks

3.2.1 Technology evaluation models

Technology evaluation is a set of principles, methods, and systems or tools used to critically assess the value and role technology plays in the organisation's competitiveness and productivity (Bakouros, 2000). It is imperative to evaluate technology in the manner it is intended to be used to determine the compatibility of the technology and systems (Lewis & Wrage, 2005). There is constant academic enquiry into IS technology models (Petter et al., 2008) such as the Technology Acceptance Model (TAM), Theory of Reasoned Action (TRA), and Theory of Planned Behaviour (TPB) (Averweg, 2008) to clarify why some IS models are instantaneously accepted by users, while others models are not. TAM highlights that the

attitude of a user towards the system plays a significant role to ascertain whether the user will actually use the system (Chuttur, 2009). However, acceptance is not necessarily fulfilment, although it plays a significant role in indicating IS success (Burtscher et al., 2009). Furthermore, both TRA and TPB provide a framework to study attitude toward behaviour, indicating the most important determining factor—behavioural intent (Ong, Day & Hsu, 2009). The authors' assumptions are that people are sensible and make use of information at their disposal and consider the implications of their actions before they even decide to behave or not to behave in a certain way (Averweg, 2008). The following section presents the Information Systems theoretical frameworks.

3.3 Information systems theoretical frameworks

3.3.1 Introduction of information systems theoretical frameworks

A theoretical framework is the structure that holds together or supports a theory of an academic enquiry, and it introduces and defines the theory to explain why the research problem under study exists (Maxwell, 2011). A theoretical framework is also referred to as a map or travel plan when planning a journey to a specific destination (Sinclair, 2007). The role of the theoretical framework is to influence research design with decisions about what to enquire, and to give significant guidance in terms of formulating relevant and meaningful research questions (Kelly, 2010). It also fortifies methodology and has an effect on how data are analysed and interpreted (Tubert-Brohman et al., 2013). A theoretical framework helps researchers to justify their research (Maxwell, 2011). Lastly, theory about a particular topic may be discovered, contributing new knowledge to what is already known about the topic (Glaser, 2013). The theoretical framework is therefore the backbone of the research and has direct implications on every decision made in the research process of the enquiry (Tubert-Brohman et al., 2013). Other theoretical frameworks have been applied to evaluate the success of IS but the most common include Prybutok's (2009) Comprehensive Framework Model, the Contingency Theory by Olson and Weill (1989), and the Information Systems Success Model by Fogarty, Armstrong and Dimbleby (2003). The following section presents the comparison of Information Systems theoretical frameworks.

3.3.2 Comparison of Information systems theoretical frameworks

The comprehensive framework of Prybutok (2009) justifies the value and contribution of IS expenditure on the productivity, quality, and competitiveness of the organisation. The comprehensive framework is usually presented as having three major dimensions—intercultural competence, personal interaction, and customer satisfaction—which build on the main *service quality* variable (Ihtiyar, Ahmad & Osman, 2014). Furthermore, the comprehensive framework stipulates that intercultural competence has a major impact on

customer satisfaction, both directly and indirectly, through personal interaction, with several studies emphasising the significance of intercultural competence in a marketing context (Hopkins, Nie & Hopkins, 2009). The inception of contingency theory is traced back to the 1960s when management theory and research adopted a new direction, one that exemplified a simple concept and enabled significant advancements in the study of management and organisations (Zeithaml, Varadarajan & Zeithaml, 1988). Contingency theory is also referred to as the contingency approach, emphasising the importance of situational influences on managing organisations, and questions the presence of a single, best way to manage or organise (Islam & Hu, 2012). Nowadays, the contingency approach dominates theory and research in literature on management and is built on the basis that best practices depend on the contingencies of the situation, often referred to as “it all depends” theory (Zeithaml et al., 1988). It is also regarded as a main contributor to the services science as it focuses on content analysis and the selection of contingent metrics on factors such as organisational culture, management philosophy, perspectives, legislation, the industry sector, and customers (Olson & Weill, 1989). The contingency theory of organisational structure provides a main framework for the study of organisational design while it maintains that the most functional organisational structural design is where the structure fits the contingencies (Donaldson, 2001). The DeLone and McLean IS framework measures the system, information, and service quality to obtain effective use of the system and user satisfaction which in turn delivers benefits that have an impact on effectiveness and success (DeLone & McLean, 2003). The DeLone and McLean IS framework is also regarded as a model to provide the platform and best fit for measuring enterprise systems success (Petter et al., 2008).

3.3.3 Comparison of the DeLone and McLean framework to the previous version

IS managers are under immense pressure to justify the value and contribution of IS expenditure on the productivity, quality, and competitiveness of the organisation (Myers, 2003). They often have none of the needed tools to accomplish their task and as a result fail to meet the needs of their customers (Moody, Woszcynski, Beise & Myers, 2003). Due to the complex nature of IS it has become more challenging and unclear to define IS success (Hellstén & Markova, 2006). To address this challenge, DeLone and McLean (1992) reviewed a study conducted during the period 1981-1987, classifying IS success by emphasising six concepts. The DeLone and McLean (D&M) Information Systems (IS) Success Model introduces systems quality that measures technical success, information quality that measures semantic success and use, user satisfaction and individual impacts, and organisational impact that measures effectiveness and success (Gomez & Pather, 2010). This model emphasises the need to assess the information system by suggesting a

more inclusive IS assessment framework that incorporates the performance of the organisation and ideas that emerged from other disciplines (Petter et al., 2008). Such a theory has the potential to contribute to the quality and productivity of the information system by providing feedback to align, manage, and improve the IS function (Iden & Eikebrokk, 2014).

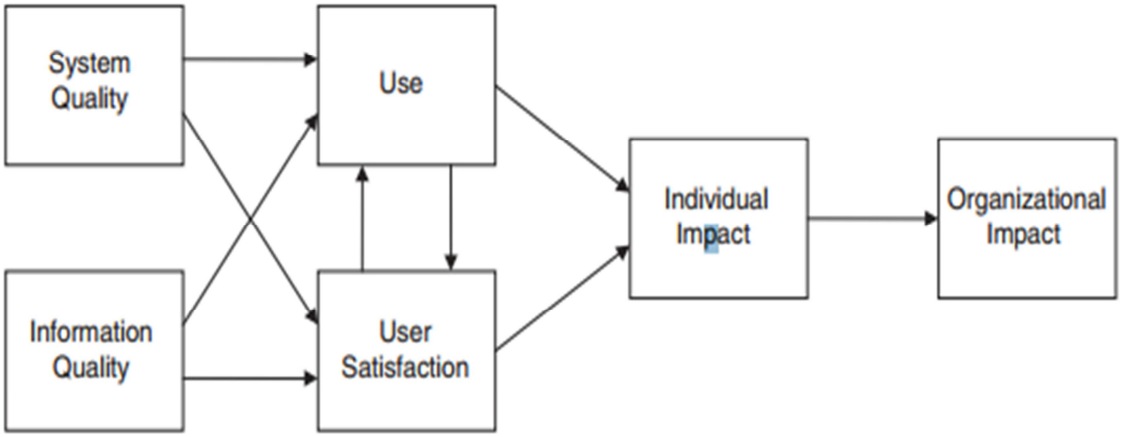

Figure 0.5: DeLone and McLean framework (1992)

The on-going study on IS continued beyond the publication of the D&M IS Success Model, requesting modifications to the 1992 model for further development and substantiation (Seddon & Kiew, 1996). Seddon and Kiew studied a portion of the IS Success Model, including system quality, information quality, use, and user satisfaction, making changes to the construct and highlighting that the essential success claim of the study that has been explored is *usefulness*, not *use* (Fogarty et al., 2003). Seddon and Kiew argued that *use* is an applicable measure for voluntary systems, however, *usefulness* is a more enhanced measure of IS success than *use* if system use is compulsory (Seddon & Kiew, 1996). DeLone and McLean (2003) responded that, even in compulsory systems, *use* is still essentially used, arguing that the concept *use* must be retained. Other researchers recommended that service quality be incorporated into the D&M model to measure the service provided by IT departments in contrast to individual IT applications by evaluating user expectations and their perceptions regarding IT (Fogarty et al., 2003).

Another enhancement to the model highlights that an information system can affect levels such as workgroups, industries, or societies other than individual and organisational levels as indicated in the 1992 model (Petter et al., 2008). This has led to the further modification of D&M, substituting the concepts, individual impact, and organisational impact with net

benefits, thereby justifying benefits at various levels of analysis and applying the model to whatever level of analysis the researcher deems most relevant (Hellstén & Markova, 2006). Lastly, the D&M model has been enhanced with updates to further clarify the use of construct, with the authors highlighting that use must be followed by user satisfaction in a process, and with positive use leading to even greater satisfaction in causality (Ramesh & Voß, 1996). Ramesh and Voß, (1996) further state that continued user satisfaction will lead to a higher intention to use, which will subsequently affect use. Hamilton and Chervany (1981) confirm that this is measured by the quality of reports, timelines, quality of service, and user communication (Scott & Chervany, 1981). Furthermore, other researchers highlight that the degree of ease associated with the use of the system and the degree to which an individual believes the technical infrastructure exists to support use of the system are direct deciding factors of user acceptance and use behaviour (Ong et al., 2009).

3.3.4 The updated DeLone and McLean Information Systems (IS) Success Model

3.3.4.1 Introduction

The IS Success Model provides a practical way to assess user satisfaction and the effects of this satisfaction on the use of information systems (Hellstén & Markova, 2006). Organisations increasingly invest significantly in IS, and IT spending is on the rise despite the economy being either high or low, thus driving organisations to properly manage budgets or to cut costs that require critical scrutiny of the benefits and cost of technology (Ajoye, 2014). It is then clear that organisations continue to invest in technology even in times of crisis (Kozina & Popović, 2010). Technology investment, like any investment, emanates from recognition on the basis of analysis and evaluation, and as such, organisations are in general interested in return on investments, with the impact of technology often indirect and influenced by factors such as human, organisational and environmental factors; this, in turn, makes the measurement of IS success complex (Petter et al., 2008). As challenging as it may be, research emphasises the significance of measuring IS success since costs and risks of large technology spending and investments may hamper organisational pay offs and benefits (Myers, 2003). Because of the emphasis on success, IS success plays a critical role in the field of information systems (Myers, 2003).

IS assessment is a significant necessity for health and performance to continuously improve the IS function. Such improvement relates directly to the overall performance of the organisation as measured in terms of effectiveness (Melville, Kraemer & Gurbaxani, 2004). Adequately assessing IS success is critical for both practitioners and researchers to gain an understanding of the value of IS management and the investment thereof (Hellstén & Markova, 2006). However, IS success is an all-round concept that can be assessed at

different levels, with various participants having different opinions of the success of the same information system (Zaied, 2012). In particular, the developers may be mostly interested in technical success, while end users are only concerned with easiness of use, and managers are merely interested in seeing the increased revenues gained through the use of IS (Halonen & Thomander, 2008). There are IS success measures such as the DeLone and McLean model as a framework to measure IS success; these success measures are widely used by IS researchers, focusing on enquiry and measuring the six dimensions of IS success (Manchanda, 1992). Furthermore, each of the variables describing the success of an information system is consistent in measuring the impact of system quality, information quality, service quality, use of information systems, user satisfaction, and net benefits (Ajoye, 2014). The researcher is aware of the justification of the value and contribution of IS expenditure as outlined by the comprehensive theory, the content analysis and metrics affecting organisational culture, and the management philosophy addressed by the contingent theory. However, this study focuses only on systems and information quality as specified by DeLone and McLean to help assess the capacity management process of ITIL in public institutions. The DeLone and McLean (2003) IS Success Model measures the functional, performing, and secure system as well as the accessible information and responsive service to effective use and user satisfaction, thus producing effectiveness, access to services, and increased productivity. Currently literature available on the actual performance or value of the capacity management process of ITIL in the public sector is minimal (Zaied, 2012). These aspects are shown in the IS Success Model in Figure 3.2.

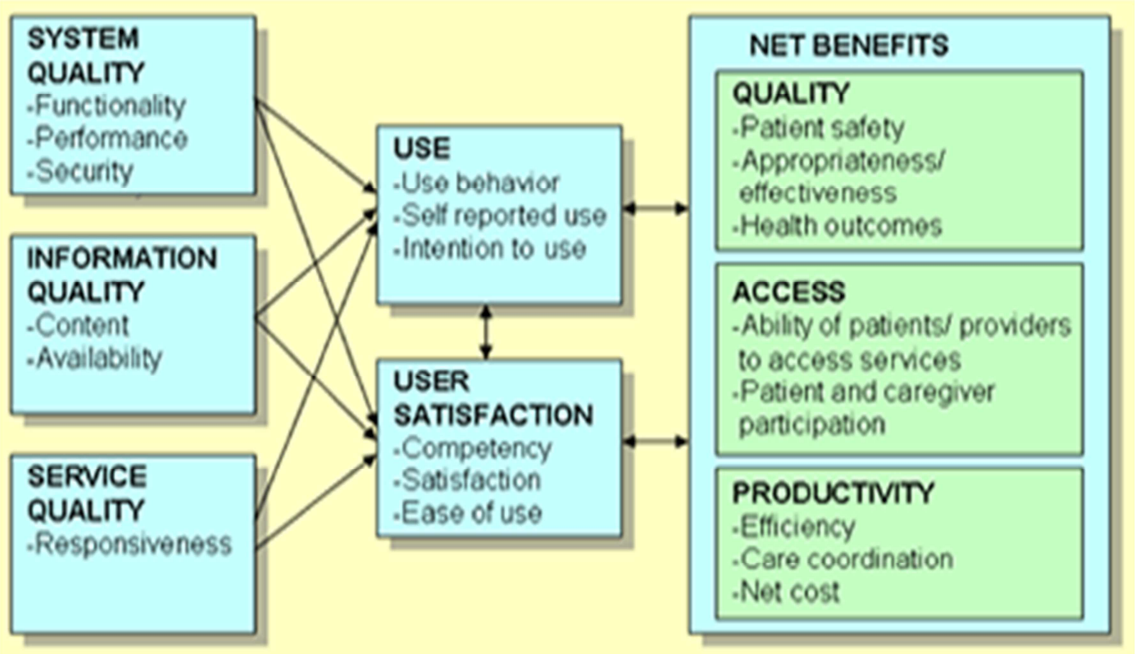

Figure 0.6: DeLone and McLean framework (2003)

3.3.5 Six dimensions (key concepts) of the DeLone and McLean model

3.3.5.1 System quality

Quality in an organisation is defined as excellence, value, conformity to industry standards, and meeting the expectations of customers (Gorla, Somers & Wong, 2010). When organisations place emphasis on excellence, value, conformance, and eliminating errors throughout their operations, products and services at the highest level desired by their customers, these organisations will be able to enjoy benefits such as savings and additional profits (Nelson, Todd & Wixom, 2014). Errors are common, with costs seemingly minimal, but over time and with repeated mistakes, costs escalate to large amounts that might stand in the way of businesses flourishing (Slavek, 2001). Thus, simply eliminating errors from the onset can result in significant overall benefits to the business (Nelson et al., 2014). System quality is therefore referred to as using best technology, adhering to industry best practice and software standards, and delivering error free performance in services (Gorla et al., 2010). System quality is also regarded as a way to manage how businesses create the products and services they sell in order to hold organisations accountable and have structures, procedures, processes, and resources in place to implement rules that keep the products they create safe (Hamilton & Chervany, 1981). The more the system quality is appreciated by users, the more satisfied they are with the system (Juhani, 2005). The elements of system quality include ease of use, system flexibility, system reliability, ease of learning, and response times (Nordström, Axelsson & Melin, 2011). Ease of use is perceived as the most common measure of system quality; however, ease of use on its own does not address all issues relating to system quality (Sharda & Steiger, 1996).

3.3.5.2 Information quality

Information quality refers to the value of the outputs delivered by the information system, either in the form of reports or online (DeLone & McLean, 1992). There are four main dimensions in information quality, namely accuracy, completeness, consistency, and currency (Nelson et al., 2014). Accuracy denotes that information is correct, faultless, specific, dependable, and free from error (Nelson et al., 2014). Completeness encompasses the recording of all values of a specific variable and is concerned with loss of information, ensuring that information is sufficient, and covers the entire scope of the task concerned (Tejay, Dhillon & Chin, 1995). Consistency is achieved when there is no conflict between two information sets and the representation of information is the same in all cases (Bytheway, 2016). Currency refers to up-to-date information (Dawes, Lobb, Moulden, Redman & Wheeler, 1992; Redman, 2001).

3.3.5.3 Service quality

The role of the IS unit is not only limited to managing products and services, but also to fulfilling the role of service providers. Pitt, Watson and Kavan (1995) recommended that the DeLone and McLean (1992) framework be adjusted to include service quality, which birthed the DeLone and McLean (2003) framework. *Service quality* is an assessment of whether the delivered service meets the client's needs (Business Dictionary, 2016a). Service quality is an experience based on how good the service is that the customer receives (i.e. customer satisfaction) (Prabandari & Rofiah, 2001). Customer satisfaction is related to customer perceptions and customer expectations (Juhani, 2005). Service quality is directly affected by customers judging their expectations of the service they will use and their perceptions of the organisation that provides the service (Sharma & Wu, 2015). In information systems, service quality refers to the support offered to users, measuring availability, responsiveness, fairness, and understanding (Halonen & Thomander, 2008) Other measures of service quality entail the competency of support staff, including their expertise, experience, and capabilities (Ajoye, 2014).

3.3.5.4 Use

Use is defined as placing something such as a tool or skill to a particular purpose (Cambridge Business English Dictionary, 2016a). System use is the number of times and the way in which the users utilise the information system, for example, degree of use, occurrence of use, nature of use, fitness of use, purpose, and extent of use (Petter et al*.,* 2008). The extent of use directly affects user satisfaction positively or negatively (Moody et al., 2003). The quality and productivity of information systems can only be improved if the systems are actually used (Myers, 2003). This brings to the fore the subject of measuring information system use, which includes the intention to use and the actual use (Petter et al., 2008). Intention to use directly affects the actual use of the information system, which determines system acceptance by its users (Alharbi & Drew, 2014). Intention to use is highly influenced by attitude towards system usage (Pousttchi & Wiedemann, 2008). This means knowing the intentions of users and understanding the factors affecting user belief towards system use would be of great significance, particularly for the IT team and management in terms of devising mechanisms to attract users towards a higher frequency of system use (Park, 2009). If users have a positive intention to use a specific system, the chances of them actually using that system are very high, meaning that the intention to use is directly affecting the actual use (Fathema, Shannon & Ross, 2015)

3.3.5.5 User satisfaction

Satisfaction is the combination of feelings or attitudes, both positive and negative, affecting the specific situation (Gomez & Pather, 2010). It includes both perceptions and attitudes (Bokhari, 2005). It is an independent evaluation of a performance related to a standard, which, when the standard is met is referred to as satisfaction, or as dissatisfaction when the standard is not met (Hirsch, 2011). Satisfaction is an important aspect of maintaining customer retention (Van Vuuren & Van Tonder, 2012); it influences a customer's decision on whether to continue a relationship with the organisation (Van Vuuren, 2012). User satisfaction is used as a measure of system success or failure and has been used as an alternate measure of system effectiveness in information systems (Vaezi, 2013). User satisfaction is the degree to which users measure whether the information system meets their needs (Ives, Olson & Baroudi, 1983). It is assumed that satisfied users will be more productive (Bakke, Myrtveit & Stensrud, 2008). Furthermore, Bokhari (2005) claims and highlights the fact that user satisfaction is influenced by technology that supports decision making. This claim is supported by Ng'ang'a and Waiganjo (2015), who state that technology improves user satisfaction, and that organisations are using technology in their internal and business processes. Prasad et al. (2010) argue that user behaviour is the best measure of assessing satisfaction.

3.3.5.6 Net benefits

The term *net benefits* refers to the degree to which individuals, groups, organisations, industries, and nations prosper as a result of information systems (Dong & Zhu, 2002). Perceived usefulness is the most common measure on an individual level (Melville et al., 2004). Individuals have the habit 'to use or not to use' the system to the degree they believe it will enhance their job performance, which is perceived usefulness (Prasad et al., 2010). On organisational level, however, great emphasis is placed on team roles in the workplace, leading to a high level of performance (Myers, 2003). Additionally, Ray et al. (2005) discovered that the most substantial IT investment contributions occur at a low organisational level where implementation takes place.

Other aspects of net benefits include quality, access, and productivity (Vaezi, 2013). The support of Information systems cannot go unnoticed in most organisations, for example banks cannot process payments, governments cannot collect taxes, hospitals cannot treat patients, and supermarkets cannot stock their shelves without the support of information systems (Carañana, 2012). Information systems touch base in almost every sector—education, finance, government, health care, manufacturing—and businesses large and small play an extremely significant role (Bourgeois, 2014). As a result, quality in IS cannot be

compromised, which denotes that the information system must be technically as well as economically viable (Hardcastle, 2011). Technical viability means the system must be able to perform within the required speed, volume, usability, and reliability constraints (Hamel, Hertz, Falk & Walter, 2013), whereas with economic feasibility the benefits accrued by the system must be worth the cost (Franchetti, 2011). Adequate security of information systems is a critical aspect of management; almost all applications dealing with finance, privacy, human resources, safety, or defence involve an extensive form of access control (Hu, Ferraiolo & Kuhn, 2006). Access control is concerned with authenticating legitimate users, mediating every attempt by a user to access a resource in the system (Fatema, Chadwick & Van Alsenoy, 2009). It emphasises that information systems must be private, easily accessible by users, and highly secured (Sattarova Feruza & Kim, 2007). Various information needs lead to diverse types of information systems integrating the numerous processes of organisational operations, thus saving time and costs (Bere, 2014). This leads to faster decision making and fewer errors made, which increases productivity (Gomez & Pather, 2010).

3.3.6 Extensions and updates of the DeLone and McLean model

Firstly, the DeLone and McLean IS Success Model, having six dimensions as published in 1992, was founded on theoretical IS research conducted by a number of academics, traced from 1970 to 1980 (DeLone & McLean, 1992). The six dimensions of the 1992 D&M model have been identified as system quality, information quality, use, user satisfaction, individual impact, and organisational impact (Juhani, 2005). It was however discovered that these six dimensions have not been empirically tested (DeLone & McLean, 1992), for instance, there might be no benefits with or without system use unless there is empirical measurement (Ramesh & Voß, 1996). Furthermore, DeLone and McLean suggested a model of temporal and causal interdependencies between the six dimensions (Kudyba & Vitaliano, 2003). A temporal process model indicates that an information system is created with various features, which, with the use of the system and its information products affects the individual user and in turn has an impact on the organisation (Sawyer, Guinan & Cooprider, 2010). Unlike a temporal process model, a causal or variance model focuses on the difference in the success dimensions to determine if there exists a causal relationship between these dimensions (Kudyba & Vitaliano, 2003). Academic inquiry into the dimension of IS success kept on advancing over the years, reviewing IS success measurement of the multidimensional relations to reflect the empirical dimension and challenges of the growing e-commerce field (DeLone & McLean, 2003). Based on on-going studies, DeLone and McLean's IS Success Model was updated by adding a service quality measure as a new dimension to the model and by grouping all individual and organisational impacts into a category called *net benefit* (Wang & Liao, 2008). An additional dimension has been added to

the updated DeLone and McLean model, namely *intention to use*, which states that before using the system, the attitude of the user shows whether they will use it or not (DeLone & McLean, 2003).

3.3.7 Criticisms and limitations of the DeLone and McLean model

Despite the multidimensional and conditional nature of IS success, the various dimensions used to measure IS success should be reduced so that research results can be compared and findings validated (Ramesh & Voß, 1996). As indicated in the DeLone and McLean model, *intention to use* and *use* are directly related, which makes it difficult to measure (Petter et al., 2008). Also, it is not clear whether the model's intentions can indeed help IS experts to better manage their IS in practice (Riempp, 2009). Some researchers have used the model to evaluate only a certain information system or used model to support their chosen success variable rather than using the model holistically (Hellstén & Markova, 2006). This poses the question whether the findings are specific to that system and its organisational context or whether it may be explained by the nature of the system (Riempp, 2009). Even though it has been highlighted that when measuring IS success, system usage takes priority, intention to use is also an important part of system success since psychologically, a user will not use the system if he or she does not have the intention to use it (DeLone & McLean, 2003).

3.3.8 Assumptions of the DeLone and McLean model

The DeLone and McLean IS Success Model assumes that system quality and information quality, separately as well as used in conjunction, both affect user satisfaction and use (Ramesh & Voß, 1996). Some of the assumptions relating to causal relationships in the DeLone and McLean model are uncertain and the model seem to be inadequate; in particular, the model lacks feedback on individual and organisational impact of user satisfaction and use (Haanappel, 2011).

3.4 Relevance of the theory to the study

The DeLone and Mclean model is an IS model that gained a reputation over the years, and it has been widely used to evaluate the success of IS (Mardiana, Tjakraatmadja & Aprianingsih, 2015). The continuous improvement and review of the D&M model, progressing through contributions, causes it to remain relevant and to meet the requirements set by different types of information systems and from different points of view (Petter et al., 2008). The model's key concepts consisting of system quality, information quality, service quality, use, user satisfaction, and net benefits are relevant to the selected study and address the content that focuses on the assessment of capacity management in the public sector. The D&M model has been applied and studied further over the years, which brought

about some critics and even the call for adjustment. However, it is still mainly used as the model of reference for IS success (Esteves, 2007). The model has exceeded the expectation based on achieving the primary objective, which is to use it for reporting and analysing IS success and effectiveness (DeLone & McLean, 2003). The updated DeLone and McLean Information Systems Success Model has been applied to the study using its six dimensions, namely system quality, information quality, service quality, use, user satisfaction, and net benefits, with additional IS dimensions, namely audit and quality control, processes, reporting, impact, profitability, and effectiveness being applied to the study.

3.5 Conceptual framework

Figure 3.3 shows the conceptual framework for the capacity management process.

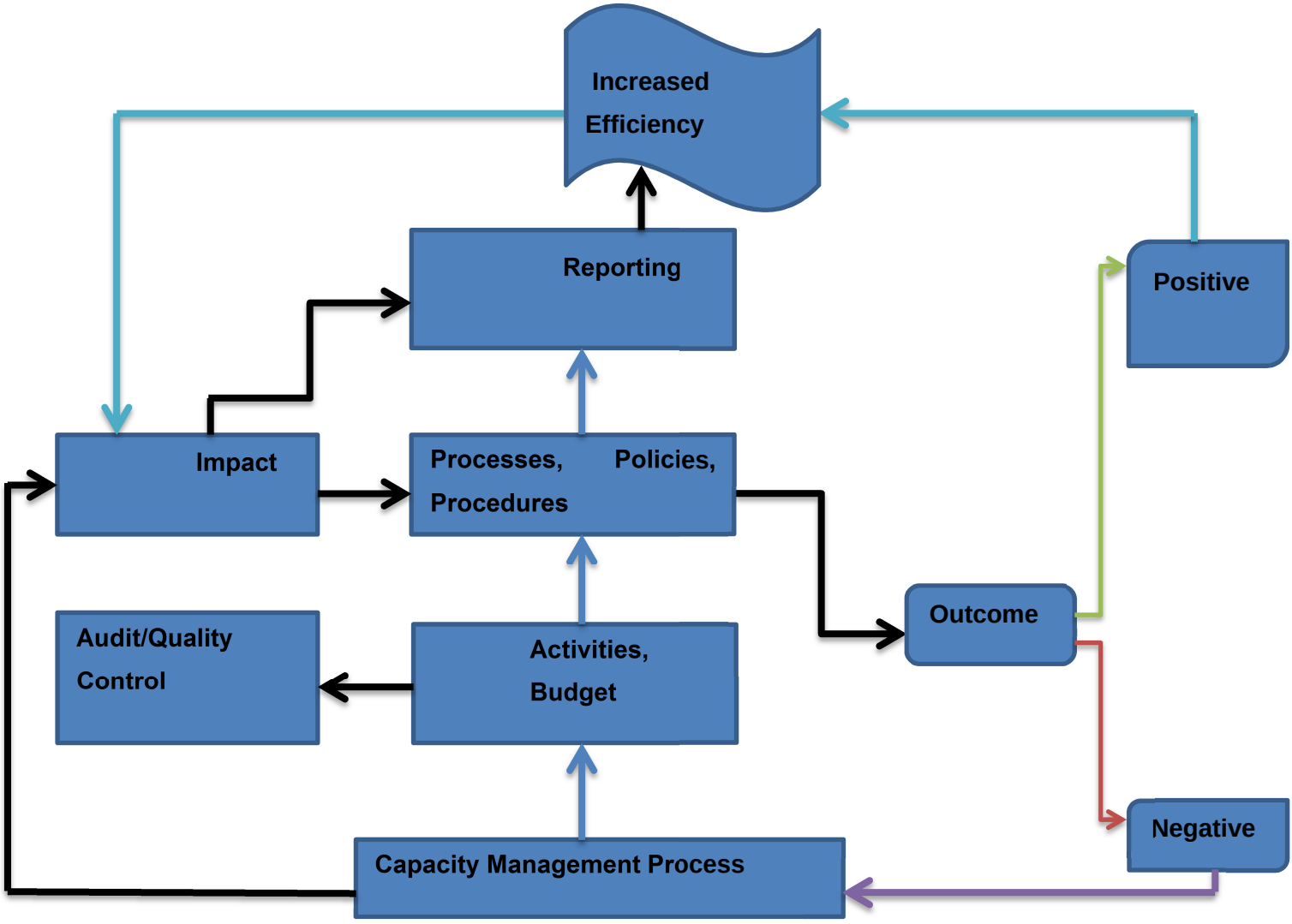

Figure 0.7: Conceptual framework for the capacity management process

The conceptual framework of the study has been derived from the additional concepts that were incorporated into the DeLone & McLean framework. The researcher deemed it appropriate to process, audit and quality control, impact, effectiveness, profitability and reporting to enhance capacity management.

On the conceptual framework for the capacity management process as shown in Figure 3.3, the red arrow denotes that there is a problem. It has been highlighted in the problem statement that despite ITIL being established as a standard for managing IT services within the South African public sector, the value of the key process of capacity management has not been determined. Literature reveals that capacity management is a process that monitors the performance of IT services and the infrastructure that supports these services, and this helps to diagnose problems before they negatively affect the customers and the business (Potter, 2015). However, the positive outcome assists in analysing current demands on IT resources, thus making forecasts for future requirements, and finally producing a capacity plan, which will be used by IT to meet the SLAs (NBS, 2015; Reddy, Singh & Petkov, 2013). As per findings, a negative outcome can result from the business only viewing ICT as a support function instead of an integral part of the business. Other challenges include monitoring systems that are not configured to address the business operations need, and as a result not bearing the intended results; ICT strategy not aligned to business and non-adherence to processes; and information not disseminated to relevant stakeholders, which delays service improvement and hampers inter-unit relations. A skills shortage among infrastructure staff working on capacity contributes to low turn-around times, to not meeting agreed SLAs, user dissatisfaction, and an overall non-performance of ICT that further affects service quality. A final challenge is the inconsistencies of not practicing ITIL as per the prescripts. To address these challenges, it is imperative for ICT to firstly outline clearly activities to be undertaken for Capacity Management. Secondly, ICT to be continuously audited on processes and procedures to ensure work is delivered according to ITIL prescripts. The more processes are consistently audited, the more they will improve thus increasing efficiency and furthermore having impact on services. Lastly, reporting makes room for continuous improvement.

Recommendations of this study include the following:

i) To continuously measure, review, and improve services, ICT has to place more emphasis on implementing ITIL consistently across lifecycles to ensure that ITIL yields the results anticipated.

ii) Business and ICT has to be integrated to ensure communication between executives who make business decisions and IT managers who oversee technical operations.

iii) By knowing the direction in which the organisation is going and the needs of the customers and users, ICT can begin to improve its own internal processes to meet these demands.

iv) Efficient monitoring of the ICT environment ensures that risks are reduced and systems are proactively managed.

v) ICT infrastructure reports should be communicated throughout the organisation in the same way as budgets and expenditure.

vi) To bridge the gap and combat ICT skills shortage, new ICT employees have to undergo extensive training, while existing employees need to be continuously upskilled to enable them to perform optimally.

vii) ICT has to be cognisant and informed of the various standards relating to technical, data, process, and quality standards. This will assist ICT in positioning itself to continuously deliver quality service and operate on a high performing standard.

3.6 Summary

This chapter described the theoretical and conceptual framework used as a tool to understand the area of study. The DeLone and McLean framework was discussed, and the theoretical aspects and practical mechanisms as well as how it has been applied to the study to explain the framework's relevance, were introduced.

CHAPTER FOUR: RESEARCH DESIGN AND METHODOLOGY

4.1 Introduction

This chapter provides an overview of the research design adopted in the study. It identifies the research philosophy, research approach, research strategy, and research methods used in the study. The sampling and data analysis techniques used are discussed. The practical approach adopted to achieve the aim and objectives is elaborated on. The research philosophy used in this study is interpretivism, with qualitative research as a research approach and case study as a research strategy as it is distinguished by the ability to investigate the phenomenon of SASSA in assessing capacity management in the public sector. The research method used to collect data is interviews.

Rajasekar, Philominathan and Chinnathambi (2006:2) define research as an orderly search for information on a particular topic. It differs from one researcher's knowledge and interest to the other. Research may take one of two forms, namely inductive or deductive research (Bhattacherjee, 2012:12). Inductive research is based on moving from specific observations to generalisations to build theories, while deductive research moves from the general and ends with the specific, thus testing the theory (Burney, 2008). Apart from forms of research, there are purposes of research such as exploration, description, and explanation (Babbie, 2001). To explore is to provide a basic understanding of the approach in order to examine a new interest or conduct an inquiry into a problem that has not been defined clearly (Babbie, 2010:92). It is done to understand the subject and quench the researcher's curiosity (Babbie, 2010:93). To describe is to define situations and events accurately (Babbie, 2010:93). Lastly, explanation refers to clarifying things with the aim of indicating the connection between variables (Babbie, 2001). Woodbridge (2014) defines methodology as ways of obtaining, organising, and analysing data. Research methodology is therefore an arranged, consistent way of solving a particular problem and a discipline of how research is to be carried out (Uusitalo, 2014). It is an enquiry with structure from general information to research design and data collection (Cater-steel et al., 2009). It is furthermore regarded as a procedure the researcher follows to perform research operations (Rajasekar et al., 2006). It is also defined as the study of methods through which knowledge is gained by means of systematic observation, classification, and interpretation of data (Dawson, 2005).

4.2 Research paradigms

While research is defined as a methodical investigation in which data are collected and analysed (Alghamdi, 2015), a research paradigm is defined as the researcher's basic set of beliefs guiding the researcher through the research process (Denzin & Lincoln, 2005). Each

of the three main research paradigms—positivism, interpretivism, and critical approach—is composed of components such as ontology, epistemology, and methodology (Denzin & Lincoln, 2005). Positivism refers to the scientific method that aims to test a theory or describe an experience through observation and measurement (O'Leary, 2010:28). The positivist paradigm builds an ontological assumption of the social reality, which constitutes that certainties (Schunk, 2008) and the knowledge from a positivist paradigm should be measurable, objective, value free, and universal (Alghamdi, 2015). Interpretivism states that both knowledge and the researcher work together and cannot be separated since the researcher is the only source of the reality coming up with his/her own interpretations of the world (Mack, 2010). This paradigm supports the epistemological assumption that our epistemic stance dictates what kind of knowledge we provide (Tennis, 2008). Furthermore, critical approach is defined as the researcher being able to critique the subject of a particular study from a practical, experienced perspective (Morris, 2006). The critical approach aims to eliminate injustice in society by addressing any kind of inequality (Irakoze, 2015).

4.3 Research design

4.3.1 Overview of research design

Design is an analytical task embarked on to ensure that the evidence collected enables the researcher to answer questions or to test theories as accurately as possible (Broadhurst, Holt & Doherty, 2012). Research design deals with a logical problem, not a logistical problem. Before builders or architects can design a work plan, they must first understand what type of building is required, its uses, and the needs of the occupants, among other (Sobh & Perry, 2006). The research design is a plan that describes how, when, and where data are to be collected, analysed, and interpreted (Papadopoulos & Lees, 2002). This is where the researcher holistically answers the research question or tests the research hypothesis (Polit & Beck, 2004). The research design follows the interpretive philosophy adopted by the qualitative approach, with the case study as a strategy, and interviews and documents as research methods, as shown in figure 4.1.

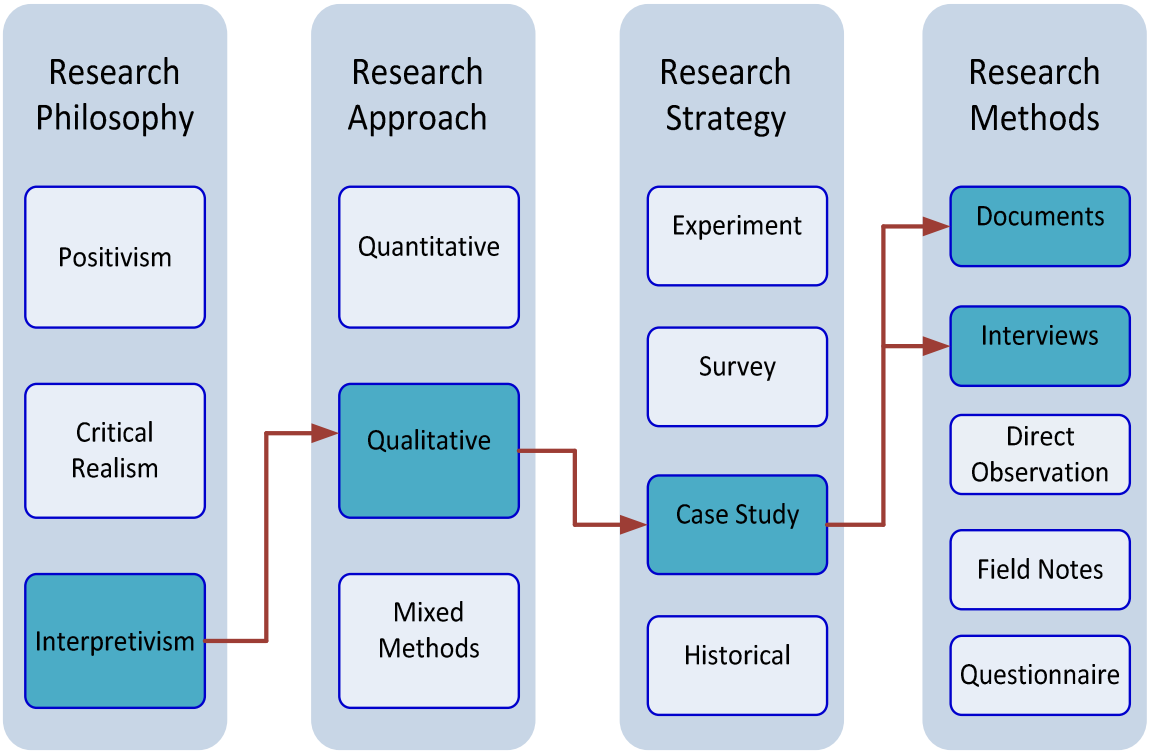

Figure 0.1: Research design overview

4.3.2 Research philosophy

Research philosophy refers to the advancement of knowledge and the nature of this knowledge (Saunders, Lewis & Thornhill, 2009). A research philosophy is a belief regarding the way in which data of a phenomenon should be gathered, analysed, and even used (Davidson, Martisons & Kock, 2004). Different views exist in research today on conducting an inquiry, which is dominated by philosophical classifications such as epistemology, ontology, axiology, and doxology (Mkansi & Acheampong, 2004). Tennis (2008) refers to epistemology as how we know what something means, thus influencing how we create knowledge. Epistemology is acceptable knowledge in a field of study, with the data collected being accurate and therefore the outcome being more objective (Saunders et al., 2009). Epistemology looks at how someone gets to know reality, assuming the relationship between the knower and what is known (Maree, 2008:55). Epistemology is concerned with how we know that what is known is true. Ontology is concerned with the nature and structure of reality, focusing on the nature and structure of how things evolved (Staab & Studer, 2007). The ontological view assumes that the real world is made up of physical and relatively static phenomena (Maree, 2008:53). It also supports scientific methods such as positivism that has a strong belief that knowledge can be acquired through these methods (Maree, 2008:53, 55). The positivist view is based on the conviction that society consists of structures, concepts, labels, and relationships that function and are tested scientifically (Maree, 2008:53). Axiology

focuses on questions about what should be; it deals with the nature of values and relates to the lessons of moral values and character development (Tomar, 2014). Lastly, doxology refers to what is believed to be true, unlike epistemology that speaks to what is known to be true (Myeko, 2014).

This study follows the interpretivist philosophy, supporting the notion that reality is constructed by subjective perception, and meaning is therefore socially constructed (De Villiers, 2005). According to Cohen et al. (2007, cited in Mack, 2010), the primary role of interpretivism is to understand, explain, and clarify social reality through the eyes of different participants.

4.3.3 Research approach

The choice of a research approach is based on the nature of the research problem or the topic, the experience of the researcher, and the participants of the study (Cresswell, 2014). The research approach refers to the research plans and procedures that categorise the steps from broad assumptions down to detailed methods of data collection, analysis, and interpretation (Neuman, 2013). This research follows the qualitative approach, defined as a style for exploring and understanding the meaning of individuals or groups attributed to a social or human problem (Soiferman, 2010). The decision to use the qualitative approach originated from fact that quantitative research lacks deeper theoretical analyses, while qualitative research addresses the overall aim of the study holistically (Stokes, 2000). It addresses complex situations by incorporating the real world context and creating an understanding of the world in which we live and why things are the way they are (Hancock, 1998:2).

4.3.4 Research strategy

Research strategy is a combination of plans or actions designed to achieve investigation goals as it will be challenging to design an effective research project without a clear direction of what the research project is attempting to achieve (Krishnaswamy, 2004). An effective research strategy consists of the aim, clear objectives, research questions, data collection resources, and various factors affecting the research in different ways, including limitations such as access, time, location, money, and ethical issues (Saunders et al., 2009). The research strategy provides the overall direction of the study, including the process in which the research is conducted (Wedawatta, Ingirige & Amaratunga, 2011). The strategy used in this study is the **case study**, which a methodology to explore a single phenomenon in a natural life context to obtain in-depth knowledge within a period of time (Cresswell, 2014). The case study allows the researcher to explore and understand complex issues and therefore it can be considered a vigorous research method particularly when a holistic, in-

depth, detailed investigation is required (Zainal, 2007). One of the reasons for using the case study as a research method is the limitations of quantitative methods to provide holistic and in-depth explanations of the social and behavioural problems under investigation (Tellis, 1997). Through the case study method, a researcher is able to go beyond the quantitative statistical results and understand the behavioural conditions through the actor's perspective (Zainal, 2007). Therefore, the case study is used in this study to offer insight that might not be achieved with other approaches such as surveys or experiments, and it is viewed as a useful tool for the preliminary, exploratory stage of a research project (Rowley, 2002). It is also regarded as the most flexible of the research strategies, providing a holistic characteristics view of real-life events while the researcher is investigating empirical events (Schell, 1992).

4.3.5 Research methods

The choice of a specific research method should be influenced by its relevance to answer the research questions (Bryman, 1984). A research method is a strategy of enquiry which moves from general assumptions to the research design and data collection (Cater-steel et al., 2009). It is also the collection of methods, techniques, assumptions, and values used in a particular form of research (Mlitwa, 2012:70). The method adopted for this study is interviews. The interview is a technique used to gather primary data for all types of qualitative research (Nyame-Asiamah & Patel, 2009). It is also a two-way conversation between the interviewer and interviewee to gather data from the participant (Maree, 2008:87). The semi-structured interview was used whereby the interviewer asked the participant questions to investigate and clarify responses (Maree, 2008:87).

4.4 Case description

The South African Social Security Agency (SASSA) is a national agency of the South African Government. It was created in April 2005 to administer the application, approval, and payment of social grants in South Africa. It was designed to reallocate the function of social security from South Africa's provinces to the national sphere of government and to report to the Ministry of Social Development. As with many other organisations, SASSA relies mainly on information that is processed by means of information technologies to achieve the smooth running of its daily functions. The execution of business processes, which in itself depends on the efficient flow of information, depends on the deployment and use of relevant and effective information technologies. This enables a unified collaboration between the SASSA employees and their stakeholders, including the grant beneficiaries. Since the formation of SASSA, the ICT branch has implemented technologies that enable the agency to execute its business processes. However, to ensure compliance to legislation, promote efficiency, and

align investments to business goals, the ICT services, which include acquisition, management, and maintenance of systems, need to be managed on an on-going basis. SASSA has since aligned its business with applying the Control Objectives for Information and Related Technology (COBIT) framework for the implementation of ICT governance and the Information Technology Infrastructure Library (ITIL) framework as a set of practices for ITSM focusing on aligning IT services with the needs of the business. In addition, all ICT services at SASSA are governed by the approved ICT service catalogue, which includes an inventory of ICT services, a definition of those services, and the terms of use. The ICT service catalogue is a centrally controlled document approved by the Chief Information Officer (CIO) and governs the use, implementation, maintenance, and management of ICT services within SASSA nationwide. SASSA is an appropriate case to investigate because it is one of the departments that has deployed ITIL extensively. All offices across the country are utilising ITIL locally for their IT processes. Effective management of IT services at SASSA has been identified as critical to ensure that services are maintained daily. Moreover, deploying ITIL ensures consistency throughout ITSM (Kanapathy, 2012). In South Africa, ITIL has been widely adopted as best practice for ITSM to improve customer service; however, the performance or rather impact of ITIL and its value to public sectors in South Africa remain unclear (Potgieter, Botha & Lew, 2002). The areas implemented include service desk, incident management, problem management, availability management, capacity management, and change management.

4.5 Data collection (sampling techniques and data collection methods)

4.5.1 Sampling techniques

Sampling is a method that selects a representation of the population and uses the data collected as research information (Latham, 2007). Depending on the population investigated, the researcher usually chooses between probability and non-probability sampling methods (Mlitwa, 2012:73). Probability sampling tests the accurate statistical description of a large population and guarantees that the sample observed represents the entire population (Babbie, 2010:196). Non-probability sampling is a technique where some, not all, units of the population are selected or where the selection cannot be accurately determined (Bhattacherjee, 2012:69). In this study, the researcher found that it is not feasible, practical, or theoretically sensible to conduct probability sampling, hence a non-probability sampling technique was used (Mlitwa, 2012:73), considering that the units observed were selected on the basis of their experience in the study and that they were the most representative (Babbie, 2010:193). Furthermore, purposive (targeted) sampling was used because the group, comprising the service providers and recipients of the ITIL capacity management services, has been predefined. Purposive sampling has been adopted for qualitative design to explore

the selected public sector where individual interviews were conducted among participants with the purpose of collecting in-depth qualitative data about their perception and experiences of capacity management in bringing value into the South African public sector. The sample size in qualitative design is small and is purposefully selected, preferring those individuals who have the most experience with the studied phenomenon - in this case the IT professionals in the selected public sector and IT unit heads (representing the business and users) who use the IT services daily. In addition, sampling comprises the unit of investigation, unit of analysis, and unit of observation (Mlitwa, 2012:72). The unit of investigation in this study is the South African public sector, while the unit of analysis is SASSA, and the unit of observation comprises the IT heads who are usually involved in the delivery of IT services and unit heads using IT services.

4.5.2 Data collection methods

As indicated in the beginning of this chapter, the research employs the interpretivist philosophy and applies a qualitative study approach with the case study as a strategy and interviews as the research method. The interview is a technique used to gather primary data for all types of qualitative research (Nyame-Asiamah & Patel, 2009). For more in-depth data on the capacity management process, extensive semi-structured interviews were conducted on selected samples of the IT unit heads and executive heads within SASSA. During the interviews, data were recorded and later transcribed to maintain accuracy. Data recording is as critical as other methods of data gathering such as taking notes and observations, since researchers can replay the recordings at their convenience to main accuracy when analysing the data (Maree, 2008:92). After data have been collected, it is best to transcribe it word-by-word electronically or digitally (Maree, 2008:108). Transcription assists with a rich data analysis since it includes some non-verbal signs such as silence, embarrassment, emotional distress, or a sigh (Maree, 2008:104). It is widely considered as an essential part of the analysis and interpretation of voiced data (Davidson et al., 2004). For this study, qualitative data through interviews were collected from ten participants.

4.6 Ethical considerations

The researcher undertook to comply with the ethical principles of the Faculty of Informatics and Design at the Cape Peninsula University of Technology (CPUT) as well as to the general principles of scientific research such as not being subjective in the process of data collection, data analysis, and interpretations for the benefit of the researcher’s personal agenda. The researcher agreed that no photos and contact details of participants and interviewees will be displayed and that no names will be revealed.

4.7 Data analysis

Data analysis is the process of establishing the participants' understanding of an area of study by analysing their perceptions, attitudes, knowledge, values, feelings, and experience (Maree, 2008:99). Data were analysed using the thematic analysis strategy, which is a methodical and replicable technique used to summarise words into fewer content based on the plain rule of coding (Stemler & Sonnabend, 2007). It is the process of viewing data holistically to identify keys in the text to assist in understanding and interpreting raw data (Maree, 2008:101). Once data have been transcribed, coding takes place, which is the accurate reading of transcribed data, line-by-line, and separating the data into analytical units (Maree, 2008:105). It is normal to move in circles by reading data across data sources repeatedly in coding as a researcher gains an understanding of things and as things are revealed through the data (Maree, 2008:107). In the first instance, coding acts as source of critical data collection; secondly, coding acts as markers and pointers of the researcher's observation; and lastly, coding enhances findings of deeper realities about the data (Maree, 2008:105). Once the data have been transcribed and coded, the next phase is to consolidate and associate related codes into themes (Maree, 2008:108). Thematic/conceptual analysis chooses a concept for examination and the analysis involves counting and adding its presence (Stemler & Sonnabend, 2007). A thematic/conceptual analysis identifies, analyses, and reports patterns or themes within data (Ritchie, Lewis, Nicholls & Ormston, 2013). Themes stem from data collected and from the researcher's understanding of the topic under study (Amukugo & Peters, 2016).

4.7.1 Steps in conducting a thematic/conceptual analysis

Table 4.1 shows the thematic analysis steps.

Table 0.1: Thematic analysis steps

1	Decide on the level of analysis.
2	Decide how many concepts to code for.
3	Determine the frequency of a concept.
4	Decide how to distinguish between concepts.
5	Develop rules for coding text.
6	Decide what to do with irrelevant information.
7	Code text.
8	Analyse results.

4.7.2 Themes, categories and sub-categories

Table 4.2 shows the identified themes that emerged from the theoretical framework of DeLone and McLean's IS Success Model and the Information Systems discipline. These categories and sub categories were derived from data collected (Ruhode, 2016).

Table 0.2: Themes, categories and codes

Theme	Category	Code/Sub-category
System quality	**System tools**	EoS
	Applications tools	ERP
Service quality	**Performance**	Capacity
		Skills
	Efficiency	Tools
		Technology
		Turnaround times
	Functionality	Planning
		Processes
	Monitoring	SLA
Information quality	**Accuracy**	Incorporation; Accuracy
	Communication	Stakeholder engagements
		Structures
		Targets
Use	**Optimisation**	System utilisation
		System analysis
User satisfaction	**Clients**	Users
	Governance	User awareness; Communication;
		Turnaround times; Closing of calls;
		Processes; Escalations
	Capacity	Support
		Capacity constraints
		Outsourced services
Net benefits	**Relationships**	Business engagement
		Commitment
	Research	Scientific solutions
	Governance	Processes
		Structure
	Net cost/Budget	Allocated funds
Process	**Implementation**	Implementation
		Performance
		Benefits
	Impact	Inconsistency
		Value
Audit/quality control	**Capacity management**	Processes
		Governance
		Capacity planning
		Capacity monitoring

Theme	Category	Code/Sub-category
Impact	**Business continuity**	Backup
		Business continuity
		Disaster recovery
Effectiveness	**Capacity management**	ICT commitment
		Services
		Responsibilities
		Managing
		Services
		Gaps
Profitability	**Performance and monitoring**	Capacity
		Projects
		Infrastructure
Reporting	**Infrastructure performance**	Limited reporting
		Inconsistence of reporting
		Capacity planning reporting
		Backup reporting
	Capacity	Capacity
		System availability
		Capacity planning
		Infrastructure
		Disaster recovery
	Processes	Planning
		Documentation

4.7.3 Description of capacity management themes

System quality

System quality refers to using the best technology, adhering to industry best practice and software standards, and delivering error free performance in services (Gorla et al., 2010).

Service quality

Service quality refers to the support offered to users, measuring availability, responsiveness, fairness, and understanding (Halonen & Thomander, 2008).

Information quality

Information quality refers to the value of outputs produced by the information system, either in the form of reports or online (DeLone & McLean, 1992).

Measuring use

Use is defined as taking hold of something with the intention to achieve something (English Oxford Living Dictionaries, 2017e).

User satisfaction

User satisfaction is an independent evaluation of a performance related to a standard, which when the standard is met is referred to as satisfaction, or as dissatisfaction when the standard is not met (Hirsch, 2011).

Net benefits

Net benefits refer to the amount to which individuals, groups, organisations, industries and nations prosper because of information systems (Melville et al., 2004).

Process

Business dictionary defines a *process* as a set of activities and steps that are consistent and associated with achieve a desired goal (Business Dictionary, 2016b).

Audit and quality control

Audit is defined as a systematic examination of an organisation's accounts by qualified accountants called auditors (English Oxford Living Dictionaries, 2017b). *Quality control* is a regular onsite examination of systems to ascertain whether or not these systems have been effectively implemented (English Oxford Living Dictionaries, 2017c).

Impact

Impact is defined as having a strong effect on someone or something (English Oxford Living Dictionaries, 2017d).

Effectiveness

Effectiveness is defined as adequacy in accomplishing a purpose by producing an outstanding result (English Oxford Living Dictionaries, 2017f).

Profitability

Profitability is defined as yielding profit (English Oxford Living Dictionaries, 2017g).

Reporting

Reporting is defined as providing information about something or someone (Cambridge Business English Dictionary, 2016b).

4.7.4 Data interpretation

Once data have been transcribed and coded, the next process is to interpret data to make sense of the data. Interpretation is explaining and analysing what participants have said and done in conjunction with the existing theory, which is the literature view (Maree, 2008:111).

4.7.5 Data validation

One of the main factors of data collection and processing is the need for data validation or data verification (Morris, 2006). Whether the research is conducted using the quantitative or the qualitative method, the study needs to be tested for validity (Aslam & Aftab, 2014). For data to be valid, it needs to appropriate, meaningful, and useful (Thanasegaran, 2009). Data validation in research refers to the level to which a method investigates what it is intended to investigate or how accurate the research results are (Kvale, 1996). Even though some questions in research cannot be answered satisfactory, the researcher needs to provide evidence to support the validity of the research (Drost, 2011).

4.7.6 Delineation of the research

The study only focuses on a selected South African public sector organisation because of its widespread use of ITIL as a best practice for ITSM. This study is a deductive research project with a descriptive contribution to knowledge. Performance levels of ITIL in the public sector as explained by DeLone and McLean will be communicated to both academic and practitioner audiences.

4.7.7 Ethical consideration

The researcher assured participants of compliance with the ethical principles of the Faculty of Informatics and Design at the Cape Peninsula University of Technology (CPUT) as well as the general principles of scientific research such as not being subjective in the process of data collection, data analysis, and interpretations for the benefit of the researcher's personal agenda. The researcher agreed that no photos and contact details of participants and interviewees will be displayed and that no names will be released.

4.7.8 Conclusion

The conclusion defines and proves to the reader the importance of research for a specific topic, restating the main arguments and recapping the entire study (Whitehead, 2004). It is not just about summarising the main topics highlighted in the research problem, but also about emphasising key points to reveal possible new areas of existing knowledge or future research (Maree, 2008:113).

4.8 Summary

In this chapter, the researcher discussed the research approach. The case study has been adopted as methodology to investigate the phenomenon of SASSA in assessing capacity management in the public sector. Data were collected using is interviews and analysed using thematic analysis. The steps of thematic analysis were discussed and the themes with categories were highlighted. The qualitative data were collected from senior ICT

professionals and executive heads at a South African public organisation by means interviews. The data analysis phase will be discussed in Chapter Five, while the discussion of findings will be done in Chapter Six, followed by the conclusions and recommendations in Chapter Seven.

CHAPTER FIVE: DATA ANALYSIS AND FINDINGS

5.1 Introduction

This chapter presents the outcome of the findings derived from the data analysis. Interviews were conducted to collect data from ten respondents and thematic analysis was used to analyse and classify related codes into categories. Furthermore, categories were analysed to find similarities that form themes or patterns. The themes were used to explore the capacity management process of ITIL in a selected public South African organisation.

Data were collected from the heads of the IT unit as well as the executive heads of the other three units, namely Corporate Services, Finance, and Grants Administration. The organisation, including IT, has internal auditors who audit IT processes, IT service delivery, and IT spending. The respondents were not limited to IT unit heads and executives that represent the business and users of IT service; the IT auditor has been included as a respondent in the study to provide insight into the IT department. All respondents were asked to participate. This was followed by signing the consent letters as required by the University and confirming the willingness of the respondents to participate in the study. Interviews were scheduled for thirty minutes each; however, 70% of the respondents continued beyond their scheduled time.

This chapter provides the background of the participants, followed by coding, categorising, creating themes, and summarising as part of the data analysis, which incorporates general data analysis primarily across all themes. Tables were used to ensure a simplistic, reader-friendly presentation of the data. The chapter concludes with a summary. The following section presents the description of data analysis and findings, focusing on system quality.

5.2 Description of data analysis and findings

5.2.1 System quality

To understand system quality, the following question was asked:

- What monitoring systems are available for hardware, software, or networking?

Responding to the question, JM-RESP3, AA-RESP7, and TR-RESP9 all mentioned that the monitoring system available for hardware, software, or networking is Eye of the Storm (EoS). JM-RESP3 further said that there is a lack of standard regarding reporting tools and preferred technology; EoS is not only monitoring availability and uptime but threshold too. EoS can “show in terms of usage for certain processes” (JM-RESP3). Similarly, AA-RESP7 stated that the only system they know of is EoS “in terms of systems availability but not sure

of its accuracy, since when certain offices are down, it is not reflected on the system… Not everything is incorporated on the monitoring system". TR-RESP9 confirmed that the "Eye of the Storm system is used to monitor the capacity performance". However, FC-RESP1 divulged that even though tools such as EoS are available, they do not really bear the intended or desired results. Apart from EoS as the monitoring tool, VS-RESP8 mentioned the use of Enterprise Resource Planning (ERP) as an application tool that monitors processor usage and memory usage. ERP was also mentioned as an application tool that measures the number of users accessing the system (JM-RESP3). The following section presents the description of data analysis and findings, focusing on service quality.

5.2.2 Service quality

The following questions were asked to understand service quality:

- How would you rate the skills, experience, and capabilities of capacity/infrastructure staff?
- Do they have the tools to be able to do the work?
- How would you rate performance against agreed upon service levels?

It is evident that there are quite a number of issues regarding staff capacity in terms of skills and capabilities as well as infrastructure for staff. One of the issues has been identified by FC-RESP1 and SN-RESP5 as capacity constraints. Both respondents indicated that capacity constraints is directly contributing to performance, while FM-RESP1 mentioned the difficulty to pinpoint skill competence and insufficient time to do proper troubleshooting due to capacity constraints. FM-RESP1 further stated that, "maybe on the aspect of capacity" resources are too limited in terms of numbers "to be able to look at all issues around that space. Most of the time as infrastructure you will find that you monitor either availability or accessibility in terms of network, but when it comes to the applications side you find that it is an area whether you do not have time or capacity to look into" (FM-RESP1). ICT is augmented by service providers "to deliver services to business" (SN-RESP5).

Most respondents pointed to the issue of skills shortage contributing to performance, which further contributes to service quality (JM-RESP3, SN-RESP5, FF-RESP6, AA-RESP7 & TR-RESP9). "Skills in terms of the support of the technology or the operation of the technology are missing; we do have the service, the technology itself is running well but we are lacking skilled type of resources" (SN-RESP5). The organisation relies on individual skillsets; the Technical Advisory Team (TAC) was formed, comprising of specialised skillsets "to assist units and regions at the same time" (SN-RESP5 & JM-RESP3). Thus, when regions want to procure infrastructure, the request has to go via TAC to analyse requirements, to "close the gap of capacity" and to advise. Both FF-RESP and AA-RESP7 pointed to the lack of skills

not only with organisational infrastructure staff responsible for managing capacity but also with outsourced service providers. AA-RESP7 further acknowledged that outsourced service providers are not only lacking in skills but also in best practice.

Responding to issues on whether the infrastructure staff have the tools to enable them to do the work, JM-RESP3, SN-RESP5 and FF-RESP6 indicated that there are either no tools at all or no relevant tools to do the work. JM-RESP3 said there are no specific tools and no standard of technology used across the organisation, while SN-RESP5 indicated there are tools available for the technicians and engineers to perform their duties, although the respondent does not think these tools are appropriate for these tasks. The other challenge highlighted is that it is not sufficient to provide users with technology without "being able to support it" (FF-RESP6). ICT is reactive rather than proactive due to the lack of planning (NM-RESP2). NM-RESP2 further pointed out the vital role of planning, and stated that they are:

> "…forever reactive rather than being proactive. It is more of like there is a project now, it needs 1,2,3,4, ok, we need to buy it. And by so doing or being reactive, we sort of disadvantage ourselves in a sense that you know when you buy in piecemeal you are not exercising economies of scale, you [are] not able to properly plan your layout of your environment".

VS-RESP8 mentioned issues with adhering to processes, for example, the company does have skilled technical staff, but the IT processes are a challenge, including logging a call. With these challenges stated, ICT has been rated by HDG-RESP10 as a unit with good turnaround times even though not all issues logged are resolved immediately, but they (ICT) do show up on time. Responding to performance on agreed upon service levels, JM-RESP3, SN-RESP5, FF-RESP6, and TR-RESP9 mentioned different issues on meeting the SLA targets. SN-RESP5 raised the issue of management having "to start streamlining solutions to resolving capacity issues in terms of skills, in terms of resource provisioning in order to meet the level of SLA performance that we have put out there and agreed upon". Other challenges raised include developing a service catalogue with a low maturity level (JM-RESP3) and the SLA performance not measuring correctly in a manner that assists the ICT department to meet the agreed upon targets (FF-RESP6). The Operational Level Agreement (OLA) was likewise mentioned by FF-RESP6: "We identified the services we have and what we proposed but we have not entered into any Operation Level Agreement (OLA) because we are just not confident of our infrastructure at the moment because of the migration, eDirectory, GroupWise are not being upgraded". The following section presents the description of data analysis and findings, focusing on information quality.

5.2.3 Information quality

To address information quality, the following question was asked:

- Do you know of any mechanism in place to analyse system usage and to report on performance?

It is evident that mechanisms are in place. EoS is used to analyse system usage and report on performance. However, the information provided by the system cannot be counted as accurate; when certain offices are down it is not always reflected on the system (AA-RESP7, VS-RESP8, HDG-RESP10 & TR-RESP9). AA-RESP7 highlighted issues regarding the limitation of system functionality in terms of ICT not being able to report accurately, meaning not everything is incorporated into the monitoring system. VS-RESP8 stated that there are mechanisms in place to analyse system usage but that the information is not passed on to the relevant stakeholders. In addition, HDG-RESP10 stated that in most instances, management only gets to know about such reporting when systems are down and local office users are complaining and escalating matters to executives. TR-RESP9 reported that the EoS reporting tool is used as a mechanism to analyse system usage, however, the issues revolve around unrealistic targets of attaining "95% availability of systems as a monthly target". The following section presents the description of data analysis and findings, focusing on measuring use.

5.2.4 Use

To learn about measuring use, the following question was asked:

- To what extent is usage of systems and performance data analysed in order to optimise resource utilisation?

VS-RESP8 mentioned that the organisation uses systems such as Oracle to determine how many people access the system within the organisation. For this, they analyse reports, compare the results to other regions, and encourage users to access Oracle. Such reports enable the monitoring of the usage and functionality of the system. Systems are analysed but in a very inconsistent manner (TR-RESP9). The following section presents the description of data analysis and findings, focusing on user satisfaction.

5.2.5 User satisfaction

To learn about user satisfaction, the following question was asked:

- How would you rate customers to determine if they are happy with the services provided?

Users are not satisfied with ICT services (FC-RESP1, KG-RESP4 & SN-RESP5). FC-RESP1 alluded to the aspect of support in particular: “If you have the report that gives you between 40% and 60% SLA output instead of [the] 95% target, it definitely tells you that you might not be having a happy user base”. The other contributing factor to user dissatisfaction is that ambiguous, confusing, non-supported ICT processes are put in place. KG-RESP4 reported that “the last time we [ICT] did a survey, we did not score very well, between [a] score of 1 to 5, we scored 2 to 3”, hence user dissatisfaction. SN-RESP5 backed up the claim that users are not satisfied by reporting that user response is “not good at all, the issue is basically [ICT] support”. JM-RESP3, however, maintained that not all users are unhappy: “It is in between, some happy some not happy”. Two factors, among other, include user awareness, “…users [are] not being informed, e.g. not aware that if the call has not been resolved it cannot be closed for any other reason”, and the closing of calls, “…calls being closed by technicians without actually assisting users to avoid calls running out of SLA, thus avoiding penalties” (TR-RESP9). FC-RESP1 indicated that calls are taking too long to be resolved, thus turn-around times pose a great challenge. Another reported instance is that some users are tolerating not receiving good ICT services; as such, these services remain idle.

There is also the aspect of communication between the receiver of the service and the provider of the service. There seem to be a gap between the users and ICT, and this leads to ICT being reactive (FC-RESP1). FF-RESP6 was adamant that “currently ICT is reactive to everything, not proactive”. The other issue raised is the lack of Head Office support that makes it difficult for regions to perform optimally (HDG-RESP10). Despite the majority of respondents not being happy with ICT services, VS-RESP8 mentioned that ICT is trying, however improvements need to come forth.

It was further reported that:

> “…users are happy that whenever we require assistance from ICT we get it on time; the only concerns that we normally get from district and local offices [are] mainly the availability of 3G cards and that systems are slow at times, and that they need more boosters. In terms of asking for equipment, it is quick to get except minor issues like 3G cards taking long to arrive because they prioritise local and district offices” (VS-RESP8).

In terms of capacity, FC-RESP1 reported that, “ICT resources are not enough in terms of doing the support”, thus contributing to slow turnaround times and leading to user dissatisfaction. To complement ICT Staff, some services are outsourced. FF-RESP6 raised the concern of outsourced services not delivering on time and therefore not meeting the agreed upon SLA targets. This means the outsourced capacity has a direct impact on users

who will make use of any means necessary to have their requests addressed. The other reported challenge concerns the "lack of SLA being signed and ICT not being able to enforce penalties for non-delivery [of outsourced services] according to [the] SLA" (FF-RESP6). The following section presents the description of data analysis and findings, focusing on net benefits.

5.2.6 Net benefits

To learn more about net benefits, the following questions were asked:

- How supportive is the business to ICT in meeting business needs?
- Are they able to meet the requirements?
- As much as ICT is supposed to be an integral part of the business, is the business working together with ICT?

The findings reveal that the business shows some level of support (JM-RESP3, TR-RESP9 & VS-RESP8). JM-RESP3 mentioned that "we have got [an] ICT Steering Committee, which are represented by executives of the branches. We have another structure called ARB (Architecture Review Board), which is represented by different managers from different units" (TR-RESP9). In addition to the support provided to ICT by the business, "the organisations is [sic] committed because it runs too many applications, and too little capacity will lead to the failure of them [business operations] to run" (TR-RESP9). The support provided to ICT by the business is further confirmed by VS-RESP8 who said that even the office of the CEO and other stakeholders are supportive. Over and above the business being supportive, SN-RESP5 indicated that in essence, "…the business is awaiting ICT to engage. ICT is lacking business relationship management and because of that, ICT is not able to enjoy the support from the business. For example, when business wants something, ICT just says business wants it without engaging and finding out why". Another factor is providing scientific solutions that speak to research. Both AA-RESP7 and HDG-RESP10 brought to light that ICT must not only engage the business, but also bring about scientific solutions. AA-RESP7 reported that:

> "ICT must be able to sell itself to business on certain aspects to make it more beneficial and say, business this is what we have in the marketplace and this is what our research has been telling us in order to make your business more effective; let us buy into this technology, simple things such as equipment. ICT must be forceful and tell business that yes, it maybe be cheaper now, but in a long run where we are going and it is more cost effective to start investing on these things now. I do not think ICT has been forceful enough in terms of getting business to the table to understand what is it that we can make available, and how it is going to benefit them".

In addition to what was mentioned by AA-RESP7, HDG-RESP10 was adamant that:

> "…ICT can be more proactive; currently ICT waits on business to take the lead. I do understand that they are overloaded with current workload with the available capacity; more can happen and that ICT advises the business that these are the new developments within the field and the business is willing to listen. Business does not always have knowledge, but ICT has to explore what is happening in the field, does the research, and proposes those new developments for the business, and picks up the trends as to what [is] supposed to be done instead of waiting for things to break down and do the damage control - and that time the damage has already been done. Besides grants admin structures, there is governing structures that ICT could engage business further..."

While some respondents pointed out issues not only with the business but also with ICT not being convincing enough, KG-RESP4 indicated that in most instances, business wants help immediately without allowing ICT to provide functional solutions. Business does not respect the ICT processes, and this hampers IT governance. Another factor contributing to how supportive the business is to ICT in meeting business needs revolves around structures as reported by FF-RESP6 stating that executive management is more supportive than lower management who sees ICT simply as a support function and not as an integral part of the business. The budget also plays a role in how supportive the business is to ICT in meeting business needs. If the business is supportive, are they allocating sufficient funds to ICT to execute its business mandate? According to respondents, the business is trying its best to support ICT - the business is being supportive and funds have been allocated (HDG-RESP10). JM-RESP3 stated that ICT is tasked with compiling the budget plan and forwarding it to the business for review; funds are then allocated in line with the projects that have been identified. As part of the performance review or report, ICT indicates achievements in relation to the budget that was allocated. Other issues regarding the allocation of funds are that, "even though budgets get allocated, they are not allocated timeously" to the regions, which has a direct impact on ICT service delivery (TR-RESP9). Another issue stated by TR-RESP9 is that of "currency fluctuation impacting on ICT services due to exchange rates". This implies that what has been projected for is not what is received from the market. The following section presents the description of data analysis and findings, introducing additional concepts focusing on process.

5.2.7 Process

To understand the process, the following questions were asked:

- How would you rate the implementation and benefit of ITIL at SASSA?
- Does it bring value to the public sector, particularly at SASSA?

KG-RESP4 and SN-RESP5 both reported that ITIL has been implemented and it is still a work in progress with a maturity level of two. This is supported by FF-RESP6 who indicated that even at its lowest implementation it adds value. “In the limited way that we have implemented it [ITIL], there is value coming from it, but there will be a lot more value from it once we migrate to Microsoft because we will be implementing a lot more of capacity management into the projected solutions” (FF-RESP6). In addition, bringing value to the business, “ITIL provides quality within an organisation” (JM-RESP3). The organisation has done very well in terms of “Local Office Improvement Plan for providing infrastructure at local offices, availability of systems that we have to support the business” (VS-RESP8). The business processes and turnaround times depend heavily on the availability of systems. The implementation of ITIL is not without challenges even though benefits are evident. One of the challenges of implementation is that users have not yet realised the benefits in terms of user satisfaction (TR-RESP9). There are also challenges regarding how much value it adds to the organisation, i.e. achieving the required level of repeatability. “We are achieving the required level of repeatability because once things are repeatable they become predictable. We have not really reached a level where we actually say things are predictable but we are getting there” (SN-RESP5). One of the contributing factors highlighted by NM-RESP2 is that the organisation is not always practising ITIL as per the ITIL prescripts, thus creating inconsistency. KG-RESP4 argued that “ITIL itself does not bring value, but it is the implementation of aspects of it [that] will bring the value, in other words, ITIL provides you with, first of all, the vocabulary to communicate; secondly it provides the framework or a structured framework to think”. The following section presents the description of data analysis and findings, introducing additional concepts focusing on audit and quality control.

5.2.8 Audit and quality control

To learn more about audit and quality control, the following questions were asked:

- Recently ICT has been audited, not only from a budget aspect but also from a process aspect, so what would you say about the outcome, what do the auditors say about ICT?
- Is ICT doing what it is supposed to do?

Various issues have been highlighted by TR-RESP9 in response to audit/quality control in ICT. Some of the issues identified include:

> “Terminations or deactivation of users in time on infrastructure, not only SASSA but [the] public sector at large. Reviewing of activities performed e.g. users performing duties on the network, users installing programs on their machines, and ICT engineers not being monitored. Access not monitored to ensure users are actually getting the access they requested. Capacity issues

with regards to skills and over reliance on service providers. Non-uniformity of processes, following same processes everywhere, not regions doing their own processes. Disaster recovery, process put in place but lack of testing therefore, and the fact that disaster has not happened, hence the lack of disaster recovery testing. Change management, no impact analysis on users during downtime. Lack of user awareness, turnaround times contributing to user not being satisfied. Calls being closed by service provider to avoid penalties and as such not showing a true reflection of what is actually happening. Poor communication by ICT. Not all regions have good infrastructure. Blanket approach not working due to network operator dynamics in various regions. Internet access issues due to poor infrastructure. Achieving 95% a challenge as stated in the Operational Plan target to be attained monthly. Not enough budget, thus impacting on ICT operations on achieving its goal. Budget not allocated on time to regions and thus impacting on regions achieving their goals. Currency fluctuation impacting on ICT service delivery due to exchange rates at time of purchase and that what has been projected for is not what is received from the market".

JM-RESP 3 mentioned that,

> "…according to [the] auditors, we [the organisation] are not doing bad at all, but the problem is difficult to measure because when auditors come, they audit for different processes at different times; they do not audit all processes at once; they just come look for two processes and audit them. Next year they would come for other processes and audit them. Yes, we have processes that we are doing so well and we do have others that we know we are not there yet, but are moving…"

FF-RESP6 stated that capacity needs are catered for with the Medium Term Expenditure Framework (MTEF), while AA-RESP7 indicated that capacity varies in different regions in terms of human capacity - there is structure but it is not funded, thus ICT is not taken seriously and this contributes to ICT being reactive. This statement made by FF-RESP6 has been confirmed by VS-RESP8 who said that when planning is done, it is seldom that the capacity plan is addressed after the operational plan. TR-RESP9 highlighted that the "capacity plan is not matured in SASSA, therefore the report produced is very minimal as there is [sic] no resources to analyse them". JM-RESP3 reported that capacity is managed by engineers to ensure that ICT has "enough server space, enough memory, and from there advise what needs to be done". Capacity planning is a cycle; it is continuous. Whatever is in the pipeline, ICT looks at the current infrastructure environment, what it can and cannot accommodate, and then from there "you start doing capacity planning and it is a cycle" (NM-

RESP2). The following section presents the description of data analysis and findings, introducing additional concepts focusing on impact.

5.2.9 Impact

To learn about impact, the following question was asked:

- The disaster recovery and capacity plan provides input to the business continuity plan; what input does the capacity management process provide to the business continuity process?

While, according to AA-RESP7, disaster recovery plays a critical role in backups that are managed nationally within the organisation and in tapes that are taken off regional sites, business continuity is also a major focus as the organisation currently does not have a business continuity plan. This has been identified nationwide as a major risk area and ICT has been tasked from a national perspective to look at a strategy and implementation of business continuity in all nine regions. “I doubt if we have any business continuity plan… and that was evident during the load shedding; it was only then that people were running around to say we need to buy more 3G cards and get more generators. People were just improvising and the CEO gave an instruction to the acting CIO to draft a business continuity plan in case the systems go down or load shedding” (VS-RESP8). TR-RESP9 highlighted that “the measuring of the system and performance to analyse data is not done regularly”, making it a difficult task for disaster recovery, capacity planning and capacity management to contribute to business continuity. HDG-RESP10 had no knowledge of whether there is any disaster recovery within the organisation. The following section presents the description of data analysis and findings, introducing additional concepts focusing on effectiveness.

5.2.10 Effectiveness

To understanding effectiveness, the following question was asked:

- How effective is capacity management in meeting business needs and how does it feed into other processes?

It is evident that capacity management assists the organisation in meeting its business needs, but with room for improvement. This is supported by VS-RESP8, who stated that “IT is committed to supporting the business but a lot could be done…” In addition, NM-RESP2 highlighted that capacity management has a major impact on all other services, including availability management. Any changes happening within ICT has an impact on capacity; there is thus a need to be able to know what is happening, in what direction the solution is going, and how the issues will be resolved. ICT senior managers have been tasked to

manage capacity in their respective regions. JM-RESP3 confirmed that all the senior managers from the regions are responsible for managing the capacity:

> "We have a senior manager infrastructure who is responsible for managing capacity… As a manager, you need to understand your capacity requirement from [a] personnel point of view for me to be able to provide these particular services… When you look at ITIL, capacity management is not always buying additional storage; it is not always buying memory. Capacity management also at the same time, as per ITIL, is user behaviour; you need to manage the user behaviour. For example, one way of managing capacity that we are doing in terms of managing user behaviour is to set limits. Setting limits to say, for example, for you GroupWise is so much, we are doing that purely just to manage capacity, because we know that if we do not do set limits, people will just continue, continue to grow without really managing it. So basically we want users to manage the capacity required. We set limits on different values, limits on storage, limits on bandwidth. For example, there was a requirement in one of our provinces and regions, they wanted to increase their WAN link because it is currently operating at full capacity, and I said no, we do not just always when we fill up the capacity that we have, we do not just say please upgrade; we need to do a proper analysis. For example, we need to understand what is it that actually is occupying that space and the work that has been done; is it work related or is an issue around security where you find out actually you have got so many viruses coming in, just emails spammed, etc."

The other aspect of effectiveness is that infrastructure staff are actually responsible for managing capacity, thus monitoring the backups, servers, switches, or routers. One of the major challenges within ICT in the organisation is human capacity in terms of ICT. "Currently one that is the major gap in ICT is in terms of human capacity; we have the organogram that is approved but not capacitated because it is not funded and ICT from [a] national perspective has not been forceful to ensure that the organogram is fully capacitated to address the gaps" (AA-RESP7). The issue of ICT in terms of human capacity is confirmed by VS-RESP8 mentioning that the organisation had to opt for outsourcing some services as an alternative in order to bridge the gap. The following section presents the description of data analysis and findings, introducing additional concepts focusing on profitability.

5.2.11 Profitability

To understanding profitability, the following questions were asked:

- Are there capacity management activities established within the organisation, e.g. monitoring of usage and performance, capacity planning, sizing of service elements, etc.?

- What are they?
- If not, why not?

JM-RESP3 emphasised that for capacity planning activity:

> "…you do not just upgrade because there is high usage. You need to understand what is the cause of that high usage; you need to understand the people that are using that infrastructure; you cannot have for example let us say [a] 2MB link being supplied to an office of 20 people and you find out that your 2MB link is always fully utilised. You need to understand how can a 2MB link be fully utilised by 20 people; we also do analysis before we just upgrade. We plan for upgrade where we know there is going to be growth; we look at trends, which is very important; for example, when I talk about mainframe - mainframe we normally look at the trend in terms of data growth, processor utilisation. So, if this is the trend for the year and we project it and this is the trend for past three years or past year, the projection for next year is going to be 1,2,3,4,5 based on for e.g. legislative changes as well. We look at trends, we analyse requirements, we look at the strategy, and from there we plan our capacity".

SN-RESP5 indicated that "capacity management is not happening consciously; even if, when you look at business, we have ERP as a service. We put ERP together, and we say we predict that in 2018, [the organisation] will have 18000 people and therefore we need to make sure that [the] technology we procure must be able to handle that capacity; we plan for it but not in detail". FF-RESP6 stated that to profit the organisation, there are migration-planned services that include migrating from the Novell platform to Microsoft Migration as well as the rolling out new services. There is also a plan to up skill users, not just the ICT staff but also the user base as a whole. Proper inspection is done to ensure that capacity management is adequately supporting the customers and business needs as well as in terms of the new offices that are rolled out (VS-RESP8). Limited human capacity in ICT is highlighted by TR-RESP9 who indicated there have been capacity management activities established; however, these are mostly being handled by third parties. The following section presents the description of data analysis and findings, introducing additional concepts focusing on reporting.

5.2.12 Reporting

To understanding reporting, the following question was asked:

- Are standard reports concerning performance produced on a regular basis?

The consensus with regard to reporting is that there is limited and inconsistent reporting on infrastructure performance. FC-RESP1 stated that "In terms of what I receive… there is very

little that is reported around capacity planning as well as capacity management". Furthermore, FF-RESP6 highlighted: "And now that we are not getting those reports I really feel the loss and impact of not having those reports and the effect that it is actually having on availability of services to our users". Some respondents were not aware of what is contained in the reports and how the reports are analysed. VS-RESP8 and TR-RESP9 both mentioned that they have not seen the systems performance reports, and do not know what is contained in the reports and how is it analysed, not even "in terms of how many people have got laptops, desktops and which software licenses they have". AA-RESP7 stated that "there is offsite storage in regions regarding backup but [I] have not seen any report to that effect". HDG-RESP10 indicated that "we get reports when we are doing the reviews and governing structures", while FC-RESP1 mentioned that capacity is managed, although this management is not without challenges as there are aspects regarding backups and the aging of infrastructure. FC-RESP1 stated: "At times the use of the resources exceeds a specific threshold and in such instances you will find, eh we do not necessarily deal with such high spikes in terms of a particular plan put in place". KG-RESP4 indicated that "I do not work directly with those reports; I use it to prove that my server was down, a line speed was down, in case something went wrong with the system. Unless there is a problem with the database and all that stuff, user has a problem with connectivity, etc." The issues around planning reported by FC-RESP1 include that mostly are challenges addressed as they appear without having a plan in place. FC-RESP1 further mentioned that "the use of experience might be vital but it is not always assisting" because the experienced person might leave the organisation and then documentation is needed to assist the new person in dealing with some of the problems.

5.3 Summary

In this chapter, the collected data were analysed and the findings were discussed based on the responses of the interviewees. Data were collected using themes in reference to the DeLone and McLean framework and added themes to the theoretical framework.

CHAPTER SIX: DISCUSSION AND FINDINGS

6.1 Introduction

In this chapter, interpretations and opinions of the findings are discussed. This includes an explanation of the implications of the findings and contributions to future enquiry. With the primary focus on answering the questions posed in Chapter One, this chapter elaborates on how the results support the answers and how the answers fit in with existing literature on the topic. The discussion is considered the heart of the thesis. The following section presents the discussion of findings, focusing on system quality.

6.2 Discussion on findings

6.2.1 System quality

6.2.1.1 System tools

The majority of respondents mentioned that the monitoring system available for hardware, software, or networking is Eye of the Storm (EoS), with some respondents indicating a lack of standard in terms of reporting tools and preferred technology that is put in place. Another issue highlighted is that the system is not configured to address business operational needs and therefore does not bear the intended results. System accuracy poses a challenge, considering that when certain offices are down, it is not reflected on the system. As mentioned by Gorla et al. (2010), system quality is referred to as using best technology, adhering to industry best practice and software standards, and delivering error free performance in services. This evidently shows the challenge in the way system monitoring is handled at the organisation and could further pose risks on organisational excellence, value, and conformance to industry standards, as highlighted by Poels and Cherfi (2006). Whenever excellence, value, and conformance are not addressed in an organisation, it could lead to excessive errors throughout the operations, products, and services desired by the customers.

6.2.1.2 Application tools

Besides EoS being used as an application tool, as indicated by the majority of respondents, a few also highlighted Enterprise Resource Planning (ERP), which is the Oracle business management system that integrates the applications an organisation uses to collect, store, manage, and interpret data, including purchase and service delivery. In addition, Oracle is used to monitor the number of users accessing the system. Not much has been said about the Oracle system except its functionality and use to monitor user access. Ali and Younes (2013) indicate that the more system quality is appreciated by users, the more satisfied they are with the system. System quality elements include minimal system complaints, ease of

use, system flexibility, system reliability, ease of learning, and response times. The following section presents the discussion of findings, focusing on service quality.

6.2.2 Service quality

6.2.2.1 Performance

The questions posed in terms of performance were related to capacity and formulated around the skills of infrastructure staff. Most respondents indicated a skills shortage, contributing to non-performance and impacting on service quality. It was also stated that the technology itself is running well but the organisation is lacking specific types of skilled resources, which results in the organisation having to depend on individual skills. Some respondents stated that skills are not only lacking among organisational infrastructure staff responsible for managing capacity but also among outsourced service providers. Outsourced service providers are mentioned as not only lacking in skills but in best practice too. Service quality does not only refer to customer satisfaction, it also refers to the competency of support staff, which includes their expertise, experience, and capabilities (Yoon & Guimaraes, 1995; Petter et al., 2003). While most of the respondents mentioned the lack of skills among Infrastructure staff, a few also commented on existing skills and indicated that challenges are more on capacity constraints and adhering to processes.

For questions on capacity, some of the responses focused capacity constraints, including a limited number of resources which become apparent when staff are assigned to calls where there is simply not enough time to conduct proper troubleshooting. The existence of challenges in terms of capacity constraints, skills capabilities of infrastructure staff, and adherence to ICT processes is evident.

6.2.2.2 Efficiency

Tools, technology, and turn-around times were the focal point of questions formulated to understand efficiency. Regarding tools, respondents stated that there are either no tools at all, or no relevant tools to troubleshoot or resolve specific issues. Respondents further indicated that there are no specific tools and no standard of technology used across the organisation. There is no set standard or uniformity, thus no specific tool has been put in place. In information systems, service quality refers to the support offered to users, measuring availability, responsiveness, fairness, and understanding (Halonen & Thomander, 2008). It would not be such a daunting task for the infrastructure staff to offer excellent service to their users if they have access to the relevant tools to conduct their work. Another challenge is technology support, considering that it is not sufficient to simply provide users with technology; the organisation also has to be able to support the very same technology deployed. As mentioned by some of respondents, ICT is making an effort to address these

issues. IT is viewed as a unit with good turnaround times, and even though not all issues logged are resolved immediately, the IT staff do show up on time.

6.2.2.3 Functionality

The questions asked to determine functionality focused on planning and processes. ICT is viewed as being reactive rather than proactive due to a lack of planning. Apart from stating that ICT lacks in planning, some respondents also mentioned user adherence to ICT processes as a major challenge. Service quality is directly affected by customer expectations, their evaluation of the required services, and their perceptions of the organisation providing the service (Oliver, Rust & Varki, 1997). It is evident that users are not only looking at whether ICT provides outstanding technical support, they also take into consideration the processes used. If ICT processes are not easy to follow, ICT will have an unhappy user base. Although it is important for users to follow ICT processes, it is equally important for ICT to follow their own processes.

6.2.2.4 Monitoring

To gain an understanding of the monitoring process, the questions posed to the respondents focused on the SLA. To meet the requirements of the SLA, management needs to start streamlining solutions and resolve capacity issues in terms of skills and resources. Another challenge raised includes developing a service catalogue as it is not measured correctly in a manner that assists ICT in meeting agreed upon targets. In addition to the SLA, the Operational Level Agreement (OLA) was mentioned; although ICT identified the services they offer, they have not entered into any Operation Level Agreement (OLA) with other sub-units due to the infrastructure that has not been upgraded. Service quality is an assessment of whether the delivered service meets the client's needs (Business Dictionary, 2016a). It is not only about delivery of services but whether the service meets the desired output as agreed upon by the business and ICT. Meeting the needs of business is a challenge within ICT as they have been agreeing to unrealistic targets and, as a result, contributed to unachieved targets and the monitoring thereof. The following section presents the discussion of findings, focusing on information quality.

6.2.3 Information quality

6.2.3.1 Accuracy

Respondents indicated that systems are in place to analyse system usage and report on performance. However, most of the respondents reported that information regarding these systems cannot be accepted as accurate; when certain offices are down, it is not always reflected on the system. Furthermore, system functionality is limited in terms of ICT not being able to report accurately and therefore not everything is captured on the monitoring system.

Accuracy denotes that information is correct, faultless, specific, dependable, and free from error (Levitin & Redman, 1995). Because not all information is reflected on the system, ICT is unable to deliver error free reports, implying that the reports cannot be relied on.

6.2.3.2 Communication

It has been mentioned previously that that systems are in place to analyse system usage; however, the information is not passed on to the relevant stakeholders. This practice does not only delay service improvement but also hampers inter-unit relations that are needed to place ICT in a better position to present itself to the business. Additionally, in most instances management only gets to know about error reporting when systems are down and local office users are complaining and escalating matters to executives. Information quality refers to the value of outputs produced by the information system, either in the form of reports or online (DeLone & McLean, 1992). The value of communication is that information is shared among role players. The following section presents the discussion of findings, focusing on measuring use.

6.2.4 Use

Use is defined as taking hold of something with the intention to achieve something (English Oxford Living Dictionaries, 2017e).

6.2.4.1 Optimisation

System utilisation and system analysis are observed as the main subjects of optimisation. The organisation uses systems such as Oracle to determine how many people access the system within the organisation, as alluded to by the respondents. System reports are compared to the reports of other regions, and therefore users from all regions are encouraged to access and use the system. The quality and productivity of information systems can only be improved if these systems are actually used (Myers, 2003). Understanding factors that affect the belief of users towards the system would be of great significance, particularly to the IT team and management in devising mechanisms that will attract users towards increased system use (Park, 2009). As more and more users access the system, the usage and functionality of the system are monitored. Further to the system being monitored on the basis of use and functionality, the system is reported to be analysed, albeit in an inconsistent manner. The following section presents the discussion of findings, focusing on user satisfaction.

6.2.5 User satisfaction

6.2.5.1 Clients

Regarding clients, most users are not satisfied with ICT services. Reports indicate a SLA output of between 40% and 60% instead of the 95% target. This unquestionably reveals that ICT services are not well received. There is however an indication that some users are happy with ICT services notwithstanding the large number of users who are dissatisfied. Furthermore, there are users who reportedly take advantage of and using their dissatisfaction of ICT services to be idle and to not further report ICT issues, and then use this as a reason for not being able to do their work. Gil, Hudson and Quintana (2008) refer to satisfaction as an important aspect of maintaining customer retention, while Ndubisi et al. (2012) concur that satisfaction influences a customer's decision on whether to continue a relationship with the organisation. This is confirmed by the feedback that although users are not happy with ICT services, they are also not prepared to continue any relationship with ICT in terms of reporting incidents.

6.2.5.2 Governance

Factors affecting governance include user awareness, closing of calls, turnaround times, escalations, processes, communication, and ICT response. With regard to user awareness, the respondents mentioned that users are not informed of what to do and what not to do when the call has been logged or the incident has been reported; the users are also not aware that if the call has not been resolved, it cannot be closed for whatever other reason. Further to this it has been reported by respondents that calls are closed by technicians without them actually assisting users in order to avoid calls running out of the allocated timeframe in which the query has to be resolved, thus avoiding penalties. Closing of calls is directly related to user awareness, meaning that users are aware that the call is not supposed to be closed unless it has been attended to by the technician to the user's full satisfaction. Respondents also indicated that calls are taking too long to be resolved, which implies that turn-around times are a major challenge. This relates to user awareness. If users were informed of what is contained in the SLA, they would be in a better position to actually monitor their logged calls as per the agreed service target stipulated in the SLA. Lack of user awareness has a direct impact on user performance. Selling their services is not ICT's only responsibility, they also need to ensure that users are aware of their privileges such as the right to ask to reopen unfinished closed calls and to report open calls that are past the turnaround times. When calls are not attended to within the specified time frames, the SLA has been violated, which leads to escalation. Respondents mentioned that there is no proper escalation procedure or level in place. The lack of user awareness affects most areas, including escalation - when there is no platform for escalating violations, or rather, when

users are not aware of the escalation process, an environment is created in which users are simply not satisfied, and this affects their productivity. This is confirmed by Bakke et al. (2008) who state that satisfied users are more productive. Mithas, Krishnan and Fornell (2003) confirm that technology improves user satisfaction, and that organisations are using technology in both their internal and their business processes. There is also the challenge of communication between the receiver of the service and the provider of the service, where there seem to be a rift between the users and ICT, leading to ICT being reactive.

6.2.5.3 Capacity

Some respondents reported that the lack of Head Office support makes it difficult for regions to perform optimally**.** Even though the majority of respondents are not happy with ICT services, it has also been mentioned that ICT does try to perform better; however, improvements need to come forth. Capacity constraint is a major challenge. Respondents reported that ICT resources are insufficient in terms of support, thereby contributing to non-compliancy of turnaround times, which leads to user dissatisfaction. With such a challenge, some of the ICT services are outsourced; however, outsourced services are also reported as not being delivered on time and as a result, agreed upon SLA targets are not met. The following section presents the discussion of findings, focusing on net benefits.

6.2.6 Net benefits

6.2.6.1 Relationships

Relationships, research, governance, and budget play vital roles in the net benefit of an organisation. On relationships, interviewee responses revealed that the business shows some level of support, with some respondents pointing to existing governance structures within the organisation that assist ICT in engaging with business. Over and above the business being supportive, respondents indicated that the business expects ICT to engage in business relationship management, but that ICT is lacking business relationship management, and because of this, ICT is not able to enjoy the support of the business. The ICT department deprives itself from improving its performance by not strengthening its ties with other teams, including the business. Grohowski, McGoff, Vogel, Martz and Nunamaker (1990) indicate that within the organisation, more emphasis should be placed on relationships among teams, which will improve performance and productivity. Business is committed to supporting ICT, owing to the fact that it relies on ICT to function. Confirming the feedback of respondents that business solely depends on ICT for it to function, Bresnahan, Brynjolfsson and Hitt (2002) concur that net benefit is the amount to which individuals, groups, organisations, industries, and nations prosper as a result of information systems. In addition, IT has become the support for businesses and organisations to the point where it

would be impossible for many to function and succeed without it (Chitambala, 2006). It is evident that the business is slowly realising the importance of ICT within the organisation and is therefore willing to engage and foster relations to improve service delivery.

6.2.6.2 Research

An important factor highlighted by respondents is that ICT should be addressing issues scientifically through conducting research. Most respondents brought to light that ICT should not only strive to engage the business, they should also bring about scientific solutions. Respondents reported that ICT is not able to sell itself to business on certain aspects to make it more beneficial. ICT has not been convincing enough in terms of engaging business with new technological developments and how it can benefit the business. In addition to what has been reported by most of the respondents, ICT is not proactive, and, as a result, does not take the lead in exploring what is happening in the field, doing the research, proposing new developments for the business, picking up on trends, and proposing new solutions. This evidence from the findings is in line with what has been said previously by de Bruijn and Herder (2009), namely that the IT discipline advances research, scholarship, and enquiry into new knowledge, and this in turn guides new advancements in various aspects of modern life. This is also confirmed by Peters, Schneider, Griesshaber and Hoffmann (2012) who state that in effect, research advancement is the most critical role of the IT discipline; it is a basis upon which modern technological developments are built. Furthermore, research advancements extend beyond just the productivity and competitive aspect; it also informs innovative improvements on existing technologies or inventions into new solutions (Uriona-Maldonado et al., 2012). This will not only assist the organisation in attaining its mandate, but also in setting them apart from other organisations, thus remaining efficient in offering quality services. Other aspects of net benefits include quality, access, and productivity, as stated by Petter et al. (2008).

6.2.6.3 Governance

While some respondents pointed out issues not only with the business but also with ICT not being convincing enough, some interviewees indicated that in most instances business wants immediate assistance, thereby not allowing ICT to provide functional solutions. As a result, business does not respect ICT processes and this hampers accountability and IT governance. Beyond the support and service performed by IT, there is also the need to manage and govern IT properly (Coertze & Von Solms, 2014). With respondents reporting that ICT has a challenge in getting the business to adhere to its processes in order to govern IT, Prasad et al. (2010) confirms that business support is key to attaining IT governance. Without adhering to IT governance, there will be no accountability. A further contributing

factor focuses on structures, where executive management is seen as more supportive than the lower levels management who view ICT as a support function instead of an integral part of the business.

6.2.6.4 Budget

The responses from participants show that the business is trying its best to support ICT by allocating funds. ICT is tasked to draw up the budget plan in line with identified projects, prior to the budget allocations. As part of the performance review or report, ICT indicates its achievements in relation to the budget that was allocated. This is congruent with Audisio, Bozzetti, Gennari, Jaklitsch, Korpena, Longo, Wiggers et al. (2004) who state that performance management also inputs into the financial management process by planning the budget for either Infrastructure upgrades or requisition of new components. A further issue on the allocation of funds is that even though budgets are allocated, it is not done timeously for the various regions, which directly affects ICT service delivery. Currency fluctuation impacting on ICT services due to exchange rates is a further aspect that was pointed out by the respondents. This implies that what has been projected is not what is available in the market. Supply versus demand denotes that adequate resources must be available to support the business demand and meet the agreed upon service targets, while cost versus resources denotes that spending on resources must be necessary and justifiable in terms of the business needs and using resources optimally (Brewster et. al., 2010, 2012). The following section presents the discussion of findings, introducing additional concepts focusing on process.

6.2.7 Process

6.2.7.1 Implementation

Information Technology Infrastructure Library (ITIL) is one of the best practices to sustain and improve IT services and IT governance (Axelos, 2015). One of ITIL's recognised ways of doing things is through processes (Axelos, 2015). To understand processes, one first has to look at how ITIL has been implemented and whether it delivers any benefits. Barua, Kriebel and Mukhopadhyay (1995) discovered that the most substantial IT investment contributions occur at the low organisational level where implementation takes place. This claim has been confirmed by most of the respondents who admitted that ITIL’s success and performance are widely dependent on its implementation. The respondents further stated that ITIL itself does not add value; it is the implementation of certain aspects of ITIL that adds value. In other words, ITIL provides the organisation firstly with the vocabulary to communicate; secondly it provides the framework or a structured framework to think. ITIL has also been reported as improving performance in infrastructure deployment, availability of systems, business

processes, and turnaround times. Owing to the low implementation of ITIL within the organisation, it has not yielded many results, particularly among the clients.

6.2.7.2 Impact

Impact determines whether ITIL adds value to the organisation or not. ITIL has been implemented in the organisation, and it is still a work in progress with a maturity level of two. However, even at its lowest implementation, ITIL already adds value, while some respondents hope to see more value forthcoming as the organisation is migrating from Novell to the Microsoft environment. With this migration, there is the anticipation of more value from ITIL, considering that there will be more capacity management of the projected solutions. In addition to adding value to the business, ITIL provides quality within the organisation through improved business processes and turnaround times. The implementation of ITIL is not without challenges even though benefits are evident. One of the implementation challenges is that users have not yet realised the benefits of user satisfaction. Another challenge within the organisation is the inconsistency of not practicing ITIL as per the prescripts. This is contrary to the very explanation of what a process is, namely the set of activities and steps consistent and associated to achieving a desired goal (Business Dictionary, 2016b). While most respondents admitted to organisational inconsistencies, they also conceded to the fact that the organisation is not where it needs to be; it has not really reached a level where it can actually say things are predictable, rather, it is a work in progress. The following section presents the discussion of findings, introducing additional concepts focusing on audit and quality control.

6.2.8 Audit and quality control

Audit is a systematic examination of organisational accounts conducted by qualified accountants (English Oxford Living Dictionaries, 2017b), while quality control is a regular onsite examination of systems to ascertain whether or not these systems are effectively implemented (English Oxford Living Dictionaries, 2017c).

6.2.8.1 Capacity management

The outcome of the audit on the ICT budget and processes has revealed that the on time termination or deactivation of users on the network has been a challenge both within the organisation and in the public sector at large. This reveals the importance of managing capacity. According to Waschke (2009), capacity management is often overlooked; it is a process within the service design stage that focuses on the proactive management of resources and performance. It focuses on management, control, performance prediction, utilisation, and capacity of technology components (Fronheiser, 2006). Whilst it monitors capacity on devices, it is not limited to technology alone; it is a process of placing policies

and procedures in place to govern capacity (Agutter, 2012). The importance of effectively managing capacity cannot be overrated, with Brewster et al. (2012) indicating that when resources run out of capacity, performance suffers and this has a detrimental impact on the business. The lack of terminating and deactivating user accounts on the network does not only pose a capacity risk, it also poses a security risk. If services are not protected from unauthorised changes, it could affect security, efficiency, and compliance, thus significantly impacting on business operations (Saetang, 2011).

Reported issues around the systems development life cycle include the ICT strategy not being aligned to business, and a lack of resources. There is no standard of doing things, which leads to non-standardised processes, non-uniformity of processes, and not following the same processes across regions. User account management is a challenge, including the review of activities performed on the network, users installing programs on their machines, and ICT engineers not being monitored. Ensuring that users gain the access they actually requested, is not monitored. Contrary to what has been reported by most respondents, a few mentioned that the organisation is not performing as negatively as indicated in the outcome of the auditors. However, the problem is that audits are conducted on different processes at different times, which makes it difficult to measure, compared to an audit conducted on all the processes at once.

Capacity issues in terms of skills and over reliance on service providers have been reported as a challenge. Some respondents reported that human capacity varies across different regions; there is structure, but it is not funded, thus ICT is not taken seriously and this contributes to ICT being reactive. When planning is done, it is seldom that the capacity plan is addressed after the operational plan. There is a level of immaturity in the organisation regarding the capacity plan; the report produced is minimal as there are no resources available to analyse the plan. Capacity planning is a cycle, it is continuous; whatever is in the pipeline, ICT looks at the current infrastructure environment to plan ahead. Capacity planning is a process to put in place the IT infrastructure to meet future workload demands (Hill, 2016). The following section presents the discussion of findings, introducing additional concepts focusing on impact.

6.2.9 Impact

Impact is defined as having a strong effect on someone or something (English Oxford Living Dictionaries, 2017d).

6.2.9.1 Business continuity

Disaster recovery plays a critical role in backups that are managed nationally within the organisation and in tapes that are taken off regional sites, with business continuity also being a major focus as the organisation currently does not have a business continuity plan. This has been identified nationwide as a major risk area and ICT has been tasked from a national perspective to look at a strategy and the implementation of business continuity in all nine regions. The non-existence of a business continuity plan surfaced again as a challenge; respondents expressed their doubt regarding the organisation having a business continuity plan and mentioned that the lack of this plan was evident during the load shedding period. Besides the issues surrounding the organisation's disaster recovery and business continuity, some respondents stated that measuring the system and performance to analyse data is not done regularly, making it a difficult task for disaster recovery, capacity planning, and capacity management, which in turn affects business continuity. There is a disaster recovery process in place; however, the process has not been tested in practice. Regarding change management, there is no proper analysis done to determine the impact of service downtime on users. The following section presents the discussion of findings, introducing additional concepts focusing on effectiveness.

6.2.10 Effectiveness

Effectiveness is defined as adequacy in accomplishing a purpose by producing an outstanding result (English Oxford Living Dictionaries, 2017f).

6.2.10.1 Capacity management

As much as ICT relies heavily on the business for support to perform its (ICT's) assigned tasks, it is equally important to understand how committed ICT is in actually supporting the business to attain its mandate. Capacity management as a process within ICT has been analysed to determine whether it assists the organisation in achieving their desired objective. Responses show that capacity management does assist the organisation in meeting its business needs, but there is room for improvement. It has furthermore been indicated that capacity management has a major impact on all other services, including availability management. The output of capacity management supports other processes such as informing change management of the need for additional capacity, or of the potential impact of a new service on current capacity levels (Brinkerhoff, 2010). This literally means that any changes happening within ICT has an impact on capacity; there is thus a need to be able to know what is happening, what direction the solution is taking, and how the issues will be resolved. This function, however, is dedicated to ICT senior managers within the respective

regions to manage capacity and the need thereof in order to understand their capacity requirements so that ICT will be able to provide specific services.

Planning in capacity management is critical, proving that planned buying is more cost effective than repeated emergency buying, which is expensive (Klosterboer, 2011). More importantly, practicing ITIL as per its prescripts helps in understanding that capacity management is not always buying additional storage, nor buying memory; it is in essence managing user behaviour, with one of the ways of managing capacity in terms of user behaviour being to set limits on the number of emails users can store. This is done purely to manage capacity, because if limits are not set, the number of emails will simply continue to grow without users really managing their emails, so basically users are obligated to manage the capacity allocated to them. Limits are therefore set on different values—limits on storage, limits on bandwidth. For example, even with the upgrades of links, proper analysis is done to ensure the reasons for the links to operate in full capacity are legit. Another aspect of effectiveness is that of the infrastructure staff actually responsible for managing capacity, thus monitoring the backups, servers, switches, or routers. ICT has major human capacity challenges in the organisation with the organogram that is approved but not capacitated due to limited funding. As highlighted by Klosterboer (2011), successful implementation of capacity management requires a team of professionals who are well trained and able to perform their roles. Considering that the team has human capacity challenges, the expectancy of them delivering an excellent service on time given the conditions they work in, is challenging to them. This issue has been addressed partly through outsourcing some of the ICT services as an alternative to bridge the gap. This type of interim solution does not guarantee excellence as the business has to rely on the level of training and skills of the service providers as well. In addition to training the internal staff, the business also has to ensure that the service providers are trained as they also need to become acquainted with the organisational environment, and this affects service delivery time. The following section presents the discussion of findings, introducing additional concepts focusing on profitability.

6.2.11 Profitability

Profitability is defined as yielding profit (English Oxford Living Dictionaries, 2017g).

6.2.11.1 Performance and monitoring

Capacity planning is not limited to upgrading solely because of high system usage; analysis needs to be done to identify the cause of high utilisation. Not only does analysis have to be done on high system usage, but also on what the system is used for and how often the system is accessed, thus, usage trends have to be identified. Trend analysis assists with investigating the trend in terms of requirements, data growth, or processor utilisation. It also

assists in projecting and planning for the next number of years, incorporating legislative changes, and planning for capacity at a strategic level. Although capacity management activities are planned for, these activities are not properly detailed in cases where capacity management is not happening consciously. The following section presents the discussion of findings, introducing additional concepts focusing on reporting.

6.2.12 Reporting

6.2.12.1 Infrastructure performance

There is general consensus among the respondents that reporting on infrastructure performance is limited and inconsistent. Reports do not reveal much about capacity planning and capacity management. As much as availability reports are extremely useful in keeping management informed as to what is happening on services to the users, these reports are generated/written in an extremely inconsistent manner. A further concern is that some of the respondents are not aware of what is contained in the reports and how the reports are analysed.

6.2.12.2 Capacity

Although capacity is managed, it is not without challenges in terms of backups and the aging of infrastructure. The respondents stated that another aspect of standard reporting in terms of performance in capacity is that at times the use of resources exceeds specified thresholds. It is concerning that although there is a plan for disaster recovery the plan has not been tested, considering that the organisation has not experienced the disaster for which the plan is in place.

6.2.12.3 Processes

Technical experience is rated as vital but the drafting and continuous update of technical documentation is more critical. When a staff member who is experienced in a specific skill leaves the organisation and a new person is appointed, the technical ‘how to’ documents are of great assistance to the new staff member for troubleshooting.

6.3 Summary

In this chapter, findings were discussed based on the interview responses of the participants. Collected data were compared with information obtained from the literature to draw a conclusion on the management of capacity. Findings indicate that the reports do not reveal much about capacity planning and capacity management. Although capacity is managed, it is not without challenges in terms of backups, the aging of infrastructure, the lack of skilled ICT staff, and ICT capacity constraints. Considering ICT’s lack of skills and capacity constraints, it is a challenge to deliver excellent service and manage capacity appropriately.

CHAPTER SEVEN: CONCLUSION AND RECOMMENDATIONS

7.1 Introduction

In this chapter, the research is summarised and the main points are highlighted. The research findings are evaluated and the research problem, objectives, and questions are revisited. Recommendations are made based on the findings and conclusions are drawn based on the research.

7.2 Revisiting the research problem

Despite ITIL being established as a standard for managing IT services within the South African public sector, the value of the key process of capacity management has not been determined. Without this assessment, the government faces challenges in investing in technology.

7.3 Revisiting the research objectives

To determine how widespread the use of ITIL is in the public sector

Only 21% of South African public departments implemented IT governance, including ITIL; however, IT governance is not sustainable (DPSA, 2013). Of the 21%, ITIL has been adopted by SASSA with many processes implemented, including capacity management, and this sparked the interest of the researcher to use SASSA as a case in this study. It is not clear to what degree IT governance has been adopted by South African organisations and whether ITIL is of benefit to all aspects of ITSM best practice in South African organisations (Marnewick & Labuschagne, 2011b).

To identify the overall benefits from using ITIL in the South African public sector

One of the benefits of ITIL as a best practice of ITSM is that it improves customer service (Kanapathy, 2012). In South Africa, one of the challenges of the implementation of ITIL is that users have not realised the benefits in terms of user satisfaction. Another challenge within the organisation is the inconsistency of the business not practising ITIL as per the ITIL prescripts.

To identify the effectiveness of the capacity management process of ITIL in the South African public sector

Capacity management in the service design stage is meant to support the business and reduce the costs of IT services by streamlining and aligning IT resources to the business demands, but whether this has indeed been accomplished, is not defined (Dutton, 2010).

7.4 Revisiting the research main question

What is the value of the capacity management process within the service design stage of ITIL in managing IT services in the South African public sector?

Findings show that capacity management assists the organisation in meeting its business needs, but with room for improvement. It has furthermore been indicated that capacity management has a major impact on all other services, including availability management.

7.5 Revisiting the research sub-questions

To what extent has ITIL been implemented in the public sector in South Africa?

ITIL has been implemented with a maturity level of two and is still a work in progress.

What benefits have been achieved through the implementation of ITIL in the public sector in South Africa?

Findings reveal that as the maturity level of implementation rises, the perception of challenges declines, and the number of realised benefits as well as the number of implemented ITIL processes increase (Marrone & Kolbe, 2010).

How effective is capacity management in the South African public sector?

When capacity is governed properly and the capacity management process is in place, the performance and availability of IT services will improve (Agutter, 2012), which ensures reduced risk, increased efficiency, confident forecasts, and cost effectiveness.

Reduced Risk: Findings revealed that nationally, Business continuity and disaster recovery have been identified as major risk area It is therefore imperative for ICT to not only manage ICT but also be able to reduce risks or rather plan for them.

Increased Efficiency: Findings revealed the challenges with regards to terminations or deactivation of users in time on infrastructure within public sector. Reviewing of activities performed e.g. users performing duties on the network, users installing programs on their machines, and ICT engineers not being monitored. Access not monitored to ensure users are actually getting the access they requested. Without effective management of user accounts, access and activities on the network there won't be increased efficiency.

Confident Forecasts: Findings reveal that ICT is forever reactive rather than being proactive. It is more of like there is a project now, and things have to be bought now. And by so doing or being reactive, ICT sort of disadvantage itself in a sense that you know when you buy in piecemeal you are not exercising economies of scale, you [are] not able to properly plan your layout of your environment.

Cost effectiveness: Findings also reveal that even though budgets get allocated, they are not allocated timeously, this impact directly on planning. ICT departments in the South African public sector are faced with various capacity management challenges, including lack of appropriate skills, aging of equipment, underutilisation of IT services by departments, duplication of IT resources within one organisation, lack of documented procedures, non-existence of IT strategies and business plans, inadequate network infrastructure, and contractors not performing in accordance with contractual agreements (ITWeb, 2014).

7.6 Summary of research findings

- From the study it is found that the monitoring system available for hardware, software, or networking is Eye of the Storm (EoS); however, EoS is not configured to address business operational needs and as a result, it does not bear the intended results
- In particular instances when certain offices are down, it does not reflect on the system; system functionality is limited in terms of incorporating everything on the monitoring system and can therefore not be relied on
- Systems are in place to analyse system usage and the reporting of performance; however, information on the system cannot be counted on as being accurate
- Besides EoS being used as an application tool, the Enterprise Resource Planning (ERP) Oracle system has been mentioned as business management system that integrates applications; however, nothing else was said about this system
- Information on reporting is not disseminated to relevant stakeholders, which delays service improvement and hampers inter-unit relations. Some people only become aware of the information in the reports when the systems are down. The role of information is to be shared among role players
- Skills shortage among Infrastructure staff working on capacity contributes to the non-performance of ICT, which further impacts on service quality. The technology is there, but the lack of skilled resources is a major challenge
- Shortage of skills has been a challenge not only among infrastructure staff but also with the outsourced service providers as the organisation has outsourced some of its ICT services. The skills shortage among the service providers is not the only challenge mentioned; a further challenge is the lack of best practice
- Capacity constraints within ICT lead to calls taking long to be resolved, which contributes to poor turnaround times and leads to user dissatisfaction
- The lack of adhering to processes has been outlined as a concern
- There are either no tools or no relevant tools to troubleshoot specific issues. There is no set of standards or uniformity across the organisation

- Even though not all calls are resolved on time—emanating from capacity constraints and lack of skills—ICT does show up on time. ICT is seen as not delivering the desired outcome; nevertheless, ICT is trying and therefore improvements need to come forth
- ICT is reactive due to a lack of planning
- Management needs to streamline solutions in order to resolve capacity issues in terms of skills and resource planning so that the agreed SLA can be met
- A service catalogue has been developed, but it is not measured in a manner that assists ICT in meeting agreed upon targets
- By agreeing to unrealistic targets, meeting the need of business has been a challenge within ICT
- Most users are not satisfied with ICT services, with reports indicating a SLA output of between 40% and 60% instead of the 95% target. There are only a few users who reported that they are satisfied with ICT services. A small group of users use their dissatisfaction of ICT services to their advantage by not reporting ICT issues and subsequently remain idle and do not conduct their work
- Uninformed users are not equipped to escalate their dissatisfaction with ICT services, for example, unresolved calls cannot be closed; however, calls are being closed by field support engineers without actually assisting users in order to avoid calls running out of the allocated timeframe in which the query has to be resolved, thus avoiding penalties
- Turnaround times pose a challenge—if users are informed of what is contained in the SLA, they will be in a better position to monitor their logged calls
- There is no proper escalation procedure or level in place as users are not aware of the escalation process; thus, their productivity is affected
- Lack of Head Office (HO) support makes it difficult for regions to perform optimally
- Capacity constraints is a challenge, with not enough ICT staff doing the work
- Because of the low frequency of implementing ITIL in the organisation, this system has not yielded many results from the clients' side
- ITIL has been implemented with a maturity level of two and is a work in progress. However, even at the lowest level of implementation ITIL already adds value. Using ITIL has improved performance in Infrastructure deployment, availability of systems, business processes, and turn-around times. It is anticipated that with the Microsoft migration, the business will draw more value from ITIL, considering that there will be more capacity management in the projected solutions
- Although the benefits of using ITIL are realised, ITIL implementation is not without challenges, including the inconsistencies of not practicing ITIL as per the ITIL prescripts

- The business does show some level of support through existing governance structures creating a platform for ICT to engage with business
- ICT is lacking in business relationship management and as a result, ICT is unable to enjoy support from the business
- ICT lacks scientific solutions that speak to research. ICT has not been convincing in terms of engaging the business in new technological developments and demonstrating how these developments can benefit the business
- In most instances, business wants immediate assistance without allowing ICT time to provide functional solutions. As a result, business is seen as not respecting ICT processes, thus hampering accountability and IT governance
- Executive management is seen as mostly supportive to ICT compared to middle management who views ICT as a support function rather than as an integral part of the business
- The support that the business is providing to ICT is evident in the allocation of funds even though budgets are not allocated on time for the various regions. This affects currency fluctuation impacting on ICT services due to exchange rates
- Audit findings of the ICT budget and processes reveal that the on time termination or deactivation of users on the network has been a challenge within the organisation and in the public sector at large
- User account management is a challenge, including issues such as the review of activities performed on the network, users installing programs on their machines, and ICT engineers not being monitored
- Unprotected services from unauthorised changes could have an impact on security, efficiency, and compliance, which significantly affects business operations
- ICT strategy not aligned to business and lacks resources
- There is no standard of doing things, leading to non-standardised processes, non-uniformity of processes, and not following the same processes across regions
- There are capacity issues with regard to skills and over reliance on service providers
- Human capacity varies in different regions; there is structure but it is not funded, thus, ICT is not taken seriously and this contributes to ICT being reactive
- There is a level of immaturity in the organisation regarding the capacity plan; the report produced is minimal as there are no resources available to analyse the plan
- The organisation currently does not have a business continuity plan and this has been identified nationwide as a major risk area
- A disaster recovery process was put in place but it has not been tested

- Change management is in place, but there is no proper analysis done to determine the impact of service downtime on users
- In addition to the systems being monitored in terms of use and functionality, these systems are reported to be analysed, but in an inconsistent manner
- Capacity management has a major impact on all other processes, including availability management. The output of capacity management supports other processes such as informing change management of the need for additional capacity or the potential impact of a new service on current capacity levels
- Successful implementation of capacity management requires a team of professionals who are well trained and able to perform their roles adequately. Considering that the team has human capacity challenges, the expectancy of them delivering an excellent service on time given the conditions they work in, is challenging to them
- Although capacity management activities are planned for, these activities are not properly detailed in cases where capacity management is not happening consciously
- Reporting does take place; however, it is limited and inconsistent in terms of infrastructure performance. Respondents stated that reports do not reveal much about capacity planning and capacity management
- Capacity is managed but not without challenges because there are issues with backups and aging infrastructure
- Technical experience is rated as vital but the drafting and continuous update of technical documentation is more critical; what does help is documenting how to troubleshoot the technical problems

7.7 Limitation of the study

The study could not cover all the regions within SASSA; it was limited to a purposive sample in the Cape Town and Pretoria regions. The study could furthermore not cover the middle management of the business; only senior an executive management were targeted due to time constraints. While this is sufficient to provide an exploratory insight into the subject at hand, covering more regions and including middle management could have shared more in-depth insight in to the subject.

7.8 Contributions and recommendations

7.8.1 Contributions

The research was performed by exploring the organisation's ITIL implementation with the focus on the capacity management process. Implementation is dependent on the organisation aligning ITIL with the business and IT strategies, supporting management with regard to ICT, adhering to ICT processes, following procedures, and a skilled ICT workforce.

The study used DeLone and McLean framework to understand and assess the capacity management process at the selected public organisation in South Africa. The framework use six concepts to understand the phenomenon. The concepts are system quality, service quality, information quality, use, user satisfaction, and net benefits. However, the researcher added six more concepts that assisted not only in understanding the phenomenon but the additional concepts played a critical role in formulating interview questionnaire. Those concepts are process, audit and quality control, impact, effectiveness, profitability, and reporting.

7.8.2 Recommendations

7.8.2.1 ITIL implementation

The low implementation of ITIL within the organisation resulted in the business side not yielding significant results. ITIL has been implemented with a maturity level of two and it is a work in progress. With the migration from Novell to the Microsoft environment there is the anticipation of more value from ITIL considering that there will be more capacity management of the projected solution. A challenge within the organisation is the inconsistencies that arise because of not practicing ITIL as per the ITIL prescripts. One of the greatest values and benefits of ITIL implementation is that it establishes a common focus across the ICT department. It demands consistency across IT service delivery and provides the tools to continuously measure, review, and improve services. In order to do deliver these services, ICT has to place more emphasis on implementing ITIL consistently across lifecycles to ensure that ITIL yields the results anticipated.

7.8.2.2 Business support to ICT

In most instances, the business demands immediate assistance without allowing ICT sufficient time to provide functional solutions. As a result, business is seen as not respecting ICT processes, thus hampering accountability and IT governance. Executive management is viewed as mostly supportive of ICT compared to middle management who only views ICT as a support function and not as an integral part of the business. Business and ICT have to be integrated to ensure communication between the executives who make the business decisions and the IT managers who oversee the technical operations.

7.8.2.3 ICT aligned to business

ICT strategy is not aligned to business and lacks resources. Meeting the needs of business has been a challenge within ICT, as ICT has agreed to unrealistic targets. It is imperative that ICT and the business are aligned for the successful implementation of ITIL best practices. By knowing the direction the organisation is taking and the needs of the customers and users, ICT can begin to improve its own internal processes to meet these demands.

7.8.2.4 Audit findings

Audit findings of the ICT budget and processes reveal that the on time termination or deactivation of users on the network has been a challenge within the organisation and in the public sector at large. If former users still have **access** to customer data and sensitive internal systems, there is significant potential for them to inflict havoc on the file systems.

7.8.2.5 Network monitoring tools

Data collection revealed that the monitoring system available for hardware, software, or networking is Eye of the Storm (EoS). The monitoring system is however reported as not being configured to address business operational needs and therefore not bearing the intended results. There are instances where certain offices are down, but it does not reflect on the system. System functionality is limited in terms of ICT not being able to report accurately and therefore not everything is captured on the monitoring system. Systems are in place to analyse system usage and report on performance; however, the information on the system cannot be counted as accurate. For ICT to run at optimal performance and prevent errors, proactive infrastructure monitoring is essential, that is, monitoring of the health of the ICT infrastructure and producing reports that address the needs of the business and end users. Considering that not all problems are immediately visible and tend to build up over a period of time, it is key to understand the limitations and configuration of the monitoring system so that it can be accurately aligned to address the needs of the business. Efficient monitoring of the ICT environment ensures that risks are reduced and systems are proactively managed.

7.8.2.6 Information

Information on reporting is not disseminated to relevant stakeholders, which delays service improvement and hampers inter-unit relations, with some people only becoming aware about information in the reports when the systems are down. The role of information is to be shared among role players. Monitoring ICT infrastructure efficiently means access to critical information that is valuable to ICT as well as other internal stakeholders. ICT infrastructure reports should be communicated throughout the organisation in the same way as budgets and expenditure are communicated. Management has very little knowledge on how their ICT environment is truly performing. The only time managers are truly aware is when there are disruptions and the business is at risk.

7.8.2.7 ICT skills shortage and capacity constraints

A skills shortage among infrastructure staff working on capacity contributes to low turn-around times, the inability to meet agreed upon SLAs, user dissatisfaction, and the overall non-performance of ICT which further affects service quality. Shortage of skills has been a

challenge not only among infrastructure staff but also with the outsourced service providers as the organisation has outsourced some of its ICT services. The skills shortage among the service providers is not the only challenge mentioned; a further challenge is the lack of best practice. To bridge the gap and combat ICT skills shortage, new ICT employees have to undergo extensive training, while existing employees need to be upskilled continuously to enable them to perform.

7.8.2.8 Non-standards and lack of adhering to processes

The lack of adhering to processes has been outlined as a concern. There are no set of standards or uniformity across the organisation. ICT has to be cognisant and informed of the technical, data, process, and quality standards in order to position itself to continuously deliver quality service and operate on a high performing standard.

7.8.2.9 User account management

User account management is a challenge, including issues such as reviewing activities performed on the network, users installing programs on their machines, and ICT engineers not being monitored. Unprotected services from unauthorised changes could affect security, efficiency, and compliance, having a significant impact on business operations. While it is vital to monitor user access rights on systems and on the network, it is recommended that ICT monitors the access patterns to observe unusual activity, especially for sensitive information. These unusual access patterns can be one of the sources of many fraudulent activities such as illegally obtaining someone's access credentials.

7.8.2.10 User satisfaction

Only a few users reported that they are satisfied with ICT services. A small group of users use their dissatisfaction of ICT services to their advantage by not reporting ICT issues and subsequently remaining idle, not conducting their work Uninformed users are not equipped to escalate their dissatisfaction with ICT services and this affects their productivity, for example, calls are closed by field support engineers without actually assisting users to avoid calls running out of the allocated timeframe in which the query has to be resolved, thus avoiding penalties. Given the critical role of the user in processing information and using applications within the organisation, understanding how users are affected either negatively or positively by ICT's performance is an important phase in attracting benefits from current computing environments. System quality and information quality are two major building blocks of user satisfaction. The better the system's interface, availability, and response time are, the more users will use the system and express their satisfaction with the system.

7.8.2.11 Lack of ICT planning

ICT is reactive due to a lack of planning. A service catalogue has been developed, but it is not measured in a manner that assists ICT in meeting agreed upon targets. Meeting the need of business has been a challenge within ICT, as ICT is agreeing to unrealistic targets. ICT Planning is a continuous activity that ensures ICT implementation in an organisation is not only aligned with business strategies, it also continuously improves the organisation.

7.8.2.12 Capacity management

There is a level of Immaturity in the organisation regarding the capacity plan; the report produced is minimal as there are no resources available to analyse the plan. Capacity Management has a major impact on all other processes, including availability management. The output of capacity management supports other processes such as informing change management of the need for additional capacity or the potential impact of a new service on current capacity levels. Successful implementation of capacity management requires a team of professionals who are well trained and able to perform their roles. Considering that the team has human capacity challenges, the expectancy of them delivering an excellent service on time given the conditions they work in, is trying to them. Although capacity management activities are planned for, these activities are not properly detailed in cases where capacity management is not happening consciously. Respondents stated that reports do not reveal much about capacity planning and capacity management. Capacity is managed, but not without challenges because there are issues with backups and aging infrastructure. Technical experience is rated as vital but the drafting and continuous update of technical documentation is more critical; what does assist is documenting how to troubleshoot the technical problems. Capacity management is concerned with having the appropriate IT capacity and making the best use of it. Firstly, it confirms the availability of adequate resources before any new deployment or changes take place to ensure reduced risk. Secondly, it best utilises existing and future resources instead of adding resources every time a problem arises without proper analysis of the situation to ensure increased efficiency. It also helps with improved financial projections and more accurate forecasts for future resource requirements that lead to confident forecasts. Lastly, capacity management empowers ICT officials to do effective planning, which ensures that excessive overcapacity such as expensive hardware upgrades do not happen on an on-going basis, and this practice ensures cost effectiveness. The organisation benefits in significant, measurable ways when ensuring that ICT capacity always exists and that it corresponds to current and future identified needs of the business. The benefits extend beyond capacity management to other processes and provide decision support to many areas.

7.9 Future studies

This study provides a partial picture of capacity management in the South African public sector. Further benefits will come to light when capacity management is investigated in other public sectors such as provincial and local sectors instead of focusing solely on the national public arena. A comparison of entire or different public sectors will offer a broader picture of capacity management in the South African public sector. Other possible research areas include public sector auditing on ICT governance and processes. If information on systems within the organisation is accurate, reliable, and meaningful, it results in good governance and users are satisfied. The main focus should be more on users than on technology and processes.

7.10 Concluding remarks

Assessment is defined by the Cambridge English Dictionary as the act of judging the amount, value, quality, or importance of something. Capacity management assessment in this study therefore aimed to judge whether it adds value to the organisation. In conclusion, it is evident in terms of the findings that capacity management is being practiced; however the organisation still has challenges in managing the process itself and in determining whether capacity management yields any results or adds value to the organisation given the challenges surrounding ICT planning, user account management, adhering to standards and processes, ICT skills (i.e. shortage and capacity constraints), information, network monitoring tools, and ITIL implementation. It is therefore essential for ICT professionals to understand and master the art of capacity management and the importance thereof in the organisation. Managing and excelling in technology alone is not sufficient. This has been the purpose of this study, namely to understand how capacity is managed and whether it meets the business needs of the organisation. This does not imply, however, that technology is less important to manage; rather, the business must be able to manage both technology and capacity to ensure excellence through reduced risk, increased efficiency, confident forecasts, and cost effectiveness.

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ANNEXURE A: CONSENT LETTER TO CONDUCT RESEARCH AT SASSA

sassa
SOUTH AFRICAN SOCIAL SECURITY AGENCY

I *Dr Waldemaar Terblanche*, in my capacity as *Regional Executive Manager* at South African Social Security Agency give consent in principle to allow Osadi Elizabeth Mosweu, a student at the Cape Peninsula University of Technology, to collect data in this company as part of his/her M Tech (IT) research. The student has explained to me the nature of his/her research and the nature of the data to be collected.

This consent in no way commits any individual staff member to participate in the research, and it is expected that the student will get explicit consent from any participants. I reserve the right to withdraw this permission at some future time.

In addition, the company's name may or may not be used as indicated below. (Tick as appropriate.)

	Thesis	Conference paper	Journal article	Research poster
Yes	✓			✓
No		✓	✓	

Name

Date

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ANNEXURE B: INTERVIEW QUESTIONS

Interview Questions			
Main question: What is the value of the capacity management process within the service design stage of ITIL in managing IT services in the South African public sector?			
Sub-questions:			
1. To what extent has ITIL been implemented in the public sector in South Africa? – Documents Study			
2. What benefits have been achieved through the implementation of ITIL in the public sector in South Africa? – Interviews			
3. How effective is the capacity management process of ITIL in the South African public sector? – Interviews			
Dimensions	**Questions**	**Interviewee**	**Comment**
1. System Quality	1A. What monitoring systems are available for hardware, software, or networking?		
(Research Question)	1B. How is your Capacity Management maintained?		
2. Service Quality	2A. How would you rate the skills, experience, and capabilities of capacity/infrastructure staff?		
	2B.Do they have the tools to be able to do the work? It is one thing to have the skills and be experienced, but a totally different thing to not have the tools to do the work?		
	2C. How would you rate performance against agreed upon service levels?		
3. Information Quality	3. Do you know of any mechanism in place to analyse system usage and to report on performance? What are they?		
4. Use	9. To what extent is usage of systems and performance data analysed in order to optimise resource utilisation?		
5. User Satisfaction	4. How would you rate customers to determine if they are happy with the services provided?		
6. Net Benefits	6A. How supportive is the business to ICT in meeting business needs? Are they able to meet the requirements? As much as ICT is supposed to be an integral part of the business, is the business working together with ICT?		
	6B. How is the budget monitored for IT services concerning resource of Capacity?		
(Research Question)	6C. What benefit does capacity management have for SASSA as a business and in helping the organisation to meet the business need? How would you rate it?		
NB: Additional concepts deducted by the researcher			
7.Process	5A.How would you rate the implementation and benefit of ITIL at SASSA? Does it bring value to the public sector, particularly at SASSA?		

(Research Question)	5B. How was the service design stage implemented as a process and how is it managed?		
8. Audit/ Quality Control	7A. Recently ICT has been audited, not only from a budget aspect but also from a process aspect, so what would you say about the outcome, what do the auditors say about ICT? Is ICT doing what it is supposed to do?		
	7B. So when it comes to Capacity Planning, as much as there are other sub-processes within Capacity Management, who is actually managing capacity on the network, e.g. managing space on ports on switches when users are leaving or joining the organisation?		
9. Impact	8. The disaster recovery and capacity plan provides input to the business continuity plan; what input does the capacity management process provide to the business continuity process?		
10. Effectiveness	10A. How effective is capacity management in meeting business needs and how does it feed into other processes?		
	10B.Are there specific people managing the process, for example, you get people specialising, be it in Servers, Backup, Switches, Routers but not necessarily managing the process thereof?		
11. Profitability	11. are there capacity management activities established within the organisation, e.g. monitoring of usage and performance, capacity planning, sizing of service elements, etc.? What are they? If not, why not?		
12. Reporting	12. Are standard reports concerning performance produced on a regular basis?		

ANNEXURE C: ANALYSIS

Question	Response	Summary	Respondents	Code	Category	Theme
Q1A: What monitoring systems are available for hardware, software, or networking?	The tools are there but how the tools are used or how the tools are configured to give us that which will answer business questions, it is still an issue.	Tools are available but no bearing intended results	**FC-RESP1**	**EoS**	**System tools**	**System quality**
	We do not have a specific tool or particular technology that we say we have put in place, but normally the tools that we use is analytics; we just analyse the trends and user requirements and from there we plan our capacity. Eye of the Storm (EoS) as monitoring availability up and down; not only that, monitoring availability also monitors threshold - once you register ten values of usage, rather, you set an alarm, so that as well compliments in terms of monitoring capacity. Do not forget as well when you draw the tool when you draw from EoS, it can show in terms of usage for certain processes. I know for example as well in ERP, we do have also a software that is loaded on specific in ERP environment that monitors processor usage, that monitors memory usage. EoS will monitor bandwidth usage for example, which is also capacity. Yes, EoS as well is used to monitor capacity from [a] bandwidth point of view.	No standard regarding referred technology and reporting tools. EoS (Eye of the Storm) does not only monitor availability, capacity and bandwidth usage, but threshold as well ERP monitor processor and memory usage	**JM-RESP3**			
	I think the monitoring tool is as good as the person using it.	Monitoring tool helpful	**KG-RESP4**			
	The only system I know of is Eye of The Storm in terms of systems availability but not sure of its accuracy, since when certain offices are down, it is not reflected on the system. Not everything is incorporated on the monitoring system.	Inaccuracy of monitoring system EoS System not incorporative	**AA-RESP7**			
	Eye of the Storm system is used to monitor the capacity performance.	Awareness of existing systems with limited information	**TR-RESP9**			
	In cases of [the] Oracle system, Head Office normally will report on how many people access Oracle. For example, they will say Western Cape do not access Oracle and they will encourage in terms of number of users accessing Oracle; they present the report and are able to monitor the usage of Oracle.	ERP monitoring the number of users accessing the system	**VS-RESP8**	**ERP**	**Application tools**	

Question	Response	Summary	Respondents	Code	Category	Theme
Q2A: How would you rate the skills, experience, and capabilities of capacity/ infrastructure staff?	Maybe on the aspect of capacity, as maybe reflect what is on their table, do they have, are they equipped enough in terms of numbers, to be able to look at all issues around that space? Maybe the answer might be no.	Difficult to pinpoint skill competence due to the capacity challenge	**FC-RESP1**	**Capacity**	**Performance**	**Service quality**
	For instance, most of the time as infrastructure you will find that you monitor either availability or accessibility in terms of network, but when it comes to the applications side you find that it is an area whether you do not have time or capacity to look into, hence you are reporting that the system is available and the person that is transacting on the system is having some difficulties in meeting turnaround times in terms of delivering the output.	Limited time to troubleshoot due to capacity constraints				
	It is below par, and the reason why it will take long to get things up there right into an acceptable level, is that we do not have enough resources to be able to monitor	Capacity constraints contributing to performance	**FC-RESP1**	**Capacity constraint**		
	Not good at all, as ICT in Head Office (Pretoria) we do not have capacity in terms of resources; service providers actually augment us to deliver services to business.	Resource constraints due to capacity	**SN-RESP5**	**Resource constraint**		
	Skills in terms of the support of the technology or the operation of the technology are missing; we do have the service, the technology itself is running well but we are lacking skilled type of resources.	Lacking skilled people	**SN-RESP5**	**Skills**		
	We depend on individual skills. There are some people within SASSA with different skillsets that are clued up and think quality, capacity, and business value. Switches have been chosen because of the ability to handle the service requests for access. Servers and SAN that we bought for Microsoft, you can actually see that there have been some capacity thoughts behind the decisions that are made there, and as a result, we believe that we are going to take the business much further with the Microsoft project because of the technology we are buying.	Dependent on individual skillset	**SN-RESP5**			

Question	Response	Summary	Respondents	Code	Category	Theme
	Even though we have a service provider that [is] supposed to do the work, for instance in [the] Western Cape, we have a bit of capacity [more] than other regions. The staff that we have got here, instead of managing those complaints or those issues thus managing the service provider, they turn to start addressing those issues themselves and it takes them away from their core responsibilities.	Skills shortage even on outsourced services	**AA-RESP7**			
	There are no sufficient skills to build capacity.	Lack of skills	**TR-RESP9**			
	But from my side, our disappointment is that you expect a lot from the service provider because they come from the private sector; they understand the best practice better than us. It is just so disappointing when you have to define best practices for them, but its ok, we will move on with that and they are not doing well for now, but the process will help us to both do well.	Lack of skills and lack of best practice among service providers	**FF-RESP6**	**Skills gap**		
	The reason we have got [a] Technical Advisory Team (TAC), those are specialisations, those are people with high skills, so TAC is there to assist units and regions at the same time. That is why now for example when regions wants to procure infrastructure, that request must to go via TAC because TAC needs to analyse that. We close the gap of capacity through TAC, they always have to touch base with TAC and TAC will advise.	Appointment of TAC to bridge the technical gap	**JM-RESP3**	**Technical Advisory Committee**		
	As far as capacity is concerned, it is fine, skills are there but do not think there are right tools to check these kinds of staff. Basically, capacity management should be done by the infrastructure management and [a] small part of it would be service management. SM should be checking whether or not we are doing what we [are] supposed to be doing.	Skills are there but no tools to do the work	**FF-RESP6**	**Tools**	**Efficiency**	

Question	Response	Summary	Respondents	Code	Category	Theme
Q2B: Do they have the tools to be able to do the work? It is one thing to have the skills and be experienced, but a totally different thing to not have the tools to do the work.	We do not have a specific tool that we say we have put in place but normally the tools that we use are analytics; we just analyse the trends when it comes to that and from there we look at user requirements. We do not use a particular technology and say that is what we are using for that. I will say [in] certain areas we use tools but [in] certain areas we do not necessarily use tools, but we use analytics - we just analyse, looking at the trends and looking at requirements, and from there we plan our capacity.	No specific tool or standard when it comes to tools No standard of technology used across organisation	**JM-RESP3**	**Tools**		
	Technicians are not given the tools to do the troubleshooting; even if a person [who] does not have the skills must depend on [a] particular level of support, they must still be able to have the tools and say this is what is seen because I won't be helpful to the next level of support if I am empty handed.	No tools supplied to technicians	**SN-RESP5**	**Tools**		
	As far as capacity is concerned, it is fine, skills are there but do not think there are right tools to check these kinds of staff.	No proper tools	**FF-RESP6**	**Tools**		
	That is a bit of a challenge currently; it is a good thing to give people technology, but the negative part of it is that we assume that people must be technology savvy as we are.	Giving technology but not being able to support it	**FF-RESP6**	**Technology**		
	Have not experienced any long delay with ICT attending to the problem, although they may not be able to resolve it immediately, they would always come back and make a special effort to resolve the problem.	ICT making effort to address issues	**HDG-RESP10**	**Turnaround times**		
	We are forever reactive rather than being proactive. It is more of like there is a project now, it needs 1,2,3,4, ok, we need to buy it. And by so doing or being reactive, we sort of disadvantage ourselves in a sense that you know when you buy in piecemeal you are not exercising economies of scale, you [are] not able to properly plan your layout of your environment.	ICT being reactive rather than proactive due to lack of planning	**NM-RESP2**	**Planning**	**Functionality**	

Question	Response	Summary	Respondents	Code	Category	Theme
	In terms of the skills, they were very helpful. They know what they are doing but the problem I had was the process. Why must I log a call in Pretoria via [a] call centre whilst it will be attend by people in Cape Town? Why can't I just go to ICT within the same building? But in terms of the skills, they are very skilful.	Skilled technical staff but the IT processes a challenge including logging a call	**VS-RESP8**	**Processes**		
Q2c: How would you rate performance against agreed upon service levels?	You might find out that there is a collective conglomerate of issues and you have to have the management right to be able to start streamlining solutions to resolving capacity issues in terms of skills, in terms of resource provisioning in order to meet the level of SLA performance that we have put out there and agreed upon.	Management to get involved in addressing issues affecting SLA targets	**SN-RESP5**	**SLA**	**Monitoring**	
	We have not matured very well within all the regions but we are starting with developing [a] service catalogue detailing services and the SLAs.	Low maturity in meeting service levels	**JM-RESP3**	**SLA**		
	We do have a service catalogue but I do not think we measure it correctly at the moment. We are running on our last legs with [a] silver bullet at the end of the rainbow, Microsoft. Hopefully then we will be able to say yes, we do have those services, but at the moment we are in limbo moving from one environment to a new one. I do not think we are currently doing it the way it should be done.	SLA not measured correctly	**FF-RESP6**	**SLA**		
	We identified the services we have and what we proposed but we have not entered into any Operation Level Agreement (OLA) because we are just not confident of our infrastructure at the moment because of the migration, eDirectory, GroupWise are not being upgraded.	Lack of OLA	**FF-RESP6**	**OLA**		
	The services are monitored using the SLA, and measured to ensure they meet the business objectives.	SLA monitored	**TR-RESP9**	**SLA**		
	But from my side our disappointment is that you expect a lot from the service provider because they come from the private sector, they understand the best practice better than us. It is just so disappointing when you have to define best practices for them, but its ok we'll move on with that and they are not doing well for now but the process will help us to both do well.	Lack of skills and lack of best practice among service providers	**FF-RESP6**	**Skills gap**		

Question	Response	Summary	Respondents	Code	Category	Theme
Q3: Do you know of any mechanism in place to analyse system usage and to report on performance?	The only system I know of is Eye of The Storm in terms of systems availability but not sure of its accuracy, since when certain offices are down, it is not reflected on the system. Not everything is incorporated on the monitoring system.	Eye of the Storm as one of tools that measures systems availability but not sure of its accuracy	**AA-RESP7**	**Incorporation; Accuracy**	**Accuracy**	**Information quality**
	I actually found out there are reports that they analyse to report on the availability of systems. I did not know there are such reports that they have got the target when it comes to system availability and that there is a report they get where you are able to find out for example that in this month systems were 97% available, and so forth. Based on that, I did not know there are such reports ICT gets on a monthly basis they analyse and come up with plans to improve system availability. For example if the network is down, what will be plan B? Will 3G cards or the boosters be used and based on that? I am aware of such reports.	Monitoring reports on availability are done but not properly communicated to relevant stakeholders	**VS-RESP8**	**Stakeholder engagements**	**Communication**	
	I am not aware of any other reporting systems in terms of performance of ICT. The only time when we become aware of the systems down, is when the local offices call us about the systems down and the duration of downtime; we do not get any report maybe indicating that the region perhaps is 99% up and running. I know that ICT comes in the morning to check systems, but when it comes to reporting, we have not received any reporting.	No proper structure or mechanism of communicating system usage and performance	**HDG-RESP10**	**Structures**		
	EoS reporting tool, unrealistic targets e.g. 95% availability of systems as a monthly target.	Unrealistic targets	**TR-RESP9**	**Targets**		

Question	Response	Summary	Respondents	Code	Category	Theme
Q4: To what extent is usage of systems and performance data analysed in order to optimise resource utilisation?	I know in cases of Oracle, Head Office normally will report on how many people access Oracle. For example, they will say Western Cape do not access Oracle and they will encourage in terms of number of users accessing Oracle; they present the report and are able to monitor the usage of oracle.	Oracle system analysed for optimisation	**VS-RESP8**	**System utilisation**	**Optimisation**	**Use**

Question	Response	Summary	Respondents	Code	Category	Theme
Q5: How would you rate customers to determine if they are happy with the services provided?	So on the aspect of looking at support in particular, If you have the report that gives you between 40% and 60% SLA output instead of 95% target, it definitely tells you that you might not be having a happy user base.	SLA not met resulting in users not being happy	**FC-RESP1**	**User dissatisfaction**	**Clients**	**User satisfaction**
	You might find out that rather than going through the pain, just ignore.	Users choosing to live by ICT challenges instead of going through the ambiguous ICT processes		**User dissatisfaction**		
	ICT processes put in place are not supported, but there is a silent war.	No support for ICT processes but users not open		**User dissatisfaction**		
	It is in between, some happy some not happy as per the survey.	Not all users happy	**JM-RESP3**	**Some users happy and some not**		
	The last time we did a survey we did not score very well, between [a] score of 1 to 5, we scored 2 to 3.	Users survey showing user dissatisfaction of ICT	**KG-RESP4**	**User dissatisfaction**		
	Not good at all, the issue is basically support.	Users dissatisfied about ICT support	**SN-RESP5**	**User dissatisfaction**		
	The culture of types of users, If when I am not working, I am comfortable about it.	Some users comfortable with not being able to work	**FC-RESP1**	**Idle users**		

Question	Response	Summary	Respondents	Code	Category	Theme
	Users [are] not being informed, e.g. not aware that if the call has not been resolved it cannot be closed for any other reason.	Users awareness	**R-RESP9**	**Users awareness**	**Governance**	
	Calls being closed by technicians without actually assisting users to avoid calls running out of SLA, thus avoiding penalties.	Closed calls even if users are not assisted	**TR-RESP9**	**Closing of calls**		
	When you check on data If calls takes too long to be resolved.	Calls taking long to be resolved	**FC-RESP1**	**Turnaround times**		
	Just the perception that IT takes long to do things, but different units will have different responses, e.g. operations maybe got a brunt of problems, power issues, you end up taking a brunt of them.	ICT taking long to address issues	**FC-RESP1**	**Turnaround times**		
	If when the call goes out of an SLA, there is this high level of escalation then you will have those kinds of reports.	No high level of escalation	**FC-RESP1**	**Escalations**		
	In this instance, lately we have a lot of per abased kind of processes, which you need to go through.	Ambiguous ICT processes	**FC-RESP1**	**Processes**		
	There should be a better communication between the receiver of the service and the provider of the service. So If there is a gap in between; you do not know how they perceive the service that you are rendering, then it is problematic to have an assertion that they are happy or not happy.	No clear communication between users and ICT	**FC-RESP1**	**Communication**		
	Currently ICT is reactive to everything, not proactive.	ICT not being proactive	**AA-RESP7**	**ICT reactive**		
	Generally, the finance users are happy that whenever when we require assistance from ICT we get it on time; the only concerns that we normally get from district and local offices [are] mainly the availability of 3G cards and that systems are slow at times, and that they need more boosters. In terms of asking for equipment, it is quick to get except minor issues like 3G cards taking long to arrive because they prioritise local and district offices.	ICT trying but there are issues at district and local levels with unavailability of functional equipment and slow systems	**VS-RESP8**	**(Improvement) ICT trying its best**	**Capacity**	

Question	Response	Summary	Respondents	Code	Category	Theme
	With users, there is satisfaction with services coming from ICT, especially equipment provided to users. Where we do have a challenge, is where there is a reliance on Head Office to complete the project. When we have the project within the region, there is success.	ICT in the regions let down by Head Office in most instances	**HDG-RESP10**	**Lack of Head Office support**		
	ICT Resources are not enough in terms of doing the support.	Not enough ICT resources to do support	**FC-RESP1**	**Capacity constraints**		
	No, [the] problem is the lack of SLA being signed and ICT not being able to enforce penalties for non-delivery according to [the] SLA, and basically this means that the outsourced capacity is not delivering on time and that has a direct impact on the users who will start making use [of] any means necessary to have their requests addressed.	Outsourced capacity not delivering on time	**FF-RESP6**	**Outsourced services**		

Question	Response	Summary	Respondents	Code	Category	Theme
Q6: How supportive is the business to ICT in meeting business needs? Are they able to meet the requirements? As much as ICT is supposed to be an integral part of the business, is the business working together	Yes, within SASSA we have got governance structures; these governance structures, that's the structures we use to engage the business, for example, we have got [an] ICT Steering Committee, which are represented by executives of the branches. We have another structure called ARB (Architecture Review Board), which is represented by different managers from different units. There are governance structures in place, represented, that actually help us engage with business.	There are structures throughout SASSA that help ICT to engage with business	**JM-RESP3**	**Business engagement**	**Relationships**	**Net benefits**
	I think the business is awaiting ICT to engage. ICT is lacking business relationship management and because of that, ICT is not able to enjoy the support from the business. For example, when business wants something, ICT just says business wants it without engaging and finding out why.	ICT is lacking business relationship management, thus not engaging the business	**SN-RESP5**	**Business relationship**		

Question	Response	Summary	Respondents	Code	Category	Theme
with ICT?	Yes, the organisations is [sic] committed because it runs too many applications, and too little capacity will lead to the failure of them to run.	Business supportive of ICT due to the fact that it needs ICT support to maintain its applications	**TR-RESP9**	**Commitment**		
	ICT must be able to sell itself to business on certain aspects to make it more beneficial and say, business this is what we have in the marketplace and this is what our research has been telling us in order to make your business more effective; let us buy into this technology, simple things such as equipment. ICT must be forceful and tell business that yes, it maybe be cheaper now, but in a long run where we are going and it is more cost effective to start investing on these things now. I do not think ICT has been forceful enough in terms of getting business to the table to understand what is it that we can make available, and how it is going to benefit them.	ICT not able to sell itself to business ICT must only be engaging the business, but engaging literature, thus advancing in scientific solutions and research ICT needs to be firm with the business	**AA-RESP7**	**Scientific solutions**	**Research**	
	ICT can be more proactive; currently ICT waits on business to take the lead. I do understand that they are overloaded with current workload with the available capacity; more can happen and that ICT advises the business that these are the new developments within the field and the business is willing to listen. Business does not always have knowledge, but ICT has to explore what is happening in the field, does the research, and proposes those new developments for the business, and picks up the trends as to what [is] supposed to be done instead of waiting for things to break down and do the damage control - and that time the damage has already being done. Besides grants admin structures, there is governing structures that ICT could engage business further...	ICT must be proactive ICT to advise the business of new developments CT to engage in research and come up with solutions	**HDG-RESP10**	**Scientific solutions**		
	Business gets frustrated and wants things, and wants them now, and they do not necessarily respect ITIL processes; maybe certain times with user consumption, when there is a problem, a user must log a call, eventually they get used to the pattern. Our thinking is somewhat structured but the way we interact with business might not be fully structured.	Business wants help immediately without allowing ICT to provide functional solutions Business does not respect ICT processes, thus hampering IT governance	**KG-RESP4**	**Processes**	**Governance**	

Question	Response	Summary	Respondents	Code	Category	Theme
	Certain elements that are high management level are supportive but the lower management are not of that view; they see ICT as just a support. They say one thing but the truth comes out when something goes wrong, so the will say we are a support function, but the moment the tools required to address the strategic deliverables of the organisation fail. They do not link the fact that the strategic resources of ICT being implemented is [sic] actually helping them to do the core business; they just see it as a tool that they use daily to do things and do not understand the impact. (They do not want to recognise the impact).	Executive Management is supportive as compared to lower management who only sees ICT as a support function	**FF-RESP6**	**Structure**		
	Business does not have a choice because they have to take over the payment of social grants; they are very committed. The fact that the CEO has took this upon herself that she will be monitoring IT herself, it means SASSA is very serious about this plan. Also from the Social Development Ministry, they are very much interested because they have to present it at the portfolio committee. Politically there is commitment, and from the administration as well there is commitment. They were given time frames, firstly making sure that they have a complete list of all things that would be required from ICT and also Finance to ensure there is budget to fund for that and HCM to advertise in terms of all those requirements. In terms of the future, it is taken care of, and actually, the detailed plan has to be finalised in two weeks and signed off by the CEO.	Business being supportive, even from the CEO's office and Social Development Budget allocated to ensure the support of ICT	**VS-RESP8**	**Allocated funds**	**Budget**	
Q6B: How is the budget monitored for IT services concerning resource of capacity?	Normally we plan for budget, right, they give us the budget for that basis; we monitor the usage in line with projects that we identified for the budget. Budget allocated, we have got particular projects as part of performance review or report; we indicate achievements in relation to budget that was allocated to that.	Budget allocated and has to reflect achievements	**JM-RESP3**	**Allocated funds**		
	Even though budgets get allocated, they are not allocated timeously.	Budget not allocated on time	**TR-RESP9**			
	Currency fluctuation impacting on ICT services due to exchange rates.	Exchange rates	**TR-RESP9**			

NB: Additional Concepts deducted by the researcher

Question	Response	Summary	Respondents	Code	Category	Theme
Q7A: How would you rate the implementation and benefit of ITIL at SASSA? Does it bring value to the public sector, particularly at SASSA?	I think SASSA has done very well in terms of [the] Local Office Improvement Plan for providing infrastructure at local offices, availability of systems that we have to support the business. SASSA business processes and turnaround times depend heavily on the availability of systems, the network, and actual laptops.	ITIL improved performance in Infrastructure deployment, availability of systems, business processes, and turnaround times	**VS-RESP8**	**Performance**	**Implementation**	**Process**
	Implementation of ITIL to SASSA is very low and the benefit not realised by the customers.	Benefits of ITIL not yet realised by customers	**TR-RESP9**	**Benefits**		
Q7B:Does ITIL bring value to public sector particularly at SASSA	We are not always practicing as per ITIL prescripts capacity management in its truest form, so in most cases we find ourselves reacting.	Not always properly following ITIL prescripts	**NM-RESP2**	**Inconsistency**	**Impact**	
	If the answer is yes or no, I would say yes, ITIL provides quality within an organisation, and SASSA included, we have adopted ITIL and through those phases of ITIL, we are able to provide value to business.	ITIL adding value to SASSA	**JM-RESP3**	**Value**		
	We started already; I would say we are at level 1 and 2 levels.	SASSA at maturity levels 1 and 2	**KG-RESP4**	**Value**		
	ITIL itself does not bring value, but it is the implementation of aspects of it [that] will bring the value, in other words, ITIL provides you with, first of all, the vocabulary to communicate; secondly it provides the framework or a structured framework to think.	ITIL success is dependent on implementation	**KG-RESP4**	**Implementation**		
	We are implementing ITIL, it is still a work in progress; we have been implementing it for a while but we have not gone far. We are at maturity level 2.	SASSA at maturity level 2	**SN-RESP5**	**Work in progress**		
	We are achieving the required level of repeatability because once things are repeatable they become predictable. We have not really reached a level where we actually say things are predictable but we are getting there.	SASSA achieving level of repeatability and working towards being predictable	**SN-RESP5**	**Value**		

Question	Response	Summary	Respondents	Code	Category	Theme
	In the limited way that we have implemented it, there is value coming from it, but there will be a lot more value from it once we migrate to Microsoft because we will be implementing a lot more of capacity management into the projected solutions. At the moment we do it, but it takes us long due to non-automation since the Microsoft will be coming with automated audits on systems.	ITIL shows value at SASSA even at the limited implementation	**FF-RESP6**	**Value**		
	SASSA has done very well in terms of [the] Local Office Improvement Plan for providing infrastructure at local offices, availability of systems that we have to support the business. SASSA business processes and turnaround times depend heavily on the availability of systems, the network, and actual laptops.	ITIL assists SASSA with availability of systems and turnaround times	**VS-RESP8**	**Value**		
	Implementation of ITIL to SASSA is very low and the benefit not realised by the customers.	ITIL benefits at SASSA have not been realised yet	**TR-RESP9**	**No value yet**		

Question	Response	Summary	Respondents	Code	Category	Theme
Q8A: Recently ICT has been audited, not only from a budget aspect but also from a process aspect, so what would you say about the outcome, what do the auditors say about ICT? Is ICT doing what it is supposed to do?	According to auditors, we are not doing bad at all, but the problem is difficult to measure because when auditors come, they audit for different processes at different times; they do not audit all processes at once; they just come look for two processes and audit them. Next year they would come for other processes and audit them. Yes, we have processes that we are doing so well and we do have others that we know we are not there yet, but are moving. In terms of audit, we are not doing bad.	Different processes audited and SASSA making progress	**JM-RESP 3**	**Processes**	**Capacity management**	**Audit/ quality control**
	Terminations or deactivation of users in time on infrastructure, not only SASSA but [the] public sector at large. Reviewing of activities performed e.g. users performing duties on the network, users installing programs on their machines, and ICT engineers not being monitored. Access not monitored to ensure users are actually getting the access they requested. Capacity issues with regards to skills and over reliance on service providers. Non-uniformity of processes, following same processes everywhere, not regions doing their own processes. Disaster recovery, process put in place but lack of testing therefore, and the fact that disaster has not happened, hence the lack of disaster recovery testing. Change management, no impact analysis on users during downtime. Lack of user awareness, turnaround times contributing to user not being satisfied. Calls being closed by service provider to avoid penalties and as such not showing a true reflection of what is actually happening. Poor communication by ICT. Not all regions have good infrastructure. Blanket approach not working due to network operator dynamics in various regions. Internet access issues due to poor infrastructure. Achieving 95% a challenge as stated in the Operational Plan target to be attained monthly. Not enough budget, thus impacting on ICT operations on achieving its goal. Budget not allocated on time to regions and thus impacting on regions achieving their goals. Currency fluctuation impacting on ICT service delivery due to exchange rates at time of purchase and that what has been projected for is not what is received from the market.	Effective Infrastructure Monitoring	**RESP 9**	**Governance**		

Question	Response	Summary	Respondents	Code	Category	Theme
Q8B: So, when it comes to capacity planning, as much as there are other sub-processes within capacity management, who is actually managing the space on the switches when users are leaving? Simple things like to just disconnect ports and points…	From the service design, then you would understand the various projects that you have, the various projects that have been approved. Whatever is in the pipeline and based on that then you look at your current environment of Infrastructure what can it accommodate, what can it not accommodate then you start doing capacity planning and it is a cycle.	Capacity planning is a cycle, it is continuous	**NM-RESP2**	Capacity planning	**Capacity management**	**Audit/ quality control**
	Yes it's part of engineers responsibilities, part of their work plan and we also do have system administrators that are there to make sure they manage capacity, to ensure we have enough server space, enough memory, and from there advise what needs to be done.	Capacity monitoring on switches are monitored by engineers	**JM-RESP3**	Capacity monitoring		
	They are committed, there is capacity plan at different levels as well, we have Medium Term Expenditure Framework(MTEF), we identify our requirements going forward, what we need to replace. We do think ahead of capacity management, we do look at what we have, we are working on that. For training as well, same thing.	Capacity needs to be highlighted on MTEF	**FF-RESP6**	Capacity		
	Currently, this is one major gap in SASSA not only in national but in regions. Currently when you look at capacity planning from ICT, what should inform that is the strategic plan and operational plan. That is what ICT now needs to take into account when they planning in terms of what they need to provide for next year or the Medium Term Expenditure Framework (MTEF) period. Currently what we are doing while in the region not sure how they are doing at SASSA national level, if you look at capacity in ICT in all 9 regions and national it varies quiet a lot in terms of human capacity to deal with ICT issues. Although there's a structure but it's not funded which tells me that from national perspective, ICT is not taken that much seriously and it becomes a reactive issue to basically deliver on certain things not looking into whether we have expertise or do we have the capacity	Capacity varies in different regions when it comes to human capacity. There is structure but it is not funded, thus ICT is not taken seriously and this contributes to ICT being reactive.	**AA-RESP7**	Capacity		

	I also do not think that as a region when we go for our planning session where after we do our operational then we would do capacity plan and I think it is very important, maybe I must raise it in our meetings. This will also help ICT in terms of planning because currently ICT Senior Manager just get random requests especially with procuring assets.	Capacity plan not largely discussed in planning sessions	**VS-RESP8**	Capacity planning		
	Capacity plan is not matured in SASSA, therefore the report produced is very minimal as there is [sic] no resources to analyse them.	Capacity plan not matured at SASSA	**TR-RESP9**	Capacity planning		

Question	Response	Summary	Respondents	Code	Category	Theme
Q9: The disaster recovery and capacity plan provides input to the business continuity plan; what input does the capacity management process provide to the business continuity process?	Disaster recovery and backups managed nationally and tapes going offsite from the region site. Business continuity is also being a major focus where SASSA currently does not have a business continuity plan. (Nationally they have identified this as a major risk area and ICT has been tasked from a national perspective to look at a strategy and implementation of business continuity in all nine regions.)	Business continuity identified as a risk at SASSA ICT to implement business continuity	**AA-RESP7**	**Backup**	**Business continuity**	**Impact**
	I doubt if we have any business continuity plan at SASSA and that was evident during the load shedding; it was only then that people were running around to say we need to buy more 3G cards and get more generators. People were just improvising and the CEO gave an instruction to the acting CIO to draft a business continuity plan in case the systems go down or load shedding.	No business continuity and CIO tasked to draft the business continuity plan	**VS-RESP8**	**Business continuity**		
	The measuring of the system and performance to analyse data is not done regularly.	Lack of consistency in monitoring of systems	**TR-RESP9**	**Inconsistency**		
	No, I am not aware of the disaster recovery from ICT.	Disaster recovery not known if it exists	**HDG-RESP10**	**Disaster recovery**		

Question	Response	Summary	Respondents	Code	Category	Theme
Q10A: How effective is capacity management in meeting business needs and how does it feed into other processes?	IT is committed to supporting the business but a lot could be done…	IT supports business but can do better	**RESP8**	**ICT commitment**	**Capacity management**	**Effectiveness**
	Yes, it has a major impact on all other services like availability management. Any changes that happen at ICT you need to be able to know what is happening and what direction your solution is going and how are you going to resolve the issue.	Capacity management is critical and impacts on other processes	**NM-RESP2**	**Services**		
	Basically all the senior managers from the regions, it is their responsibility for managing the capacity. We have a Senior Manager Infrastructure who is responsible for managing capacity, Why, I am saying like this, we do not forget that we are talking from capacity from a resource referring to people and capacity from infrastructure as well. As a manager, you need to understand your capacity requirement from [a] personnel point of view for me to be able to provide these particular services.	Regional senior managers are responsible for managing capacity	**JM-RESP3**	**Responsibilities**		

	When you look at ITIL, capacity management is not always buying additional storage; it is not always buying memory. Capacity management also at the same time, as per ITIL, is user behaviour; you need to manage the user behaviour. For example, one way of managing capacity that we are doing in terms of managing user behaviour is to set limits. Setting limits to say, for example, for you GroupWise is so much, we are doing that purely just to manage capacity, because we know that if we do not do set limits, people will just continue, continue to grow without really managing it. So basically we want users to manage the capacity required. We set limits on different values, limits on storage, limits on bandwidth. For example, there was a requirement in one of our provinces and regions, they wanted to increase their WAN link because it is currently operating at full capacity, and I said no, we do not just always when we fill up the capacity that we have, we do not just say please upgrade; we need to do a proper analysis. For example, we need to understand what is it that actually is occupying that space and the work that has been done; is it work related or is an issue around security where you find out actually you have got so many viruses coming in, just emails spammed, etc.	Capacity Management is not only managing storage or memory but managing user behaviour	**JM-RESP3**	**Managing**		
Q10B: Are there specific people managing the process, for example, you get people specialising be it in servers, backup, switches or routers, but not necessarily managing the process thereof?	Some of services have been outsourced.	Outsourced services	**VS-RESP8**	**Services**		
	Currently one that is the major gap in ICT is in terms of human capacity; we have the organogram that is approved but not capacitated because it is not funded and ICT from [a] national perspective has not been forceful to ensure that the organogram is fully capacitated to address the gaps.	ICT capacity a challenge	**AA-RESP7**	**Gaps**		

Question	Response	Summary	Respondents	Code	Category	Theme
Q11: Are there capacity management activities established within the organisation, e.g. monitoring of usage and performance, capacity planning, sizing of service elements, etc.? What are they? If not, why not?	There are capacity management activities established within SASSA, however is being mostly handled by third parties.	Some capacity management activities handled by third parties	**TR-RESP9**	**Capacity**	**Performance and monitoring**	**Profitability**
	Capacity planning activity, you do not just upgrade because there is high usage. You need to understand what is the cause of that high usage; you need to understand the people that are using that infrastructure; you cannot have for example let us say [a] 2MB link being supplied to an office of 20 people and you find out that your 2MB link is always fully utilised. You need to understand how can a 2MB link be fully utilised by 20 people; we also do analysis before we just upgrade. We plan for upgrade where we know there is going to be growth; we look at trends, which is very important; for example, when I talk about mainframe - mainframe we normally look at the trend in terms of data growth, processor utilisation. So, if this is the trend for the year and we project it and this is the trend for past three years or past year, the projection for next year is going to be 1,2,3,4,5 based on for e.g. legislative changes as well. We look at trends, we analyse requirements, we look at the strategy, and from there we plan our capacity.	Capacity planning activity playing a critical role in capacity management	**JM-RESP3**	**Capacity**		
	Capacity management is not happening consciously; even if, when you look at business, we have ERP as a service. We put ERP together, and we say we predict that in 2018, [the organisation] will have 18000 people and therefore we need to make sure that [the] technology we procure must be able to handle that capacity; we plan for it but not in detail.	ERP planned as part of capacity management	**SN-RESP5**	**Capacity**		
	Planned services speak to Microsoft Migration because we are rolling out new services. Yes, we have a plan to up skill people, not just the ICT staff but users as a whole for some of the new services such as Link and Share-point that are coming, mostly automated online training. For the more in depth training, there will be training interventions.	Microsoft migration in a pipeline to address issues of capacity	**FF-RESP6**	**Projects**		

Question	Response	Summary	Respondents	Code	Category	Theme
	As executive, we would look at the number of offices, and the ICT senior manager would present in terms of ICT infrastructure and equipment that is there and we are able to analyse. And the General Manager (GM) Grants Administration would then say in terms of the targets that we have, we need more laptops, 3G cards, we need more boosters. We are doing those checkings [sic] if capacity management is adequately supporting the customers and business needs. Also in terms of the new offices that we want to roll out, for example, Facilities will say we want to open a new local office and the GM Grants Administration will say this is what we require and from ICT as well.	Analysis of existing and required infrastructure done to check if capacity management supports the business	**VS-RESP8**	**Infrastructure**		

Question	Response	Summary	Respondents	Code	Category	Theme
Q12: Are standard reports concerning performance produced on a regular basis?	In terms of what I receive, eh, there is very little that is reported around capacity planning as well as capacity management.	Lack of reporting	**FC-RESP1**	**Limited reporting**	**Infrastructure performance**	**Reporting**
	We used to get them daily and those were very useful, and I really relied on them to keep up-to-date as to what is happening.	Inconsistent reporting	**FF-RESP6**	**Inconsistence of reporting**		
	And now that we are not getting those reports I really feel the loss and impact of not having those reports and the effect that it is actually having on availability of services to our users.	Availability of systems impacted due to inconsistency of reporting	**FF-RESP6**	**Inconsistence of reporting**		
	No, I have not seen the reports; I do not know what is contained in the reports and how is it analysed, I have not seen the actual report itself. Even in terms of how many people have got laptops, desktops and which software licenses they have.	Capacity planning report on resources not accounted for Lack of the flow of information	**VS-RESP8**	**Capacity planning reporting**		
	I have not seen reports regarding performance on systems.	Reporting not communicated.	**TR-RESP9**	**Reporting**		
	There is offsite storage in regions regarding backup but have not seen any report to that effect.	Backup reporting consistently not communicated to executives	**AA-RESP7**	**Backup reporting**		

Question	Response	Summary	Respondents	Code	Category	Theme
	At times the use of the resources exceeds a specific threshold and in such instances you will find, eh, we do not necessarily deal with such high spikes in terms of a particular plan put in place.	Non-capacity of resources	**FC-RESP1**	**Capacity**	**Capacity**	
	I do not work directly with those reports; I use it to prove that my server was down, a line speed was down, in case something went wrong with the system. Unless there is a problem with the database and all that stuff, user has a problem with connectivity, etc. To actually monitoring the applications, we have done application monitoring, only did the infrastructure monitoring.	Using reports to prove systems availability and line speed	**KG-RESP4**	**System availability**		
	We get reports when we are doing the reviews and governing structures.		**HDG-RESP10**			
	Some things that need to be sort of considered in terms of capacity planning as well as in terms of monitoring aspects.	Capacity planning/monitoring	**HDG-RESP10**	**Capacity Planning**		
	Managing, although the management is not without challenges because there are aspects around backups and aging of infrastructure.	Backup and aging of infrastructure	**FC-RESP1**	**Infrastructure**		
	It is just that we have not experienced a kind of disaster that tests if that has been done.	Disaster recovery	**FC-RESP1**	**Disaster Recovery**		
	Somebody acting or responding to what was conveyed as a problem	Lack of planning, deal with issues as they come	**FC-RESP1**	**Planning**	**Processes**	
	Use of experience might be vital but it is not always assisting because, eh, if a person who is experienced with the environment goes out and you have a new person to deal with the situation, sometimes you need to be assisted by those documents on how you need to go through to tackle some of the problems.	Skill vs. documentation (lack of documentation)	**FC-RESP1**	**Documentation**		