

Assessment of IT Governance process maturity in Eastern Cape Governance Departments

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DECLARATION

I, **Memory Munashe Ranga**, hereby declare that this thesis, entitled **Assessment of IT Governance Process maturity in Eastern Cape Governance Departments** is my own work carried out at North West University, Vaal Triangle Campus, and has not been submitted in any form for the award of a degree at this or any other university or institution of tertiary education or published earlier. All the materials used have been duly acknowledged as references in the text.

Signature: 

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APPROVAL

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I thank God, my Father, for keeping your word as you never left me nor forsook me on this journey. Thank you for allowing me to go through each day with the knowledge that nothing is impossible in your presence. Today, by your grace I have finished this study.

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DEDICATION

This research is dedicated to my parents, Emmanuel and Ruth Ranga. Your sacrifices in providing me all I needed ensured that my life reaches the pinnacle of success. You planted a seed in me to understand the value of education. I dedicate this to them in recognition of their hard work and resilience.

For your Words of Wisdom,
your Edurance, your Hope and Belief in me,
For never giving up even when all seemed impossible,
this one is for you, Mum and Dad.

ABSTRACT

The South African Government has invested in Information Technology Governance (ITG) for all its Government Departments. Furthermore, the Government Departments have implemented the Information Systems Audit and Control Association (ISACA) Control Objectives for Information and Related Technology (COBIT) for ITG processes. Despite all these available frameworks, Departments still fail to capitalise and improve the ITG processes fully, mainly because these frameworks are too generic and difficult to apply for specific governance needs. Furthermore, there is no guiding framework for ITG maturity processes specific to the Government Departments. This study operationalises two objectives, firstly, to assess the ITG processes maturity levels for the Eastern Cape (EC) Government Departments and secondly to develop a customised framework for the Eastern Cape Government Departments (ECGDs) that should assist them to move from current levels to higher ones in the future. The Government-Wide Enterprise Architecture (GWEA) Framework South Africa was also incorporated (Makovhololo, 2018). Currently, all Government Departments in South Africa are guided on ICT Governance by the DPSA and GWEA frameworks. This research provides an overview of the ICT governance frameworks adopted by South African Government Departments and proposes a different framework designed to strengthen the dynamism of best practices.

This research adopted a mixed research approach within a case study, utilising both qualitative and quantitative methods. Nine Government Departments in the Eastern Cape Province (ECP) were considered for the research. Data were collected through interviews, questionnaires, COBIT assessment experiments, and desktop surveys. COBIT assessment tool, IT Organization Modelling and Assessment Tool (ITOMAT), Statistical Package for the Social Sciences (SPSS), and Actor-Network Theory (ANT) were used to collect and analyse data. Findings show that none of the Eastern Cape Departments involved in the study has done the maturity level assessment. Neither do they know how to conduct it. Also, none of the Departments is aware of moving from one maturity level to the next. All the Departments have not fully utilised the COBIT Assessment tool to determine the maturity levels. Furthermore, findings show that the Eastern Cape Departments have ICT-related policies and strategies; however, there are implementation challenges that affect ITG plans. There is a clear indication that the current guiding national governance framework is outdated and does not accommodate the new changes in other governance frameworks. The study provides the maturity levels for the engaged Departments and develops a guiding ITG maturity assessment framework. The primary outcome of the research should assist Eastern Cape Government Departments in assessing their ITG process maturity levels and moving from a lower maturity level to a higher.

Keywords: Information Technology, Governance, policy implementation, maturity model, maturity assessment, Actor Network Theory, ITOMAT, Processes

LIST OF ABBREVIATIONS

ANT	Actor-Network Theory
BAI	Build, Acquire and Implement
DSS	Deliver, Service and Support
ITIL	IT Infrastructure Library
MEA	Monitor, Evaluate and Assess
SPSS	Statistical Package for the Social Sciences
AI	Acquisition and Implementation
APO	Align, Plan and Organise
AG	Auditor General
AGSA	Auditor General Auditor South Africa
BSC	Balance Score Card
CMM	Capability Maturity Model
CMMI	Capability Maturity Model Integration
CIO	Chief Information Officer
COBIT	Control Objectives for Information and Related Technology
CG	Cooperate Governance
CGICTPF	Corporate Governance of ICT Policy Framework
CGICT	Corporate Governance of Information and Communication Technology
DSR	Data Science Research
DS	Delivery and Support
DPSA	Department of Public Service and Administration
EC	Eastern Cape
ECGDs	Eastern Cape Government Departments
ECP	Eastern Cape Province
EAs	Enterprise Architectures
ERPs	Enterprise Resource Planning
EDM	Evaluate, Direct and Monitor
FIS	Financial Information Systems
GITOC	Government Information Technology Officers Council
GWEA	Government-Wide Enterprise Architecture
ICTG	ICT Governance
ICTGPMAF	ICT Governance Process Maturity Assessment Framework
ICT	Information and Communication Technology
ISACA	Information Systems Audit and Control Association
IT	Information Technology
ITG	Information Technology Governance
ITIM	Information Technology Infrastructure Management
ISO	International Organization for Standardization
IT-CMF	IT Capability Maturity Framework
ITOMAT	IT Organization Modelling and Assessment Tool
ME	Monitor and Evaluate
MPCC	Multi-Purpose Community

NDP	National Development Plan
NTSA	National Treasury of South Africa
NGP	New Growth Path
PMG	Parliamentary Committee Group
PO	Plan and Organise
POPs	Points of Presence
PICC	Presidential Infrastructure Coordinating Commission
PRC	Presidential Review Commission
PCM	Process Capability Model
RSA	Republic of South Africa
RACI	Responsible, Accountable, Consulted, and Informed
SLA	Service Level Agreement
SACF	South African Communications Forum
SITA	State Information Technology Agency
SIP	Strategic Integrated Project
TSC	Thusong Service Centres

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1.1 Introduction

Information and Communication Technology (ICT) has been instrumental as a key strategic enabler of public service delivery. Government Departments globally have embraced technologies and improved service delivery in many countries, including African states. This research was conducted in South Africa where the government has played a significant role in improving ICT service delivery. Astute political leadership has driven ICTs in South African Government Departments (Madyibi, 2019). Since ICTs are ever-evolving and dynamic, the majority of government departments find it challenging to manage them. As a result, there is a gap between ICT services and best practices tied to ICT governance. In 2012 the Department of Public Service and Administration in South Africa (DPSA) developed the Corporate Governance of ICT Policy Framework (hereafter called the “Framework”). The Framework was developed after the Auditor General of South Africa (AGSA) recommended in 2008/09 and again in 2009/10 audit reports the need for a guiding ICT governance framework for all South African Government Departments (Madyibi, 2019). DPSA engaged with the Government Information Technology Officer Council (GITOC) to develop the Framework. The Framework incorporates the King IV Code of Good Governance, ISO 38500 Standard for the Corporate Governance of ICT, and COBIT ICT governance Process Framework.

This study investigates Information Technology Governance (ITG) only in the Eastern Cape Government Departments (ECGDs) in South Africa. The first chapter presents the background to the study, statement of the research problem, objectives, purpose, and research questions. The chapter summarises the contribution made and briefly describes the outline of the thesis. The following sections expand the overview of this research and background.

1.2 Background to the study

South African Government Departments are spread across nine provinces of the Republic of South Africa (RSA) and include Education, Health, Transport, Sports, and many more (Commission, 2013). These departments heavily depend on Information Communication Technology (ICT) as this has become imperative in a knowledge-based economy (Commission, 2013; Fourie, 2018). In so far as the government has become increasingly dependent on ICT, the general perception is that ICT is an enabler of knowledge creation and communication. The use of ICT and its management in these Departments comprises organisational, technical, political, legal, and cultural acumen and skills in order to develop both competent and efficient services.

The application of ICT and its management has become a key factor regarding successful ITG integration and its influence on the core business of various departments (Botha, 2014). These include ITG alignment, runaway ICT projects and project costs, value delivery, risk control, and maximum use of resources in the execution of specific functions that enhance performance (Chisango & Lesame, 2017). Research has shown that the top 10 management concerns include ITG alignment, business productivity, and cost reduction (De Haes & Van Grembergen, 2012; De Haes *et al.*, 2020). According to van der Walddt (2018), concerns noted with regards to ICTs range from low return on ICT investment, inadequate control structure to having limited control over ICT performance. As a result, these concerns have compelled the urgency for ITG to ensure that IT is aligned with the business and thereby maximize its application in delivering business value.

IT Governance (ITG) is defined as an “integral part of enterprise governance. It has [the] potential to provide leadership, organisational structures and processes that ensure that the enterprise’s ITG sustains and extends the enterprise’s strategies and objectives” (Andry and Setiawan (2019). Being an integral part of enterprise governance, ITG becomes part of the system by which Departments are directed and controlled (Amali *et al.* (2020). Research has shown at least a 60% better returns on IT investment when good ITG is in place and well-implemented (Amali *et al.* (2020). It has also been proven that effective ITG enables alignment between ICT and departmental goals (Neto *et al.*, 2018).

The need for effective ITG has since become a prerogative in Eastern Cape Government Departments (ECGDs) if the province is to keep abreast with national and international strides (Makovhololo, 2018). This is due to the country’s various modifications to regulatory and commercial policies that have led to convergence with regards the ICT sector (Makovhololo, 2018). With these adjustments, ECGDs have experienced rapid changes that call for investment and ICT use in public service delivery. Several ICT-enabled business applications, including those for land, income tax, education, health, human resources, finance, planning, and immigration have been deployed with the ultimate goal of improving public service delivery (Johl *et al.*, 2013).

Considering the introduction of the various Financial Information Systems (FIS) within the Government Departments, it has become clear that ICT is a critical aspect in the Departments’ success, especially with regards implementation, governance, and maturity level (Amali *et al.*, 2020). It is important to note that the success or failure of ICT-related work is determined by the support that ICT gets from top management. In this respect, the National Treasury of South Africa (NTSA)

has tasked all the RSA Government Departments to integrate ITG into Cooperate Governance (CG)(Amali *et al.*, 2020).

ITG has been a key subject amongst researchers and practitioners but remains –a nebulous phenomenon that is hardly understood or fully operationalised (Hasan, 2014; Saeed *et al.*, 2022). After 30 years of empirical research, there are still some gaps that need to be filled, especially the lack of a consistent and well-established research body pertaining to this topic. Since IT has become fundamental in organizations' support, sustainability, and growth, the most important decisions regarding information technologies have moved to the boards and senior management executives, calling for a specific focus on enterprise governance of IT (Rowlands *et al.*, 2018). In respect of this focus, Huygh, (2018) states that this situation has improved the role of IT governance as an integral part of corporate governance. In the past, IT governance has been strongly associated with the structure or configuration of the IT function, reflecting the locus of responsibility for IT decision-making (Johl *et al.*, 2013; Ngqondi & Mauwa, 2018). However, concentrating on IT structure only leaves out the sphere of IT activities within these structures, making adopting different governance mechanisms a pivotal way to improve the IT governance performance.

Process maturity is the level to which a process is plainly defined, managed, measured, controlled, and effected. The Capability Maturity Model (CMM)

model and the COBIT Framework are used as tools for measuring IT governance maturity processes and providing specific metrics to improve the process in this study (Johl *et al.*, 2013) (Rowlands *et al.*, 2018).

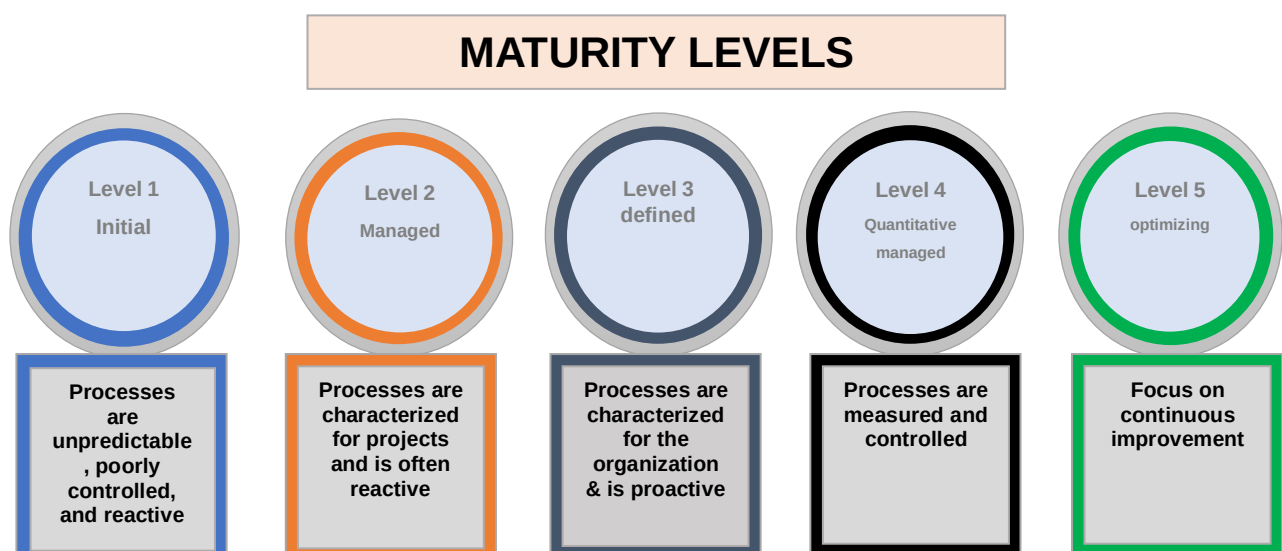


Figure 1.1: Process Maturity Level

A preliminary literature study was conducted to identify the available methods that could be used to assess ITG process maturity. In addition to this, this research project utilises Actor-Network - Theory as the basis to argue for a value structure through which ICT governance in the strategic areas of the COBIT model could be measured. Actor-Network Theory provides a basis for ECGDs, the principal actor being the Government and the Departments being the agents that work on operationalisation (De Has et al., 2016).

1.3 Statement of the problem

The ECGDs rely on the DPSA framework for ICT governance. Unfortunately, the framework does not provide the means to assist in COBIT assessment maturity levels, although the DPSA framework is based on the COBIT framework as one of the tools. The Eastern Cape Government Departments lack a guiding framework for ITG maturity processes specific for the Government Departments. To further understand the problem, it is critical to provide a brief background of the DPSA framework.

The Department of Public Service and Administration (DPSA) developed a Framework for ICT Governance in 2012 (DPSA, 2012). This DPSA framework is outdated and has not been updated to address the emerging needs of the Government Departments with regards ICT. The governance frameworks that informed the DPSA framework, such as COBIT, ITIL, and ISO standards, have been updated while DPSA is still the same (Patón-Romero, 2018) making it difficult for Government Departments to apply and fully improve process management and maturity levels management. Government Departments using the COBIT framework cannot apply the DPSA and carry out maturity level processes.

The development of the DPSA was recommended by the Auditor General Auditor South Africa (AGSA) during 2008/09 and again in the 2009/10 financial years (Patón-Romero, 2018). At that time, the Auditor General (AG) recommended that: (a) A Government-wide Governance framework to improve ICT processes be developed, and (b) The Governance of ICT duties should be explained and implemented to ensure better ICT service delivery by Government Departments. This framework is typically used with the Government -Wide Enterprise Architecture (GWEA) Framework South Africa (Rowlands *et al.*, 2018) (Makovhololo, 2018). This framework summarises processes in COBIT and how the Government Departments could successfully implement the COBIT framework within the South African context. The justification of the DPSA was based on the need for ICTs to be centralised and managed at a Political Leadership and Executive Management level. It was also argued that good governance requires support from international best practices and standards. Some of the key references were the King IV Code of Good Governance, ISO 38500 Standard for the Corporate Governance of ICT, and the COBIT ICT governance Process Framework (Naidoo, 2019).

Despite the consultation and integration of other good ICT governance frameworks, DPSA has not assisted most Departments as they have different challenges and expectations. Even though studies have shown that Government Departments have an appreciation of ICTs and have made an effort to adopt ITG frameworks such as the DPSA IT Governance framework, COBIT, Val IT, and ITIL; these Governmental Departments still struggle to attain an efficient ITG system as reflected by processes that remain underdeveloped (Van Grembergen, 2020). This research considers one critical ICT Governance framework, which is also part of the DPSA, which is the COBIT framework. Learning from the DPSA implementation lessons, this research develops an ITG framework for the ECDGs that shows a roadmap for continued ITG development and maturity. Such a framework could be useful in ITG development for the Eastern Cape (EC) Province and developing countries with the same challenges as those mentioned. The challenges confronting the South African Departments, as pointed by (Chisango, 2019) (Chisango & Lesame, 2017) are:

- i. Inconsistent and non-standard engagements on ICT governance related planning;
- ii. Too many ICT Governance frameworks not linked to each other;
- iii. A lot of money being spent by Governments Departments on ICT governance without realising much value and benefit;
- iv. Failure to apply and use DPSA to understand and capitalise from other ICT governance frameworks;
- v. Government Departments unable to utilise current ICT Governance frameworks to assess maturity levels and
- vi. Furthermore, according to the AGSA reports, the ECGDs have been lagging in implementing IT governance (AGSA, 2017/18). The challenges mentioned above, and the problem statement requires more understanding and further research, as proposed by from the key sections that follow.

1.4 Research questions

1.4.1 Main Research question

How can the ECDGs enhance the maturity of their ITG implementation through assessment of maturity levels?

1.4.2 Sub- research questions

- 1) What are the available ICT governance frameworks suitable for the ECGDs?
- 2) To what extent are the processes of ECGDs aligned to public sector ITG best practices?
- 3) What are the frameworks for evaluating ITG maturity?

- 4) What are the challenges faced by Government Departments of developing countries in the implementation of ITG?

These research questions are designed to provide answers to the following research objectives.

1.5 Research Objectives

1.5.1 Primary objectives

The main objective of this study is twofold, and elaborated to:

- a) Assess the ITG process maturity levels of ECGDs that are using COBIT and
- b) Develop a comprehensive ITG framework that enables ECGDs to move from one maturity level to the other

Currently, the Departments struggle to progress with their ITG projects, and little is known from the current DPSA framework. Thus, the proposed framework could be used to assist the public sector organisations move from one maturity level to the next from the highest governing authority to the ICT functional environment.

1.5.2 Sub objectives

In order to realize the main research objectives mentioned above, the following sub objectives are presented to:

- i. Investigate ICT governance frameworks suitable for the ECGDs.
- ii. Establish the extent to which ECGDs' processes are aligned to ITG best practices.
- iii. Identify frameworks for evaluating ITG maturity.
- iv. Interrogate the challenges faced by Government Departments of developing countries when implementing ITG.

1.6 Research design and methodology

The conduct of this study assumed a pragmatist research paradigm. Pragmatism aligns with the aims of this study that sought to assess and develop a framework for ITG. Thus, pragmatism research leads to the development of an artefact such as the framework proposed in this study. Furthermore, this study applied inductive reasoning that allows the development of a framework and proposition of hypotheses at the end where necessary. This study used mixed methods for data collection and analysis in line with the research paradigm and approach, utilising both the quantitative and qualitative methods. Hence, a triangulation of data collection techniques and

analyses were used in this study. The target population was the ECDGs. This study's data collection techniques included face-to-face interviews, questionnaires, and document analysis. Data for assessing the maturity of business processes in the ECDGs were gathered. Actor-Network Theory (ANT) and Information Technology Organisation Modelling and Assessment Tool (ITOMAT) were applied to support the interpretation and analysis of the results of this study. Measures for promoting reliability and validity were done to ensure rigour in the study. This presentation is only an outline and Chapter 2 explains the research methodology in detail.

1.7 Research Limitations

The major in this study limitations were categorized into four areas:

- In terms of the survey, the possibility of variances was evident in the results due to:
 - Self-Selection Bias, a situation where bias occurs because people who feel strongly about a subject or have an interest in it are more likely to respond than indifferent people.
 - In terms of the actual questions themselves response bias as a result of “unconscious misrepresentation” could have occurred due to people not understanding the question content or the rating based on a personal view which may not be shared by other experts either within the organisation or industry resulting in over or under estimation of maturity of specific governance areas for example.
 - The results of the interviews required coding of the responses. The definition of these codes required judgement by the researcher introducing potential subjectivity into the data analysis process.
- a) The aim of the survey was to formulate a picture of the current IT governance landscape and assess the process maturity. The concern was that sampling frame, where certain sample elements were excluded or overrepresented due to the sample selection method, could introduce bias into the results.
- b) The business environment was highly pressurized and access to ICT Directors was difficult to obtain. Only one department had a Deputy Director interviewed instead of the director.

1.8 Significance of study

The results of this study provide the Eastern Cape Government Departments with information on ICT governance maturity, the level of prevalence of ICT in the public sector, and the level of alignment of ICT to the corporate and administrative functions. The study developed a value framework that can identify the level of usage and benefit gained by Departments from the effective implementation of ITG and how the Departments could move from one maturity level to the next.

1.9 Research contribution

The contribution of this study to the body of knowledge is unique in terms of the measurement of ICT pervasiveness.

- a) ICT governance is fundamentally focused on the board directives, policies, and procedures that regulate how an organisation directs and controls the use of its technology resources so that these resources may effectively promote the realization of the organization's business goals (Robinson et al., 2020). Process maturity includes the requirement to guarantee that the current technology resources are optimally utilized and that new technology possibilities are continuously revised and planned into policies and procedures to ensure that the improvement derived from technology innovation is constantly exploited and optimized. As a result, this study investigated the training programmes that have been offered to ICT top management to ensure that they effectively implement ITG in Eastern Cape Government Departments.
- b) In this case, the framework is robust and substantial to ensure that IT enables the competitive advantage to business, IT risk must be managed precisely together with its resources. This study proffers a value framework that emphasizes the merits of implementing a best practice framework for the ECGDs, as well the framework its ability to get customized for other Government Departments across South Africa.
- c) Academically this research shows how the Actor Network Theory can be combined with ITOMAT tool to clarify the role of the human and technical aspects in ITG. The combination helped in formulating the key framework components that were considered for the final product of the research.
- d) The study generated an Information Technology Governance (ITG) assessment framework that can assist Government Departments to move from one maturity level to the other. It is not only limited to the assessment of the levels.

1.10 Thesis structure

The structure of the thesis is summarised as shown below:

- **Chapter one** consists of the background and introduction to this study. It explains why this research is relevant and introduces the problem statement and research objectives.
- **Chapter two** focuses on the research methodology and design used in this research.
- **Chapter three** is the first section of the literature review. It provides an overview of ICT Governance (ICTG) and the status thereof within South Africa, Africa, and the rest of the world.

- **Chapter four** is the second section of the literature review, describing the various models used to assess the process maturity of ITG.
- **Chapter five** discusses the findings based on the data analysis results.
- **Chapter six** presents an interpretation of the findings concerning the research questions.
- **Chapter seven** discusses the processes followed in generating and developing the ICT Governance Framework.
- **Chapter eight** concludes the study and highlights recommendations for future research in this niche area.

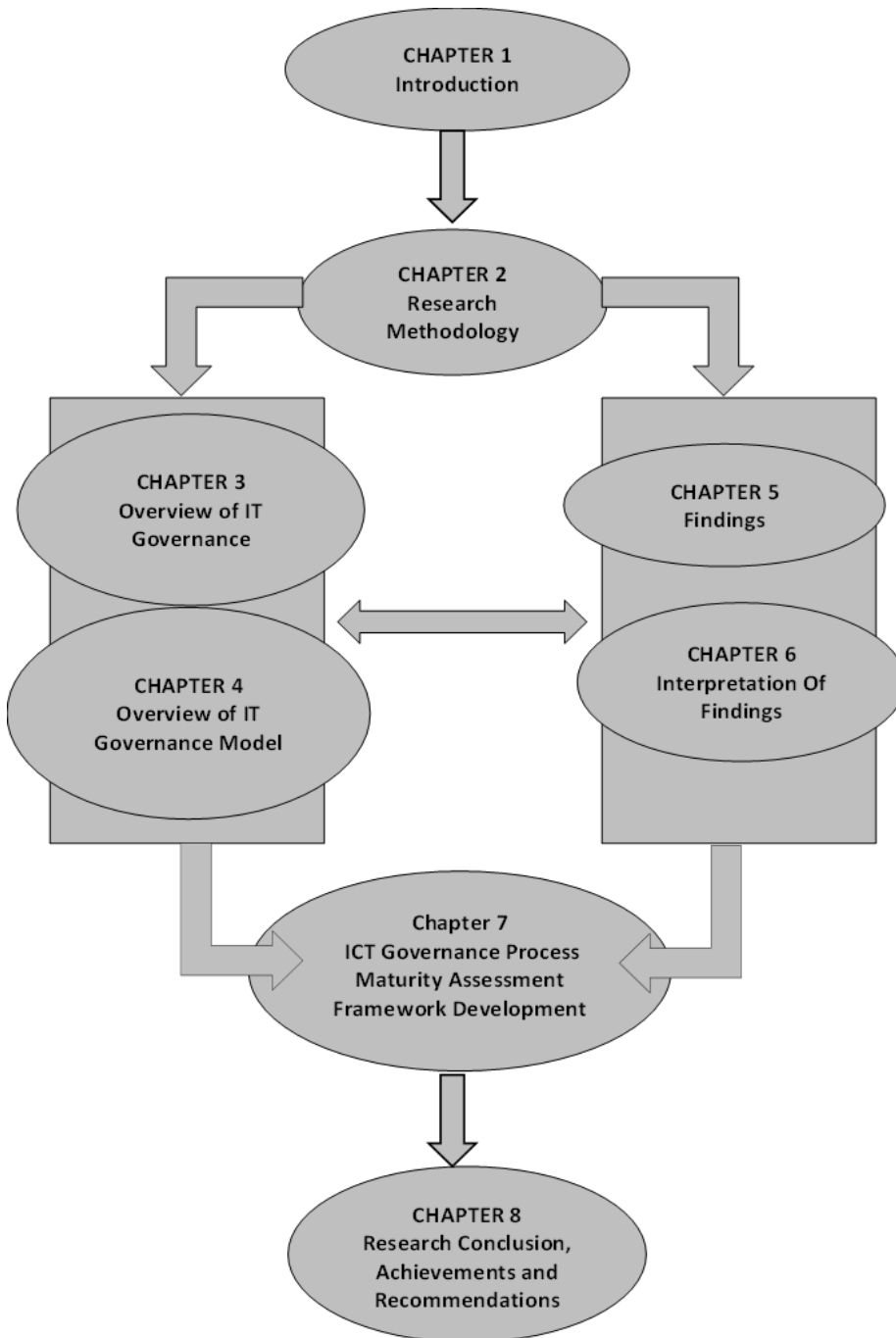


Figure 1.2: Summary of Thesis Structure

1.11 Conclusion

This introduction chapter presented the background to the research, the current problem statement as well as the research objectives. Additionally, the high-level summary of research methods followed in this study was also amplified. Most of these preliminary sections are annotated in the following chapters.

2.1 Introduction

This chapter explains the research methodology used in this study and provides the rationale. Furthermore, it provides the foundational and grounding framework on how data was collected. Firstly, the research paradigm that was followed together with the research approach and design are explained in this chapter. Since the study adopted the mixed-method approach, the research design focuses on the study's use of the mixed methods. This was informed by the nature of research questions. The research also made use of document review of the Department's strategic documentation. The study's population and the sampling methods used are also explained. This is followed by an explanation of the measures taken to ensure the validity and reliability of the measuring instrument. Similarly, practices followed to ensure adherence to the ethics code of conduct are also explained.

2.2 Research Objectives

2.2.1 Primary objectives

The main objective of this study is twofold, designed to:

Assess the ITG process maturity levels of ECGDs that are using COBIT and

- Develop a comprehensive ITG framework that enables ECGDs to move from one maturity level to the other.

Currently, the Eastern Cape Departments experience significant challenges with regards progress with their ITG projects, and little is known from the current DPSA framework. Thus, the proposed framework could be used to assist the public sector organisations to move from one maturity level to the next from the highest governing authority to the ICT functional environment.

2.2.2 Sub objectives

In order to realize the main research objective mentioned above, the following sub-objectives are presented to:

- i. Investigate ICT governance frameworks suitable for the ECGDs.

The literature presents different frameworks for IT governance. This sub-objective aims to investigate and identify an IT governance framework suitable for the ECGDs.

- ii. Establish the extent to which ECGDs' processes align with ITG best practices.

The level of alignment of ICT to the core business indicates the relevance of ICT and the effectiveness of the ICT function. The alignment is assessed using the following four domains: Business Strategy, Organization Infrastructure and Processes, ICT Strategy, and ICT Infrastructure and Processes. The alignment of ICT to the organization's processes affects its value to the department; thus, the value derived from alignment can also be used in the value assessment of the department. In this manner, alignment supports the primary objective.

- iii. Identify frameworks for evaluating ITG maturity.

One of the crucial factors of ITG development is evaluating the extent of its maturity. This helps organisations to measure their progress as they implement ITG. However, different models that could be used for process maturity evaluation are available in the literature. These include the COBIT 5's Capability Maturity Model Integration (CMMI) and ISO/IEC 15504's Process Capability Model (PCM).

- iv. Investigate the challenges faced by Government Departments of developing countries when implementing ITG.

Developing nations have always experienced more challenges in IT adoption when compared to developed nations. As such, it is also expected that developing countries would most likely face challenges when implementing ITG. This is expected to be more pronounced in the public sector where there is a shortage of the necessary skills and high labour turnover. Accordingly, this sub-objective aims to investigate challenges faced by Governments Departments in developing countries when implementing ITG. The sections below indicate how the data was collected and analysed.

2.3 Research paradigm

In any academic study, the researcher seeks to elicit new epistemic horizons that systematically adds to the existing body of knowledge (Park *et al.*, 2020). This exercise begins with carefully selecting a research topic, area of interest, and a research paradigm. A research paradigm is a set of ideas about the nature of the world and the roles of the researchers, and how their environment complicates their thinking, and underpins their research actions (de Vries, 2020).

Leading authors on research methodologies have proposed different research paradigms. For example, Park *et al.* (2020) suggest two research paradigms: positivism and interpretivism.

However, researchers believe that four research paradigms may be used in IT research: positivism, interpretivism, realism, and pragmatism. On the contrary, (Peppers *et al.*, 2007) suggest design science as an emerging research paradigm.

It should be realised that the positivism research paradigm is the oldest one that is widely used in natural science research (Collis & Hussey, 2009). The positivist research paradigm assumes that the truth is out there and can be measured independent of the researcher. This is in stark contrast to the second oldest research paradigm: the interpretivist paradigm that contends that knowledge is subject to the researcher's interpretations (Maoneke, 2014). Hence, the researched and the researcher are not independent. Nonetheless, the pragmatist research paradigm consolidates both the positivist and interpretivist paradigms and aims to propose tangible solutions in the form of artefacts.

Creswell and Creswell (2017) argue that the paradigm adopted for a study is influenced by the dominant paradigm in the research area and the nature of the problem under investigation. In order to answer the research questions posed by this study, this research project followed the pragmatism paradigm, which supports the mixed-method approach. The mixed-method combines qualitative and quantitative approaches (Almalki, 2016). The literature on IT governance within the public sector context remains fragmented; hence, assuming a pragmatist research paradigm and mixed methods research offers "a holistic understanding of" the phenomenon under research" (Leavy, 2017).

2.4 Research approach

(Reinke *et al.*, 2016) identifies two research approaches: deductive and inductive research. The research philosophy adopted in this study supports inductive reasoning. According to (Hayes & Heit, 2018), inductive reasoning begins by detecting patterns and regularities, formulates specific tentative hypotheses that may be explored, and culminates in developing some general conclusions or theories. This study used inductive logic to study the relevant literature on existing ITG frameworks as part of secondary data collection. Secondary data was gathered in the literature review chapters three and four. Equally, the study relied on document review from departmental strategic documents. This study gathered primary data and engaged in expert reviews for further data generation that culminated in the formulation of a proposed framework proffered at the terminus of this study.

2.5 Research design

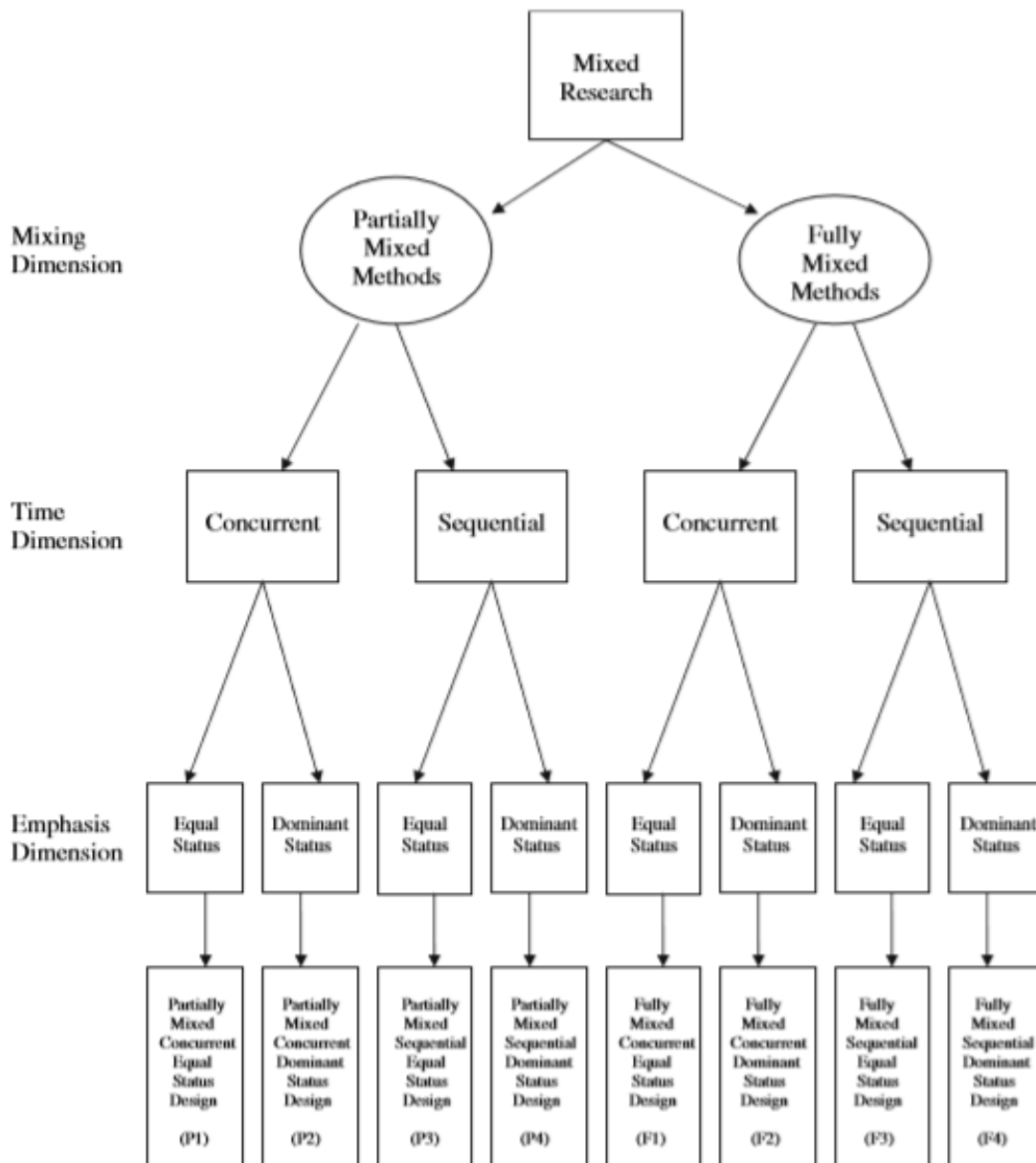
A research design refers to the research process followed in a study to address its research questions. (Maoneke, 2014) suggests that a research process involves identifying research questions that are explicated through priori constructs based on a literature review. These priori

constructs are then compared with primary data findings to address the research questions. Chapter 1 of this study defined the research questions, while Chapter three and four identified the priori constructs of this study. This chapter explains the methods used to generate the primary data used to address the research questions. As already indicated, this study subscribes to the pragmatism research paradigm and uses mixed methods. In particular, mixed methods are applied to selected case studies. The following sections explore the application of mixed methods in this study.

2.5.1 Mixed methods design

The use of mixed methods in this study implies that both qualitative and quantitative research methods were usefully applied in generating the data. Quantitative research methods are empirically objective, requiring higher numbers of samples that generate specific and precise data with potentially low reliability. Qualitative research, in contrast, uses smaller samples due to the additional investment required during the data gathering process, and it produces more accurate data while simultaneously introducing the potential of interviewer subjectivity into the process (Reinke *et al.*, 2016).

Indications are that mixed methods can be done following two separate dimensions: partially or fully mixed methods (Creswell & Creswell, 2017). Mixed methods can further assume two different designs within these dimensions: the sequential or concurrent design (Onwuegbuzie *et al.*, 2009), as shown in Figure 2.1. Mixed methods research assumes a sequential design when data collection using one research method is used to inform further data collection using a completely different research view or method (Fetters *et al.*, 2013); (Guetterman *et al.*, 2020). For instance, one could initially use a qualitative research method to gather initial data and identify key themes that are then validated using a more extensive quantitative survey. Accordingly, the design in this study involves the collection and analyses of both qualitative and quantitative data simultaneously and also for the Data Science Research (DSR) method was used in formulating the framework (Onwuegbuzie *et al.*, 2009) .



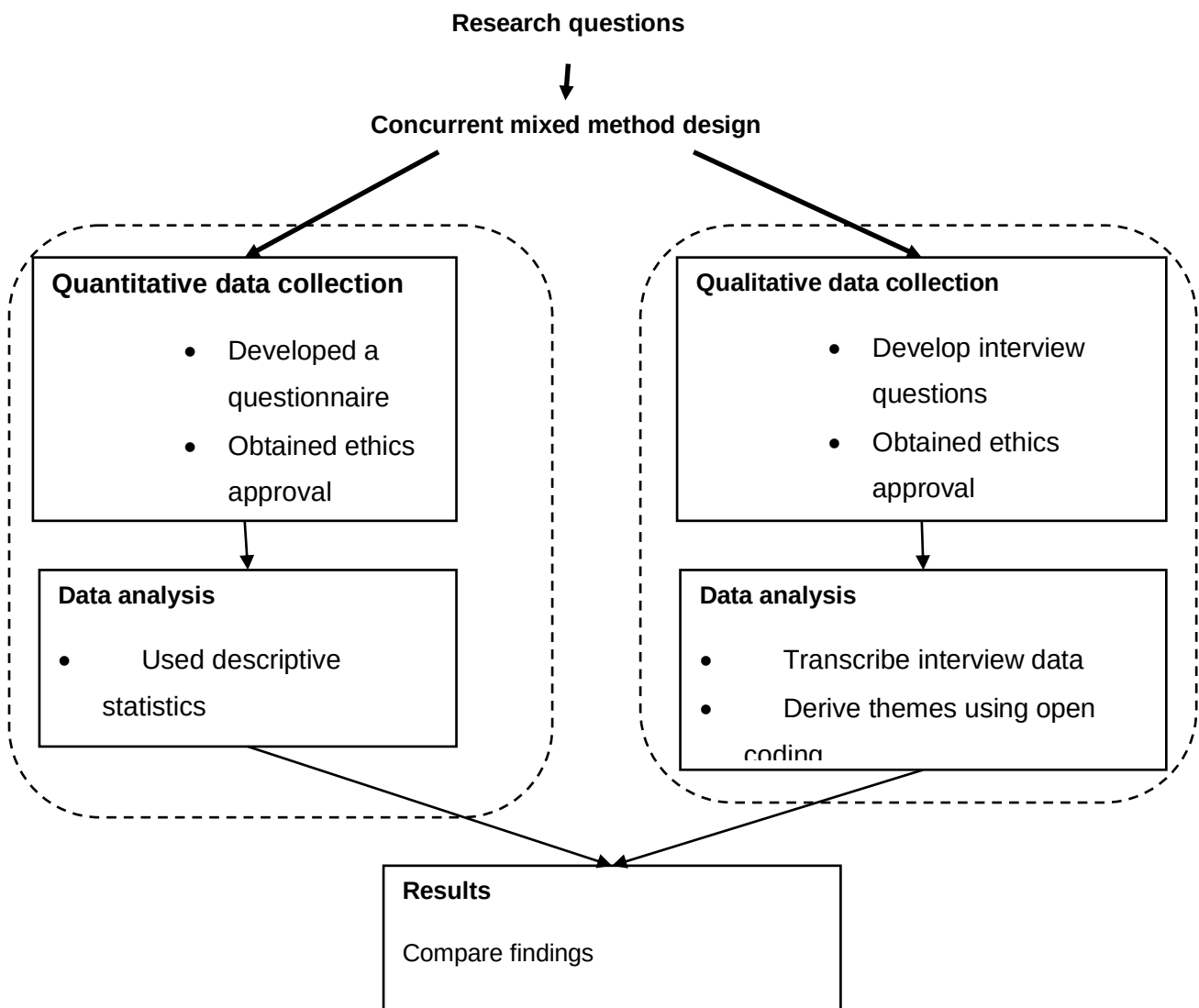
Source: (Onwuegbuzie et al., 2009)

Figure 2.1: The topology for mixed methods research design

Hong *et al.* (2018), posit that the combination of different methods helps researchers overcome the shortcomings, limitations, or intrinsic biases associated with using a single method, single-observer, and single-theory studies. Studies show that both approaches (quantitative and qualitative) have their strengths and weaknesses, and based on that assertion, the researcher argues that combining them helps to strengthen the validity and reliability of the findings.

2.5.2 Mixed method implementation

It was indicated in the previous section that this study followed a mixed-method approach. Hence, quantitative and qualitative data were gathered separately in line with a recommendation by Onwuegbuzie *et al.*, (2009). This was meant to aid the attainment of standards for enhancing rigor within each method, qualitative or quantitative. This method was selected because it assisted the researcher in providing a picture of the maturity levels of ITG within EC Province as derived from the research questions. Figure 2.2 summarises the implementation of the mixed method in this study following suggestions made by (Hesse-Biber & Leavy, 2010).



Source: (Hesse-Biber & Leavy, 2010)

Figure 2.2: The implementation of a concurrent mixed method

2.5.3 The case study site and design

This study was conducted in one of the remotest and most underdeveloped provinces of South Africa, the Eastern Cape. Nine Government Departments took part in this study, and they were analysed as distinct cases as described in the sections below. Furthermore, this section explains how case studies were used as sources of data to address the research questions. The objective of this research was to gain an understanding of the current state of IT governance and assess the process maturity thereof using exploratory research (Bhatta, 2018). The research also strove to obtain empirical data to allow for descriptive research that generated an understanding of the characteristics of a specific population, organizational IT, based on observable results (Reinke *et al.*, 2016). The focus is on explaining the unit of analysis, the number of cases, and the case selection criteria used in this study.

2.5.3.1 Proposed unit of analysis

Yin (2011) suggests that the unit of analysis is simply the case studied. This study focused on assessing IT governance in the public sector of South Africa and specifically limited to the ECGDs. The reports from the AG suggest that the ECGDs lag behind in their implementation of IT governance, a common trend in some of the rural-based provinces in the country (AGSA, 2016/17). This study is conceptualised from the understanding that it is essential to understand the levels of IT governance maturity and potential causes of this laggardness. A framework is then proposed to guide IT governance's future implementation.

2.5.3.2 The number of cases

Maoneke (2014) observed that it is vital to identify the number of cases to be included in case study research. While there is no specific number of cases suggested in the literature, it is generally assumed that the more the cases that a study is based upon, the better the result (de Vries, 2020). Accordingly, this study used a multiple case study to enhance the quality of the findings. Nine cases were considered suitable for this study. (Bhatta, 2018) (de Vries, 2020) suggest that basing a multiple case study on 4 to 10 cases, the researcher could make substantive conclusions or picture the complexities of the real world.

2.5.3.3 Case selection criteria

The research used purposive sampling to select data collection units that yielded the most relevant and broadest range of perspectives on the research conundrum (Bhatta, 2018). Nine cases were ultimately considered for this study. The public service Corporate Governance of ICT Policy Framework (CGICTPF) of South Africa shows that not every employee in the Government Departments can participate in IT governance, hence purposive sampling was used to identify relevant and information-rich participants for the study.

Overall, a population of 60 participants which comprised IT Directors, Managers and Technicians were engaged during data collection. Sections below on qualitative and quantitative data analysis explain how each method identified these participants for inclusion in the study. The sample size considered for participants reflects the diversity of the groups' composition to protect undesirable biases and rival explanations. Data collection focused on participants' perceptions on ITG adoption and implementation. In order to understand the ITG process maturity in the Departments, it was necessary to understand the participants' viewpoints on how decisions are made within the department. The factors that influence decision-making in each department were also examined.

The strength of the case study lies in its potential to provide in-depth insights and establish rapport with the participants (Feagin *et al.*, 1991). The selected Departments varied in size and the extent of governance. These two factors were essential to get diverse views in terms of industries and participants (Yin, 2012) (Basias & Pollalis, 2018). The names of the Departments cannot be revealed due to the confidentiality clause. Therefore, the department names are represented by case numbers. A brief description of the mandate of each department (case) is shown in Table 2.1.

Table 2.1: Description of Departments (cases)

Case number	Departmental mandate
Case 1	Responsible for transport
Case 2	Responsible for health and welfare
Case 3	Responsible for the governance of all the Government Departments within EC
Case 4	Traditional affairs
Case 5	Rural and agricultural development
Case 6	Managing the provincial municipal and departmental budgets
Case 7	Sports and recreation
Case 8	Education
Case 9	Economic development

2.5.3.4 Sampling method

Due to the nature of the research, the researcher should not use random sampling techniques (Berndt, 2020). Hence, the researcher used non-probability techniques to select participants for the study. This gave the researcher greater independence since it has no restrictions or boundaries in selecting the sample and depends on the researcher's judgments (Creswell & Creswell, 2017). A non-probability method is a subjective procedure in which the probability of selecting participants from the population cannot be determined (Stratton, 2021) (Etikan & Bala, 2017). Non-random sampling techniques include judgment, quota, and convenience sampling (Stratton, 2021). For this research, the researcher used convenience sampling. Interviews were conducted with the 9 IT directors from the cases selected or Government Departments considered in this study. The questionnaire was distributed to 12 IT Managers and 39 ICT Technicians within each Government department.

Table 2.2: Research Data Gathering Methods, Sample Selection Method, and Sample Size.

Data Gathering Technique	Sample Selection Method	Sample Size
Questionnaires	Purposive Sampling – ICT Managers and some technicians were selected based on the group under which the department belonged.	60
Face-to-Face Interviews	Purposive Sampling – Individuals were selected based on pre-specified criteria, namely responsibility for organizational IT or portions thereof which required their input into decisions relating to the establishment and management of IT governance within their department.	9
Document review	ICT Governance documentation such as ICT strategies, policies and ICT Steering committee reports, internal and external audit reports were requested by the researcher from the ICT Directors and were reviewed for ICT Governance process adequacy based on the structure and mandate of the department.	N/A
Experiments	Using the COBIT 5 Assessment tool to determine the maturity levels of each department.	N/A

2.5.4 Implementation of the qualitative method

As part of the mixed method, qualitative data was collected so that IT governance in the ECGDs could be assessed. This section describes the data collection and analysis methods used in the qualitative method.

2.5.4.1 Qualitative data collection

This study used triangulation of data collection techniques. Data were gathered through interviews and document analysis. The techniques are amplified below:

- a) **Interviews** – Face-to-face interviews were conducted during data collection based on open-ended questions enabling respondents to include additional detailed information relating to their choices or responses (Barrett & Twycross, 2018) (Basias & Pollalis, 2018). These interview questions were derived from the literature as shown in Appendix A. All interview sessions were tape-recorded using a Dictaphone, and the interviewer took additional notes during the interview where necessary. All interviewees were contacted in advance to schedule an appointment. The researcher requested interviews telephonically or by email. Once that was set up, the interviewee went on to send interview questions to the directors a week in advance to familiarise the interviewee prior to the face-to-face interview. The interviews lasted approximately 45 minutes each and these were held at the Government offices of each participant across the locations in Bisho, King Williams Town and Zwelitsha.
 - **Documents analysis** – this involved an analysis of existing documents that related to IT governance. Such documents reflect an organisation's commitment to IT governance and ranged from the organisational mission, vision, ICT strategies, departmental strategies, ICT policies and procedures, internal and external audits reports, and a risk register.

2.5.4.2 Qualitative data analysis

Qualitative data analysis commenced from a within-case analysis followed by a cross-case analysis (Venkatesh *et al.*, 2013). Within-case data analysis saw tape-recorded interviews being transcribed first. Transcribing saw each participant's responses being written separately. (Almalki, 2016) describes this as a process for consolidating and analysing the qualitative data gathered during the research process. This includes data reduction, structuring, and detextualising the data. Accordingly, having a transcript of the interviews paved way for data reduction. (Fusch *et al.*, 2017) describes data reduction as re-organizing data and removing irrelevant data through some form of coding. The process includes identifying keywords or phrases related to specific areas covered in the survey. The keywords or phrases were then allocated a unique identifier. This data reduction process is what (Mezmir, 2020) calls open coding.

To ensure the correctness of data, certain practices on the structure of the data were observed. In particular to this study, the interview process saw a logical sequence of questions being asked based on the structured questions. As such, the results of the coded data obtained during the data reduction process were often made within the context of a specific question, providing insight into the respondent's choice. The logical sequence of the interview questions provided the structure for the data (Aguinis & Solarino, 2019; Gill *et al.*, 2008).

Furthermore, the detextualisation of data saw most data gathered in extended text format, which was not suitable for analysis being organised. The data were tabulated, and the number of occurrences for specific keywords, phrases, or themes were documented. The purpose of the coding exercise was to reduce individual responses to a few general categories of answers that could be assigned numerical scores (Flynn *et al.*, 2018).

Findings from document analysis were collectively analysed together with findings from interviews. Qualitative data analysis progressed to axial coding once data reduction or open coding was made. Axial coding involves the establishment of relationships between categories. (Maoneke, 2014) suggests that axial coding involves establishing relationships between categories of data that were arrived at by open coding. Concerning this study, the idea behind axial coding was to address questions such as *“what is happening in relation to IT governance at the identified department?”*, *“how is IT governance happening”* and *“why is IT governance happening in a certain way?”*

The end of within-case analysis meant that qualitative data analysis could proceed to cross-case data analysis where findings from one case were compared against those of the other cases. As indicated earlier, this study was based on a multiple-case study that constituted 9 cases. Therefore, the cross-case analysis identified the most popular and least popular opinions from the data. This ensured that the resulting framework or model could easily be generalised to other cases. Nonetheless, findings from qualitative data analysis were further combined with those from quantitative data analysis prior to developing a framework. The following sections explain the implementation of the quantitative research method in this study.

2.5.5 Implementation of the quantitative method

A questionnaire was used to collect quantitative data to answer research questions presented in Chapter one. A questionnaire is a set of cautiously deliberate questions given in an unchanged method to a set of individuals to gather information around some phenomenon in which the investigator is concerned (Palinkas *et al.*, 2015). The questionnaire was developed in English, and questionnaire items were simple, straightforward, valid, and reliable. (Krosnick, 2018) states that one of the leading choices in the questionnaire design procedure proposes questions to be examined; thus, questions must be pertinent and precise. A questionnaire was designed through

a literature review, mainly Chapters 3 and 4. The questionnaire constituted of parts, namely Part A, B, and C. Part A gathered general demographic information about the Government Departments and participants' knowledge of IT governance. Part B focused on attributes for evaluating IT governance within the identified Government Departments. Lastly, Part C gathered data to assess the maturity of 34 business processes in COBIT 5. It should be noted that the DPSA adopted COBIT as its tool for implementing IT governance in Government Departments. All questions were close-ended, and respondents were to select available choices. Only Part C was based on a 5-point Likert scale that ranged from "strongly agree" to "strongly disagree." A copy of the questionnaire is attached in the Appendix B.

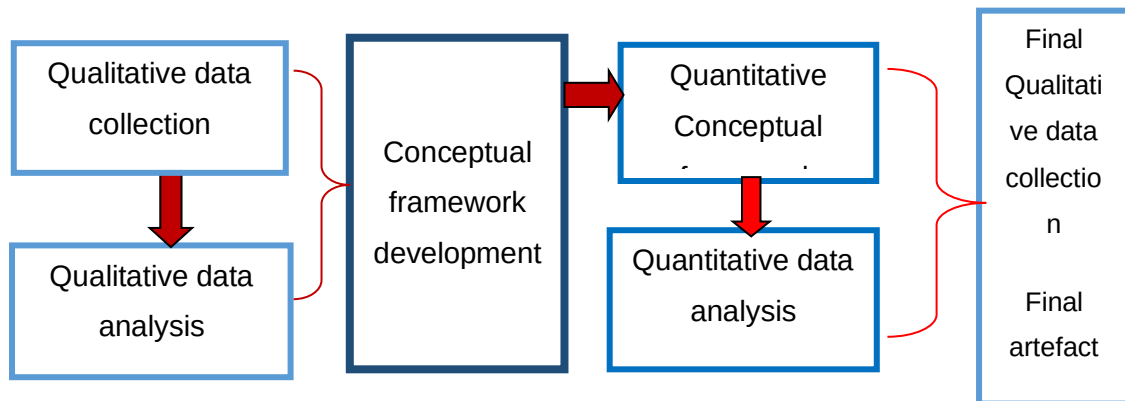
2.5.5.1 Data collection and analysis

The researcher visited various Government Departments as shown in Table 2.1 and distributed the questionnaire to the IT Manager and other ICT section heads. Respondents were given at least two weeks to complete the questionnaire. The researcher used reminders in the form of electronic mails and phone calls to encourage the completion of the questionnaire by the targeted respondents. Once the questionnaires were received, evaluating each of the responses was undertaken. Each completed questionnaire was reviewed according to the following criteria:

- Each department was evaluated to confirm that they were valid. Questionnaires submitted without Department names were excluded from the research.
- Additional questions including the first five questions had to have been answered.
- Respondents had to be related to management positions which indicated an understanding of the IT governance within the context of their department.

The Statistical Package for Social Science (SPSS) Version 25, Professional Edition) was used to analyse the collected quantitative data. Descriptive statistics were used for data analysis. These include the mean, median, and standard deviation. The distribution of respondents was used to arrive at a decision.

Furthermore, a triangulation of data analysis that combined qualitative and quantitative data was also performed (Fusch *et al.*, 2017). (Hong *et al.*, 2018) define triangulation as "the use of two or more independent sources of data-collection or analysis methods within one study in order to help ensure that the data is telling you what you think they are telling you." The use of a combination of data types (triangulation) increased the validity of the study as the strengths inherent in one approach compensated for the weaknesses inherent in another approach (Hendren *et al.*, 2018). Figure 2.3 depicts the data triangulation applied in this study.



Source: (Guetterman et al., 2020)

Figure 2.3: Using Mixed Methods

2.6 Actor Network Theory

In recent years, social theories such as Actor-Network Theory (ANT) have been employed to underpin studies in IT/IS. According to Crawford (2020), underpinning theories provide a framework within which social phenomena can be understood, and the research findings interpreted. Iyamu (2018), claims that the aim of applying theories in the IT field is to cross-examine and understand the process why systems were developed in the manner they are; to understand the choice of the deployment of infrastructure and the IT; the interaction that happened during these processes as well as any planned and unplanned consequences that could emerge during these processes.

The interpretive method is preferred for data analysis in IS/IT studies where this descriptive method, attempts to explain and interpret societal phenomena (Nehemia-Maletzky et al., 2018). However, this approach has a shortcoming because it does not have a formula and is not guided by clear rules and activities (Blok et al., 2020). Therefore, this study used quantitative methods to validate the data.

For many years, ANT has been used in social studies of technology to explain how IS/IT has been assembled and deployed in society (Blok et al., 2020; Cressman, 2009). ANT was established by O'Doherty (2019). Subsequently, ANT has been increasingly used in IT studies. The theory particularly aligns with the interpretive philosophy in the context of IT research (Eze et al., 2018). ANT focuses on actors, networks and their relationships, and their interaction. This includes how networks are formed by both humans and non-humans actors, enacting the relation

and interaction (Fenwick & Edwards, 2019). According to ANT, the world is a fusion of different kinds of heterogeneous objects and environments, both human and non-human actors cooperating and performing together (Blok *et al.*, 2020). ANT further assumes that there are no networks that consist of only humans or only of technological components; all networks contain elements of both. The theory holds an unparalleled view of society as a network of humans and non-humans that interact and cooperate in pursuing a specific goal (Crawford, 2020; Nehemia-Maletzky *et al.*, 2018)

2.6.1 Tenets of ANT

ANT has many tenets, as shown in Table 2.3 below. The focal tenet is an actor. Through other tenets, actors are connected, interact, and manifest their relationships. In ANT, the actor can make a difference within its network. According to Blok *et al.* (2020)), an actor is an entity capable of changing a particular state of affairs, and these actors can be human or non-human. Thus, people, objects, technologies, and organizations can be regarded as actors. These actors form a network that is established through an alliance of similar interests, referred to as actor-network (Yusuf).

Table 2.3: The main tenets that constitute the ANT theory

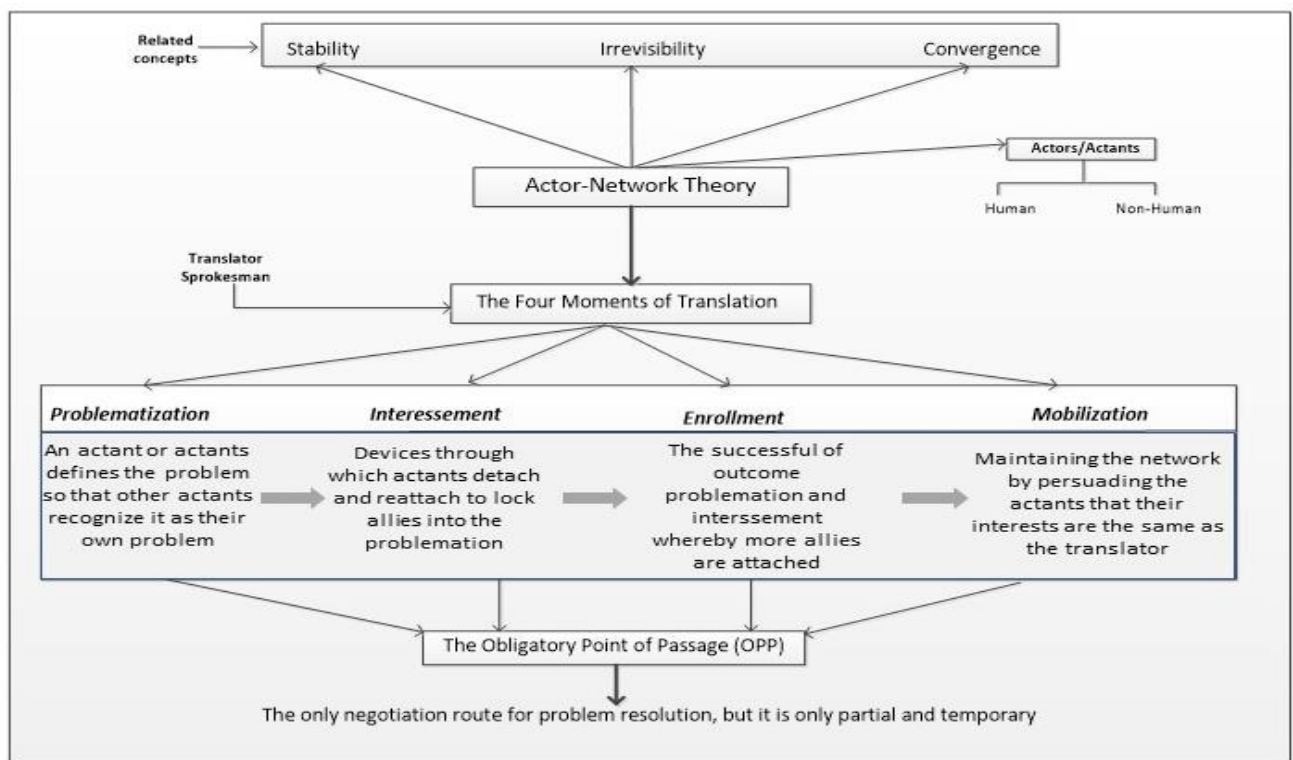
Tenets	Description
Actor (actants)	A person or anything else that is not a person such as a technological component.
Actor-nNetwork	Heterogeneous network with significant interest, such as humans, policies and entities.
Enrolment and Translation	The process of recruiting humans and non-humans by considering their interests that can have significance to the actor-network.
Delegation and Inscription	Actors who are assigned to represent and speak for certain views that they are dedicated to.
Irreversibility	The point where it is difficult to revert a situation back where other possible solutions exists.
Black box	A matured component, with features of irreversibility
Immutable mobile	Components in the network that have rich irreversibility features.

Source: (Yusuf)

2.6.2 Moments of Translation

In ANT, actors and networks are subjected to ongoing pressure for change and are thus not fixed and continue to evolve. This is a result of the constant possibility for changes by actors in the networks and the association amongst the actors (O'Doherty, 2019). Consequently, ANT -related studies emphasize the procedure undertaken to establish an actor-network and restructuring of the networks (O'Doherty, 2019). In order to explore how the actor -network was established, the moments of translation are used, which deal with how actors are recruited directly or indirectly to accept new technical innovations(Yusuf). The translation moments are how the network builder recruits actors and ensures their faithful alliance (Nehemia-Maletzky *et al.*, 2018). The Translation is not deterministic for what actors will do when they come together, but their actions are unpredictable; translation may thus be partial, producing weak connections or even disconnection (Crawford, 2020).

The moment of the translation process, as shown in Figure 2.3, follows four stages in actor-network formations: problematization, interessement, enrolment, and mobilization (O'Doherty, 2019).



Source: (Yusuf *et al.*)

Figure 2.4: Moments of Translation

The four moments of translation are discussed as follows:

Problematization is the initial stage in the moment of translation. This is the initiation stage of the process where a focal actor defines a problem for others within the network (Yusuf *et al.*). The focal actor clarifies the problem and assigns responsibilities where and when necessary.

Interessement is the second stage of the moments of translation, whereby different activities are conducted to convince actors to partake in positions offered to them in an undertaking (O'Doherty, 2019). The network initiator creates a platform to convince actors to unify their efforts to use needed resources to provide a solution to the problem (Eze *et al.*, 2018).

Enrolment follows the stage of interessement in which actors participate in the tasks assigned to them or volunteer to undertake, that is, the actors who agreed to the roles presented to them in the interessement stage (Hu, 2011). The activities undertaken in enrolment involve "multilateral group negotiations, trials of strength and tricks that accompany the interessement and enable them to succeed" (Blok *et al.*, 2020).

Mobilisation is the fourth stage of the moments of translation. It indicates the successful enrolment of actors and the enactment of the problem. It is the stage in which a 'spokesperson' can predictably speak on behalf of others, who can successfully translate the entire network's interests, roles, and relations (Crawford, 2020). The spoken person can be appointed by other actors or self-appointed. This stage translates into the successful establishment of an actor-network with aligned interests. In this stage, the Actor-Network becomes mature, and the association between actors cannot be reversed, whereby the network acts in cohesion as a single unit, this concludes in a black-box (Blok *et al.*, 2020). A black box can be opened to study the processes that made it stable.

When the translation has succeeded, the Actor-Network is mobilized to assume a particular role and perform knowledge in a particular way (Iyamu, 2018). Thus, when actors become connected, the consequences of success or failure spread through the network so that everyone is interested in being successful (Eze *et al.*, 2018).

2.6.3 Actor Network Theory and IT Studies

IT studies have used ANT because of its premise, relevance, and potential contribution to extending epistemic horizons in the discipline. According to Rhodes Birke and Knierim (2020), the use of ANT has the benefit of recreating networks and the associated matters that are or could have been easily overlooked. Also, ANT allows the creation of objects, which are often trivialised in studies (Birke & Knierim, 2020). Rhodes further argues that politics are involved in

establishing networks in ANT. This is because solutions introduced are not necessarily accepted by all and thus can be challenged. The process of enrolling actors can thus be done with subjective preference to support their favoured network. By enrolling allies, actors can mobilize the resources to sustain commitment for their preferred network. ANT has the specific notion of a community that exists of networks that consist of both human and non-human actors intending to cooperate to fulfil a specific agenda (Fenwick & Edwards, 2019).

Although ANT has gained popularity in the IS/IT field, it also faces criticism. One of the main criticisms is the notion that ANT denies any difference between human and non-human agents and the technical and non-technical (Nehemia-Maletzky *et al.*, 2018). Affirming this, Crawford (2020) indicates that understanding the interactions between humans and their lifeless objects by equating them is disputable. This flat ontology between humans and non-humans is called agnosticism which translates that the value of the contribution by human and non-human actors in the establishment of a network is regarded equal with no preference given to humans. Therefore, ANT insists on treating humans and non-human similarly, concentrating on their performances and associations rather than distinguishing them according to some pre-defined features (Blok *et al.*, 2020; Fenwick & Edwards, 2019).

The choice of applying ANT theory in this study is enhanced by what Nehemia-Maletzky *et al.* (2018), suggest in arguing that ANT addresses the elements of science and technology in the making instead of ready-made science and technology. ANT can thus be used as a tool to reveal better the complexities of our sociotechnical world focusing on the associations formed between actors, resulting in networks. ANT further attempts to address the power relationships during technology development, revealing how technical solutions came to be and the involved networks of technical and social associations (Blok *et al.*, 2020; Cressman, 2009).

On this basis, ANT dissects the interaction to clarify and establish elements such as the environment, processes, actors, politics, policies, and networks involved during the deployment of technology. The dissection of these elements is done through translations, which is a process of tracing associations or relationships between network components (or actors) as a critical activity (Crawford, 2020).

2.7 Reliability and validity

Reliability and validity are essential elements that measure a study's credibility (Fink & Litwin, 1995) (Neuman, 2014). A reliable research methodology should always show consistency in giving "the same results if repeated under the same conditions" (Neuman & Robson, 2014). On the other hand, validity measures the extent to which an idea is commensurate with the natural world (Neuman & Robson, 2014). The following sections explain the activities undertaken to ensure the reliability and validity of the measuring instruments.

2.7.1 Reliability

Before giving the respondents, the research supervisor and the statistician reviewed the interview questions and the questionnaire. The feedback from all review parties included re-structuring of specific questions, updates to terminology and options for specific questions, elimination of specific personal information requirements (Krosnick, 2018). In addition, the literature and elements in the COBIT 5's process areas were used to guide the design of questions for the interviews and questionnaires, thereby enhancing reliability.

2.7.2 Validity

Validity can be attained using different techniques depending on the method under consideration: qualitative or quantitative (Busetto *et al.*, 2020). One has to pay attention to internal and external validity for quantitative methods. Internal validity focuses on the relationship between the dependent and independent variables (Fink & Litwin, 1995). It ensures that no other explanations could explain the outcome besides the dependent and independent variables. Thus, only the independent variable should explain the outcomes of the dependent variable, and no other factors should. This study ensured internal validity by basing its questionnaire on constructs in the literature that have already been validated. However, external validity establishes measures taken to ensure that findings from the study reflect what is happening in the real world. Typically, the bigger the sample, the better the external validity.

Measures for attaining rigor in qualitative methods have also been proposed in (Fink & Litwin, 1995). These include credibility (internal validity), transferability (external validity), and confirmability. Accordingly, this study's use of qualitative methods ensured credibility by triangulating data sources, namely interviews and document analysis. This implies that findings from one technique would complement the other, thereby enhancing credibility. Transferability was achieved by describing the cases considered in this study (Srivastava & Chandra, 2018). Hence, contexts where findings of this

study apply, can be easily identified, and extension of the study findings to such similar contexts can therefore be easily made. Lastly, the use of different cases and a mixed -method implies that different sources of evidence were used in this study, enhancing the confirmability of the study findings.

2.8 Ethical Considerations

The anticipated research adhered to ethical guidelines and considerations of research since ethics underpins the limitations of this research, especially in the data collection. Research ethics entail using essential ethical values to a multiplicity of subject research, including scientific research (Pietilä *et al.*, 2020). The researcher obtained institutional permission for the research project before collecting any data. Permission was sought from the North-West University relevant authority. The Eastern Cape Office of the Premier's Provisional ICT Department also issued an ethical clearance (See Appendix C). Moreover, participation in the research was voluntary, and respondents were free to decide not to participate. Furthermore, the concept of voluntary participation is the principle of informed consent whereby respondents are required to give consent before any data was collected.

2.9 Conclusion

The purpose of the research was to assess the ITG process maturity in the ECGDs. The decision to employ a combination of qualitative and quantitative research methods was based on a range of factors:

- The intention is to increase the quality of data gathered in previous IT governance surveys by decreasing low reliability of results associated with positivist research techniques.
- Time and resource constraints did not allow for the entire information gathering process to consist of semi-structured interviews, which benefitted from the advantage of phenomenological research philosophy specifically relating to increased data accuracy.
- A sufficient sample was required to provide sufficient data to draw inferences on the ECGDs.
- The requirement of the outputs of the research to conform to previous initiatives to enable future comparative analysis research which requires historic data based on a common categorisation of results.

The data gathering exercise introduced several challenges ranging from assessing the validity of online surveys to obtaining C-Level management representation and a sufficient number of

completed surveys to enable the research to make the necessary inferences relating to ITG ECGDs. The data analysis challenges are explicitly related to simplifying the results, particularly IT governance maturity categorizations, to allow for direct assessments and comparisons between IT governance processes. The details of how these challenges were overcome and considerations when reviewing the results are detailed in Chapter 5 and 6.

The results from the survey were extensive and allowed for deeper analysis and cross-examination of specific IT governance variables and their interrelationships. However, the focus of the research was to provide an assessment of the ECGDs.

3.1 Introduction

ITG has become one of the pillars of the fourth industrial revolution (Caluwe & De Haes, 2019). This chapter provides an overview of ITG, discusses the evolution of ITG since its inception in the early 2000s, and this is followed by a discussion of the ITG building blocks. The chapter also provides a global overview of ITG within the South African context. Challenges that ITG faces in the public sector are also elaborated.

3.2 ICT and business strategy

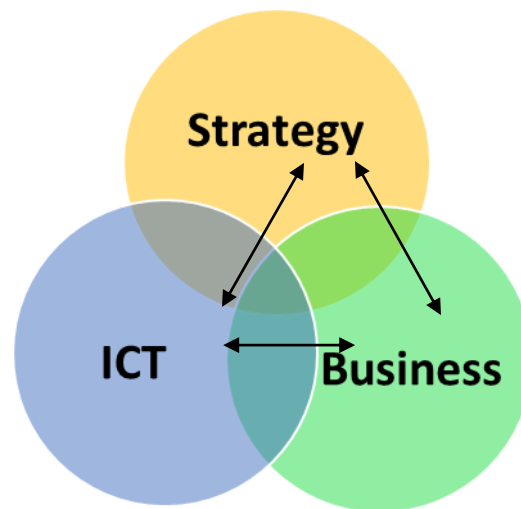
The World Bank acknowledges that ICT is a critical factor of economic development that every institution, whether private or public, should keep up with (Isa *et al.*, 2021). However, using ICT cost-effectively to meet private and public objectives is still challenging. By deploying information through a proper application of technology in business and public service delivery, ICT governance has become fundamental in determining how much corporate success is achieved (Isa *et al.*, 2021). The benefits realised from information technology investments are directly influenced by the ICTG culture adopted within a particular organisation. However, Joshi (2017) state that governance of ICT in business corporations mainly focuses on the alignment of IT with business. In the public service sector, the main goal with the strategic alignment domain is always to enable the business to achieve its goals and meet the community's needs.

Moreover, Belhaj and Jamal (2019) highlight that IT alignment ought to be synonymous with IT strategy. For ICTG, the alignment of information technology encompasses strategic integration between the current and the future organisation. The National Planning Commission (NPC) says that as much as ICT may provide meaningful direct opportunities that promote job creation, its contribution to business and economic development lies in enhancing communication and information flows that ultimately improve productivity and efficiency (Fourie, 2018).

ICT flexibility is an increasingly important factor in this dynamic environment. Strategic alignment between business and ICT can be used to measure the effectiveness of an organisation's information technology functions (Obaid, 2020). Flexible IT can deliver rapid results and support sustainable growth in a technologically advanced market

environment. Conversely, inflexible ICT could hinder effective organisational performance, for instance, driving the organisation into behavioural patterns and operations that do not embrace change (Gajdos *et al.*, 2018).

According to Haider and Saetang (2020) strategic alignment “entails the activities that an organisation’s management does to achieve goals that are cohesive across the IT and other business functions.” The following are vital in measuring IT-Business alignment: Communications maturity; Competency or Value measurement maturity; Governance maturity; Partnership maturity; Scope and architecture maturity, and Skills maturity.



Source: (Haider & Saetang, 2020)

Figure 3.1: ICT and Business Strategy.

The transactional relationship between ICT, business, and strategy entails that the business sets out its information needs, and ICT generates cost-effective ways of delivering the specified needs. Figure 3.1 shows the shared goals between ICT and business. Due to the mutual association between ICT and business strategy, it is paramount to appreciate relationship management as a critical process. Technology deployed in relationship management is expected to support diversity and flexibility. Business strategies are easily realised when there is a rapid response to the information needs and effective technology deployment (Lindros, 2017) (Haider & Saetang, 2020).

ICT management entails meeting business objectives while targeting operational, tactical, and strategic levels (Joshi *et al.*, 2017). According to Sibanda and von Solms (2019), ICT governance is considered as the distribution of ICT decision-making rights and responsibilities among the various stakeholders in an organization. Governance of ICT

then lays out the procedures and mechanisms of making and monitoring decisions (Huygh *et al.*, 2017).

3.3 ICT Vision 2030

The 2009 elections in South Africa ushered in new administration led by the then President Jacob Zuma, the appointment of new leadership into the Ministry of Communications that characterised a “new era of cooperation and dialogue between Government, industry and civil society, to set clear targets and goals for bridging the widening digital divide in South Africa and creating sustainable jobs through the development of the ICT industry” (Commission, 2013; Fourie, 2018). The ICT Vision 2030 was launched by the then Minister of Communications, Sipiwe Nyanda, who announced the development of an integrated national ICT policy framework that sought to:

- Provide a roadmap for the ICT industry’s long-term development and growth and for South Africa to become a leading country in the information era.
- Include the development by industry, in partnership with Government, of comprehensive vision and strategy towards clearly defined goals and an aspirational vision of the industry to be achieved by 2030.
- Include research on different components of the sector, local and international factors to affect it in the future, and the best options to be followed for future development” (van der Walddt, 2018).

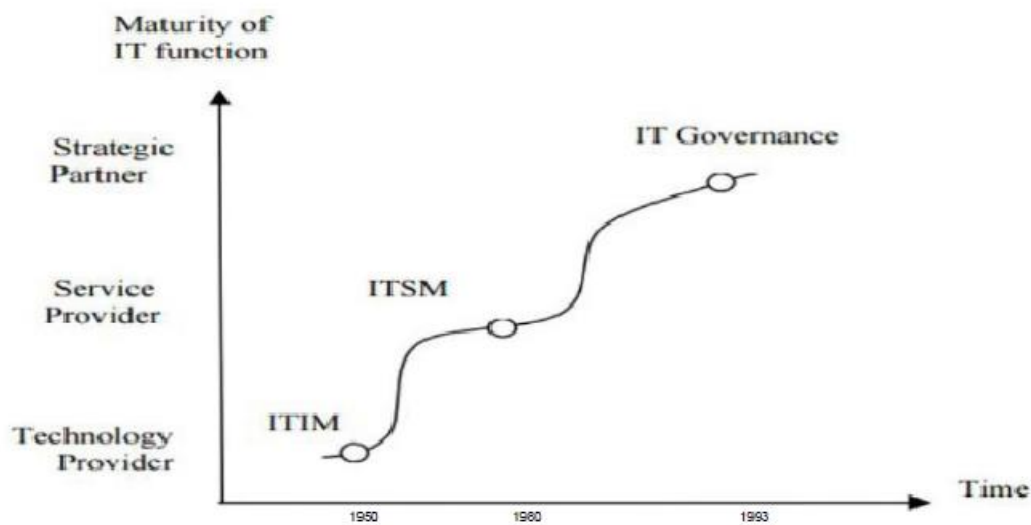
The South African Communications Forum (SACF) indicates that the development of the ICT Vision 2030 was based on an agreement between Government and industry on crucial goals and targets to be achieved by 2030. Moreover, “identification of challenges and hold-ups and a way forward in how these IT targets would be addressed, and commitment to creating an enabling environment legislatively to achieve the set targets” (Commission, 2013).

The ICT Vision 2030 was greatly supported despite an ICT sector that seemed to be on the decline. Fourie (2018) cites a lack of trust between Government and private sector ICT industry as a significant cause of the declining trend in the ICT sector. Smooth progress in pursuing the ICT Vision 2030 has been derailed due to the high turnover in leadership in the department of Communications experienced since its inception in 2009.

3.4 Evolution of IT Governance

Subjects on IT governance emerged in the literature in the early 1990s (Bianchi *et al.*, 2017). While the term “IT governance” was hardly used in the literature during the early 2000s, Huygh, De Haes, *et al.* (2018) note the use of phrases that pointed to IT governance. For example, studies that were conducted in the early 1990s focused on the “organization of the IT function” or the alignment between the “business and the IT function” or the link between “enterprise strategy, investment in IT, and enterprise performance” (Abdelbasset, 2019). The phrase IT governance was introduced in 1993 when ISACA, a United States organisation, created the IT Governance Institute (ITGI) developed specifically to promote IT governance (Kosasi & Yuliani, 2019). Furthermore, the collapse of Enron towards the end of 2001 was followed by a reciprocal move by the United States Government to enact the Sarbanes-Oxley Act in 2002, which is another development that marked a turning point in the growth and popularity of IT governance (De Haes *et al.*, 2020) (Reis *et al.*, 2020). This is corroborated by significant findings suggesting that successful IT governance could exert a positive impact upon organisational performance. This perceived impact has seen IT governance become a subject of interest in both the private and public sector (Dias Canedo *et al.*, 2020).

The growth in interest in IT governance has coincided with a growth in business institutions that are becoming highly dependent on IT to the extent that it has become difficult for institutions to function without the technology. As a result, the role of IT in the enterprise has dramatically changed from technology provider to strategic business partner. According to Botha (2014), the IT function has passed through three stages, as shown in Figure 3.2. In the earliest stage, business organisations focused on the effective management of enterprise IT infrastructure. Next to Information Technology Infrastructure Management (ITIM), IT solutions saw organisations focusing on identifying and delivering quality IT services within a reasonable time frame and cost to both internal and external customers (Janahi *et al.*, 2015). Today, business organisations’ use of IT has evolved into seeing more emphasis being put on IT governance (ITG).



Source: (Sibanda & von Solms, 2019)

Figure 3.2: Evolution stage of IT Governance

3.5 Information Technology Governance (ITG) Description

ITG can be discussed at global, national, industry, corporate, and project levels. This study focuses on corporate-level ITG. However, the study acknowledges that –corporate-level ITG can be influenced by global, national, and industry-level ITGs. Nonetheless, organizations have been inundated with challenges associated with the deployment of IT (Joshi *et al.*, 2018). These challenges can be human or non-human related, utilizing ITG to mitigate the associated challenges (Mwanza, 2019).

ITG concerns the planning for developing and implementing IT-related decisions regarding objectives, processes, human resources, and technology on an operational or strategic level (Haider & Saetang, 2020). It is thus essential that IT governance be driven, defined, and exercised by the executives of the organizations. Huygh, Joshi, *et al.* (2018) posits that IT governance is enabled by the board, executive management, and IT management, who are responsible for developing, implementing, and using IT strategy, primarily to align business and IT within the organization. Kosasi and Yuliani (2019) reinforced this idea by stating that IT governance should be accomplished by the organization's leadership, which can, in turn, cascade IT-related decisions through policies and structures. Similarly, the IT governance Institute Board Briefing on IT Governance, the institution that published a leading tool for IT governance-COBIT, indicates that "IT governance is the responsibility of the board of

directors and executive management. Hence, IT governance is a fundamental part of enterprise governance. (Neto *et al.*, 2018) provide a detailed account of IT governance and what it entails:

IT governance is the responsibility of executives and the board of directors, and is comprised of the leadership, institution all structures and processes that ensure that the enterprise's IT enables strategies and objectives (Neto *et al.*, 2018).

Alkhaldi *et al.* (2017) further states that IT governance is a board or senior management responsibility to ensure that:

- IT delivers the functionality and services that are in line with the business needs;
- IT brings new business opportunities that were never possible before;
- IT-related services and functionalities are delivered at the maximum economic value and in the most efficient manner; and
- IT related risks are known, and managed and IT resources are secured.

In short, IT governance focus areas comprise stakeholder value drivers, strategic alignment, value delivery, resource management, risk management, and performance management.

As highlighted above, IT governance forms part of corporate governance, which primarily concerns IT -related matters and activities (Rowlands *et al.*, 2018). Over the years, IT governance has evolved to become a self-standing discipline (Caluwe & De Haes, 2019). Even though IT governance has been employed chiefly by corporate and private organizations, the public sector has also shown interest and adapted the approach over the years. This could be attributed to the evident benefits that some private organizations have experienced through the implementation of IT governance (De Haes *et al.*, 2020).

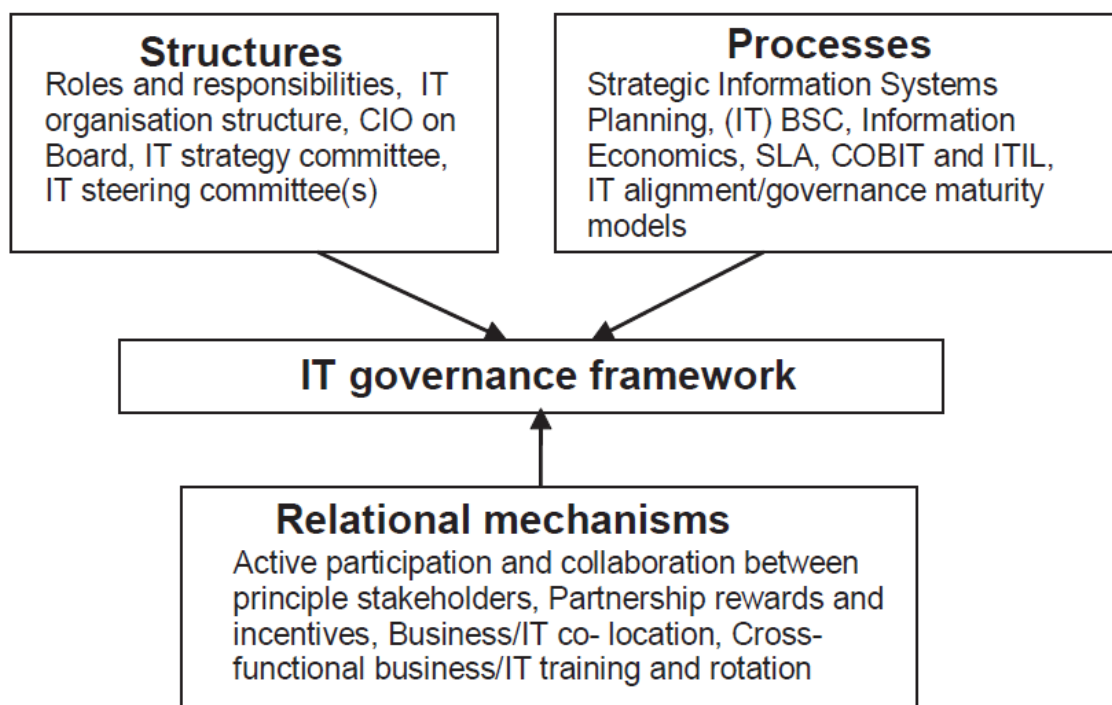
(Sibanda & von Solms, 2019) noted a lack of research offering information on the implementation of IT governance. To date, the availability of crucial information in the literature on how ITG can be done remains scarce. This lack of information on ITG is more pronounced within the public sector, where little research has been conducted (Janahi *et al.*, 2015).

3.6 Information Technology Governance components

ITG is not all about the technical aspects of IT; hence, ITG is not the responsibility of the IT function alone. In its complete sense, ITG is a part of the overall governance of an

entity, but with a specific focus on improving the management and control of IT for the benefit of the primary stakeholders (Huygh, De Haes, *et al.*, 2018). Research has shown that there are some institutions that have progressed quite well with ITG, but there are many institutions still struggling in that regard (Bianchi *et al.*, 2017).

Eventually, the Board of Directors' duty is to endorse that IT and other vital activities are sufficiently governed. Naidoo (2019), state that IT governance can be established by implementing three critical structures, processes, and related mechanisms. In short, an IT governance framework should include these three mechanisms (Neto *et al.*, 2018). These mechanisms for IT governance, most of the authors now share a similar view on what should constitute an IT governance framework (Bianchi *et al.*, 2017; Caluwe & De Haes, 2019; De Haes *et al.*, 2020). Figure 3.3 summarizes the mechanisms that should make up an IT governance framework. These mechanisms are discussed next.



Source: (Joshi *et al.*, 2018).

Figure 3.3: IT Governance Framework Mechanisms

3.6.1 Information Technology Structures

This mechanism is also referred to as the decision-making structure in the literature (Naidoo, 2019). This mechanism encourages identifying key individuals responsible for decision-making on IT use within the organisation. Such structures can come in committees for project management, IT steering committee, IT strategic committee, or defining the organisational structure showing roles and responsibilities (Naidoo, 2019). A case study conducted by Harits *et al.* (2021), found that IT steering committees are shared among the researched organisations even though different names are given to these committees. Most companies operate either in a centralized or federated IT governance model.

3.6.2 Processes

(Caluwe & De Haes, 2019) state that “processes define approaches to guide decision making, control, monitoring, evaluation, and direction setting for IT.” These processes can be implemented through the use of IT governance tools such as the Control Objectives in Information and Related Technologies (COBIT), Committee of Sponsoring Organizations (COSO), COSO_ERM, International Organization for Standardization (ISO), Balance Score Card (BSC), IT Infrastructure Library (ITIL) and TickIT (Delport & Solms, 2018). A case study that was conducted on six companies by (De Haes *et al.*, 2020) found that the Balance Score Card (BSC) and COBIT are not just used and that the processes found in ITIL such as the Service Level Agreement (SLA), are more popular. Many prioritization methods and processes are identified based on IE or other frameworks accompanied by ROI measures. Nonetheless, Mogogole and Jokonya (2018) state that COBIT, ISO 38500, and the Governance IT Process Framework are standard tools used in implementing IT governance in the South African public sector. Some of these tools are fully discussed in Chapter 4. Some suggestions defining processes are the most challenging tasks when implementing IT governance (Van Grembergen & De Haes, 2018); hence, significant attention should be given to this mechanism.

3.6.3 Relational mechanisms

As shown in Figure 3.4, the relational mechanism “promotes communication and synergy between people involved in information technology governance” (Huygh, De Haes, *et al.*, 2018). Thus, IT governance involves the interaction between employees from different departments and levels of authority; hence, it is essential to define how these employees

interact or communicate when facilitating IT governance. A case study by Bieser and Hilty (2018) on six Belgian companies found that many relational mechanisms were used in the domains of shared understanding of business/IT objectives, active conflict resolution, cross-functional business/IT training, and business/IT job rotation. In many cases, these mechanisms were rather informally organized. Interestingly, the literature suggests that establishing relational mechanisms is the most straightforward task of all the three (establishing processes and structures) when setting up an IT governance framework (Santos *et al.*, 2020). As such, organizations are advised to establish the relational mechanism for quick wins during the implementation of an IT governance framework.

3.6.4 Relationship among corporate governance, IT governance and IT management

Corporate Governance of Information and Communication Technology (CGICT) is how the current and emerging use of ICT is focused on precision. It comprises of assessing and guiding the plans for the use of ICT to support the institution and monitoring its use to achieve specific objectives. It also includes implementing strategies and policies (Arora & Sharma, 2016; Mohamad, 2018).

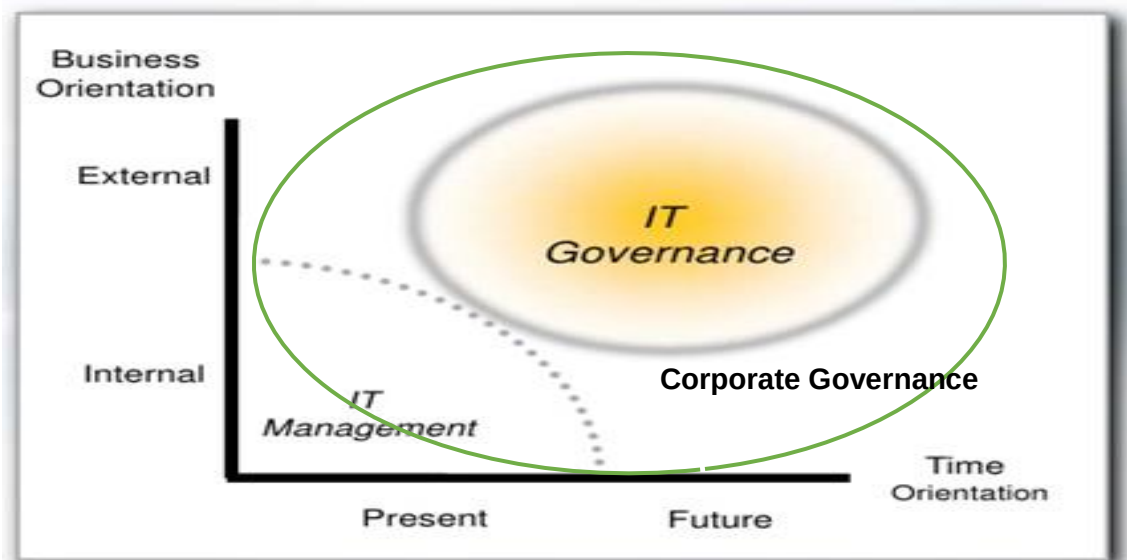
The subject of corporate governance has become a key area of concern for most countries and continues to receive increasing attention following malpractices, organisational failure due to poor IT governance, and the promulgation of various frameworks that require organisations to adhere to different governance requirements (Mohamad, 2018; Naidoo, 2019). For example, the lack of strong corporate governance principles in organisations such as WorldCom, Enron, Tyco, and Global Crossing is one of the major causes of organisational failure and poor performance. On the other hand, trade globalisation has seen organisations required to adhere to various international practices on IT governance and corporate governance in general (Arora & Sharma, 2016).

It should be realised that IT governance is a subset of corporate governance. According to De Haes *et al.* (2017) the adoption of IT governance practices has been driven by the implementation of corporate governance. (De Haes *et al.*, 2017) defined corporate governance as a “set of responsibilities and practices exercised by the board and executive management to provide strategic direction, ensure that objectives are achieved, ascertain that risks are managed appropriately, and verify that the enterprise’s resources are used responsibly.” Boards and top management must encompass governance in IT and provide executive support, bearing in mind that IT governance is not just an IT

Manager / Chief Information Officer (CIO) issue or only of interest to the IT function. In its broadest sense, it is part of the overall governance of an institution that has a specific focus on improving the management and control of IT for the benefit of the primary stakeholders (Naidoo, 2019).

The King IV report is a crucial South African document that guides the roles and responsibilities of directors and board members in running an organisation. It states that IT is a fundamental part of the enterprise strategy. The report has a substantial impact on corporate governance in terms of its role in providing information and its impact on improved fiduciary control (Naidoo, 2019). According to this report, directors should ensure that careful and realistic steps are taken regarding IT governance. It should be the role of the board of directors to ensure that the IT infrastructure of the organisation is appropriately governed (Yukhno, 2022). IT governance aims to support corporate governance by protecting information assets and aligning the strategy of the IT infrastructure with business processes. This is done to effectively and efficiently meet the organizational objectives (Rowlands *et al.*, 2018).

Good corporate governance is vital for the existence of any organisation. It ensures that the organisation is efficient and effective in working towards its goals, but it serves as a hallmark for investors and other stakeholders (Nyonawan & Utama, 2018). As indicated in the introduction, many organisations have not achieved set objectives due to poor corporate governance. However, the difference between IT governance and IT management are not always clear. According to Gerhardt and Mackenzie-Philps (2018), governance determines who should make what decision(s), whereas management is making the actual decision. IT management focuses on efficient and effective provision/delivery of IT products and services over a short period focusing on internal customers and keeping the system up and running. In contrast, IT Governance has a broader range and a more extended period, as shown in Figure 3.4. It also focuses on changing IT to meet the business objectives. Another significant difference between IT management and IT governance is that IT management and supply elements can be outsourced to an external IT services provider. In contrast, IT governance is institution - specific, and directions and controls over IT cannot be delegated to the market (Abdelbasset, 2019).



Source: (Abdelbasset, 2019)

Figure 3.4: Corporate governance vs IT management vs IT governance

As shown in Figure 3.4, IT and business are inherently interrelated. The business environment depends on IT systems to control and provision the information, including the computerization of transactions. These and other IT innovations influence the business environment by introducing new risks and capabilities requiring adjustments to existing organizational structures and updates to the information and IT requirements (Abdelbasset, 2019; Salehi et al., 2021).

3.7 Importance of IT governance

The unprecedented growth of IT has exerted considerable impact upon the global economy in public and private institutions. The effect of IT is evident in improving personal and organizational productivity (Silva et al., 2018). This influence is exhibited in how technology has improved business processes, enabling organisations to accomplish their goals (Claudio Diogo Reis et al., 2021). According to (Wasiuk & Lim21, 2021), strategic alignment is a mechanism by which an organisation envisions the relationship between its business processes and IT strategies. This enables key stakeholders to collect meaningful insights based on their current processes. Such alignment can be achieved through various governance mechanisms, including corporate governance, ITG, and project governance (Smits & van Hillegersberg, 2019).

IT consists of artefacts that enable organizations' processes and activities to achieve their business goals and objectives. As a result, the implementation and application of IT are increasingly evident in many organizations. IT is used to process data, gather information, store data, accumulate knowledge, and expedite communication (Ribeiro *et al.*, 2021). Some organizations, including the Government ministries, use IT to automate business processes, therefore improving data management, which enhances decision-making and improves services and products delivered to customers. Along the same line of argument, da Silva *et al.* (2019), emphasise that the introduction of IT has proven to assist organization's activities to be more effective and efficient. IT creates automated processes and increases effectiveness and efficiency in information usage in organisations. Information types and their usage differentiate one organization from the other regarding the products and services that they offer (King, 2018). Thus, information is a critical factor for many organisations, as it determines their survival and influences their decision-making. As a result, many organizations strive for the accuracy and reliability of the information, thereby seeking support and implementation of IT. Thus, it has become impossible for organizations that do not implement IT to survive or gain a competitive advantage in their clients' products and services. According to Ribeiro *et al.* (2021), organizations that operate in modern markets can use IT as a competitive tool that represents survival and more significant development.

In the past, IT was viewed as a supporting tool within the overall strategy of some businesses (Lindros, 2017). However, organisations, including Government ministries, have observed and realized that IT is now playing a significant role in business processes, and it has become more than an enabler. Clifton *et al.* (2020), argue that business managers have recognized the value of IT on strategic objectives by shifting its emphasis from operational objectives. Furthermore, IT applications are becoming the building block for operations within the Government (Sibanda & von Solms, 2019).

Effective IT Governance requires a significant amount of attention from the management since enterprises depend on IT to provide products and services to customers. A carefully designed and implemented IT governance harmonises IT use and management decisions with enterprise strategy and objectives (Huygh, De Haes, *et al.*, 2018). This is a point that Madyibi (2019) recognises as an indicator that good IT governance ensures that IT investments are aligned with business strategy, optimized, and deliver value within acceptable risk boundaries, taking into account institutional structure, culture, maturity, and

strategy of the institution. Moreover, Silva *et al.* (2018) identified the following benefits business organisation are likely to accrue if they effectively implement IT governance:

Good IT governance is profitable: Institutions with established IT governance have more than 30% higher profits than institutions with poor governance given the same strategic objectives.

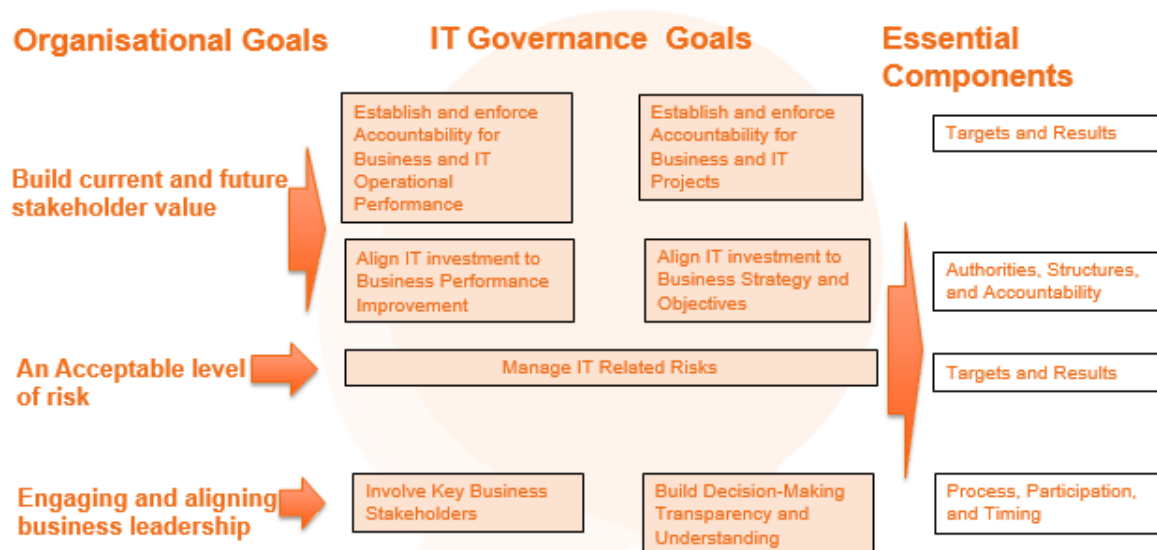
Good IT governance helps organisations meet regulatory requirements and mitigate IT related risks: IT governance follows an integrated approach to meet external legal and regulatory requirements as well as mitigate IT related risks.

IT is expensive hence the immediate need to be governed: Enterprises spend more than 4.2% of their annual revenue, which exceeds 50% of their annual total capital investment. As a result, many enterprises are prioritizing their IT spending on strategic areas.

IT is pervasive: IT is now everywhere in enterprises and is used by business organisations from different business sectors. A well-designed IT governance arrangement distributes IT decision making to those responsible for outcomes since centrally managing IT is no longer desirable.

IT brings new opportunities: the introduction of new technologies, including web based services, mobile technologies, and Enterprise Resource Planning (ERPs) solutions create strategic opportunities that have never been seen before.

IT value depends on more than good technology: as IT implementations enables standardization and integration of business process, the roles of technologists and corporate executives becomes increasingly intertwined. IT decision making necessarily becomes joint decision making so does the responsibility of the outcomes of the decision. The road map for IT governance implementation is summarised in Figure 3.5.



Source: (Cho *et al.*, 2019)

Figure 3.5: ICT Value chain

3.8 Knowledge of IT governance and ICTs

Knowledge of IT governance remains scarce across the world, including South Africa. This is so despite various commitments that the private and public sectors have made in promoting digitisation. Studies by (Ribeiro *et al.*, 2021) concluded that high costs of IT equipment and telecommunications prove to be stumbling blocks to the accessibility of ICTs that translate to effective ITCG. In some Government Departments, poor communication, and decision-making processes, lack of a shared vision and strategy, and high leadership turnover rates hinder effective ICTG (da Silva *et al.*, 2019).

For Government Departments to be transformed for the better in this information age, they should intensively invest in developing IT skills among public servants. The prevailing shortage of ICT skills in public service results in the lack of home-grown relevant information technology solutions and systems development (van der Walddt, 2018). Hence, most Government Departments are only left with a choice to outsource ICT services. This is a huge concern given that Governments can only outsource the management of the IT services but cannot outsource IT governance. Besides, outsourcing of ICT components has, in the long run, the potential risk of harming organisations if done more frequently. Therefore, Governments should consider “effective staff balancing and collaboration in information services outsourcing” (Madyibi, 2019).

However, the South African Government has attempted to fast-track IT development. Since 1999 ICT has been rolled out to previously disadvantaged communities as part of the Multi-Purpose Community (MPCC) initiative, which unfortunately did not give the expected results (Bieser & Hilty, 2018). Because of their unsatisfactory impact, the Government then rebranded and re-technologized the programs and named it the Thusong Service Centres (TSC). Powerful computers and more internet bandwidth became a common feature in the TSCs, which had the underlying objective of bringing Government to the grassroots people by providing integrated services and information to the communities. This program was part of the comprehensive strategy of improving the lives of ordinary citizens in less developed communities (SIHOTANG, 2019).

Figure 3.6 shows governance as one of the administrative functions critical in supporting ICT alignment strategy within Government organisations.



Source: (Harefa & Legowo, 2017)

Figure 3.6: Strategic control and administrative functions

Governance processes deal with crafting policies, procedures, and systems that aid the allocation of ICT decisions to key players within the organisation. On the other hand, technological and human capability supports strategic control because they deal with administrative processes for creating desired ICT and human skills, respectively, that support and shape strategic goals and objectives of the organization (Rizal *et al.*, 2020).

3.9 Current State of IT Governance

An IT governance survey by Dias Canedo *et al.* (2020), revealed that most organizations acknowledged that IT governance is vital in achieving IT alignment with business objectives. However, the actual implementations rarely meet the expectations. Furthermore, the same study also found that present governance structures do not satisfy the governing and legislative requirements (de Gier, 2018). More than half of the respondents confirmed that IT governance initiatives were not assimilated into their companies' corporate governance structures. the same respondents acknowledged that IT to business objective alignment is a crucial success factor of an IT governance initiative (Lengana, 2018). The reasons provided for this failure were the misunderstanding of IT governance and a lack of executive management support.

The scientific and technological change rate has significantly increased over the last half-century. Developments in these fields are bringing about a new economy that is global, interconnected, and knowledge -based (Kostoska & Kocarev, 2019). The results of this new age of information and knowledge have brought about changes in lives in ways we could have hardly imagined less than two decades ago. The emerging of computers, telephony, and communications is shifting the way we live and work, and it is changing many aspects of social and economic organization (de Gier, 2018). Not only are ICTs affecting the way we do business, but they have also led to the formation of new industries such as software, electronic commerce (e-commerce), and electronic Government (e-Government). ICTs have become wheels of change. However, ICTs on their own do not create transformation, but they are best seen as agents of change, innovation, and creativity. ICTs unleash the creative potential embodied in people (Rizal *et al.*, 2020). As noted by TAMBOTOH and LATUPERISSA (2015), "ICTs offer the potential for revolutionary changes in national and regional innovation systems." ICTs can strengthen economic growth if they are being used to create new markets, new technological applications for collaboration, and new methods and tools for scientific and technological research.

For many experts, ICTs not only present the best opportunity for accelerated development, but they also offer to bring a good opportunity for developing countries to catchup with the rest of the world. The belief that ICTs are formidable and cost-effective tools for developing countries is widespread" (Gasco-Hernandez, 2018). If properly used,

they can reduce poverty; empower people; build capacities, skills, and networks; inspire new governance mechanisms and reinforce popular participation at all levels" (Gasco-Hernandez, 2018). The range of applications is limitless, from electronic commerce to the empowerment of communities, women, and youth; from the promotion of good governance and decentralization to advocacy Programmes, including the observance of human rights; from long-distance education to telehealth and environmental monitoring (Isa *et al.*, 2021). The potential application of ICTs to address challenges of development is comprehensive. The opportunities to apply ICTs as an "enabler" and "facilitator for development are almost limitless. In the remainder of this chapter. The last part of this chapter will mainly focus on the scope of ICTs within governance (Cho *et al.*, 2019).

All over the world today, there is an innovative wind blowing, bringing in ICTs to governance. From Singapore, India, Australia, the United States to Egypt, there are efforts at various levels to bring ICTs to stand on the way societies are governed and managed. It is expected that after the e-commerce revolution, the next is e-Government (Rizal *et al.*, 2020). The possible reasons are: to improve the quality of service, increase the effectiveness of Governments, and reduce costs (TAMBOTOH & LATUPERISSA, 2015). The significant benefits are derived from how ICTs can reduce purchasing and fulfilment cycles and lower administrative costs. Some of the big multinationals that have embraced e-commerce intensely by putting their supply chains online are saving upwards of 20%, reducing inventories by about 50%, and in some cases lowering their administrative costs by up to 75%. ICTs can transform how most public services are delivered and the relationship between the Government and the citizen has identified three basic change potentials for ICTs within the context of governance (De Haes *et al.*, 2020).

ICTs offer the facilitating tools to expand the way societies are organized. In addition, the application of ICTs can meaningfully improve and enable horizontal communication among people and communities of interest. On the other hand, others have debated that these new technologies are now providing the essential tools that could facilitate the realization of the Orwellian scenario, "1984", which foresaw complete control by big Government. The argument is that ICTs provide the capability for Governments to monitor individuals' activities eventually and completely control society (van der Walddt, 2018). The research, however, takes the optimistic view that argues that ICTs can make substantial contributions to the recognition of good governance in Africa.

Nevertheless, African countries' problems are not related to ICT deployment on the continent. Many African Governments have websites, and albeit rudimentary, these websites can deliver important information about the countries, with tourism promotion being the central area of focus. Countries such as Botswana, Gambia, Ghana, Egypt, Kenya, Morocco, Senegal, Tanzania, Zambia, and Zimbabwe are pioneers in this regard (Claudio Diogo Reis *et al.*, 2021). These applications are only the beginning. The opportunities to apply ICTs for improved governance in Africa are many. Increasingly, Africans call for democracy, democratic institutions, more open and plural societies, more involvement in public decision-making, and a more effective administration. The room for e-Governments and the application of ICTs to nurture the nascent democracy just evolving in Africa is enormous (TAMBOTOH & LATUPERISSA, 2015).

3.10 State of ICT Governance in the world

In a case study at ING, a global financial service company Ngoma and Erasmus (2016), illustrated how ING manages different portfolios of IT investment to achieve different institutional objectives. Ngoma and Erasmus (2016), showed that shareholder return is partly related to the amount of money spent on IT. However, strategic IT investments must also be tracked to generate future revenue growth and improve all stakeholders' sustainable financial performance.

Huygh, De Haes, *et al.* (2018), conducted several case studies using six (6) Belgian institutions on IT governance best practices. It also included their preceding major in - depth case study at KBC, one of the large banks in Belgium. They started their case study with several schemes. The first scheme was that institutions use a mix of structures, processes, and relational mechanisms to build up an IT governance framework. they also tested the scheme that the chosen mix of structures, processes, and relational mechanisms relies upon multiple contingencies (Huygh, De Haes, *et al.*, 2018). Lastly, they also proposed that a well-balanced mix of structures, processes, and relational mechanisms will improve IT governance outcomes. The findings from the selected six case studies indicated that all their propositions were supported (Huygh, De Haes, *et al.*, 2018).

3.11 State of ICT Governance in South Africa

The South African Government has acknowledged the progressively strategic role that IT is playing as an enabler of public service delivery. This has been emphasized by, among

other things, the King IV Report on Corporate Governance, a Presidential Review Commission (PRC) report, and the findings of the Auditor General of South Africa (AGSA) (Chisango & Lesame, 2017; Naidoo, 2019). To enable Political and Strategic leadership to consider ICT as an enabler of service delivery. DPSA, in consultation with the South African Government Information Technology Officers Council (GITOC) and the AGSA, developed the Corporate Governance of ICT Policy Framework (ICTGPF). The purpose of the ICTGPF is to allow Political and Strategic leadership to consider ICT as an enabler of service delivery (Fourie, 2018).

As a result, South African Government Departments, Provinces, Municipalities, and other institutions are required to comply with the requirements of the ICTGPF, which the Cabinet adopted in 2012. Compliance with the Framework requirements will be monitored by the Auditor General and Department of Planning. Furthermore, Government institutions are expected to adopt a phased IT governance implementation approach controlled by strict deadlines (Gillwald *et al.*, 2018). In order to adhere to the requirements of the ICT Governance Policy Framework, all South African Government Departments, Provinces, Municipalities and other public institutions are required to create an ICT enabled environment (Sibanda & von Solms, 2019).

Alkhaldi *et al.* (2017), conducted a literature study from several established research papers to establish how determinants such as Government institution size, business strategy, and governance business structure influence IT decision -making rights. Based on the study findings, Alkhaldi *et al.* (2017), concluded that centralized IT decision -making seems to be associated with small institutions, such institutions have a cost focus business strategy, and they exist in a controlled environment. Furthermore, it was observed that these institutions have consolidated governance structures and low competence in managing IT (Rowlands *et al.*, 2018). On the other hand, decentralized IT, decision -making seems to be associated with large, complex institutions following an innovation strategy in a volatile environment, characterized by a decentralized business governance structure and high competence in managing IT (Wijayanti *et al.*, 2017). Previous researchers' such as (Gatautis *et al.*, 2015; Janahi *et al.*, 2015) also argued that Government institutions often adopt a federated IT decision -making model. Government However, (Kosasi & Yuliani, 2019) argued that using a federated model where some decisions are made centrally is essentially a vertical division of labour. Hence, to achieve the intended Government institution objective, these institutions require an integrated mechanism that allows for the coordination of IT activities distributed across

the institution. By so doing, the relational integration process and structures (both are called *relational mechanisms*) will be realised (Huygh, De Haes, *et al.*, 2018).

Asongu and Nwachukwu (2019), studied the relevance of the IT Governance process and structures at educational institutions. Their study revealed that management tools such as balanced scorecards and information economics are insufficient to govern IT effectively. These tools should be included within the institutional context of stakeholders' experiences, points of view, and understanding. Hence, institutions need to instil IT Governance tools into the institutional context.

South Africa has fairly competitive business infrastructure and it offers a unique and conducive environment for business operations to succeed (Commission, 2013). ICT makes institutions active and drives them in the right direction to achieve both their short-term and long-term objectives. Unlike in the developed countries such as the USA, in South Africa, there is a longer-term focus on the strategy that permits significant development of ICTs (Joshi, 2017). South Africa has several policies and governance guidelines that embrace information technology as a fundamental driver towards business success (Sibanda & von Solms, 2019).

Naidoo (2019), investigated the use of ICT governance policies in various non-profit and profit-making corporates and found that most organisations are slowly adopting IT governance policies. However, most institutions have fully embraced King III codes of corporate governance, but just a few have embraced the principles of King IV corporate governance. Many organisations in South Africa are yet to adopt the King IV principles of governance due to their lack of compatible alignment between business, organisational, and ICT objectives (Naidoo, 2019).

King IV Report recognizes ICT as an integral part of day-to-day business in this modern world because it is vital to sustainability, viability, and growth of organisations whether profit-making or non-profit making ICT cuts across all components, aspects, and processes in running a business. In that regard, ICT is an operational and a key and all-inclusive asset that can be utilised to gain a competitive advantage and efficacy in service delivery (Erin *et al.*, 2021). Nevertheless, IT also presents risks that institutions should be wary of. therefore, ICT should be well -governed and controlled to support the organization's strategic objectives. King IV specifies that management in an organisation should ensure prudent and reasonable steps regarding ICTG (Balaraman, 2018).

A moderately sophisticated ICT sector has emerged in South Africa over more than 20 years of telecommunications reform since the mid-1990s (Chisango, 2019). The advent of modern ICT and its complementary benefits, such as electronic faxes, faster emails, and social networks, have resulted in a tremendous decrease in the time taken to deliver services or offer deliverables leading to customer satisfaction in the private sector and communities' satisfaction in the public sector. Business growth and development of organisations have been positive (Chisango, 2019; Chisango & Lesame, 2017).

The Department of Public Service Administration (DPSA) has, between 2012 and 2014, enacted policies and guidelines of IT governance. Initially, in 2012, the DPSA implemented guidelines based on the COBIT governance framework, which mainly focused on the accountability and responsibilities of top management in Government Departments. Later on, in 2014, the DPSA set strategic and operational implementation plans that recommended a set of COBIT processes. Moreover, the DPSA has aimed to improve ICTG and strategic alignment with public administration objectives henceforth (Fourie, 2018).

The National Development Plan (NDP) highlights that all citizens of the country should access, acquire and utilize IT effectively. It identifies the need for stimulation strategies, particularly e-literacy, skills development and institutional development, and other relevant strategies that promote ICT diffusion that provides intergovernmental, private, and public coordination (Commission, 2013). The National Planning Commission (2018) concedes that IT is one of the critical strategies that the national, provincial, and local Governments can use to improve public service delivery. However, it can only be achieved if better institutional arrangements are established to manage the ICTG environment so that at the end of the day, South Africa does not fall victim to a digital divide (Kolojane, 2017).

Dating back to the dawn of democracy in South Africa in 1994, the Government sought to create an environment where ICT innovativeness flourishes. In establishing institutional arrangements, the Government launched the Presidential Review Commission (PRC) later in 1996. Among other objectives, a great objective of the commission was "to promote development in the utilisation of electronically-enabled information systems so that they can effectively enhance the processes of governance and public management" (Kolojane, 2017). PRC sought to see that Government services are readily available to citizens, officials, and other stakeholders transparently.

Through continuous innovations and effective ICTG, public administrations in South Africa can improve service delivery and be quick to respond to transparency and accountability demands. (Makovhololo, 2018)believe that when civil service adopts knowledge of ICT management practices, then delivery of Government services would significantly improve.

The South African Government went on to establish various IT agencies, particularly State Information Technology Agency (SITA), Universal Service Agency, and GovTech, which were aimed at assisting with issues like capacity building and provision of effective and efficient ICT products and services (Claudio Diogo Reis *et al.*, 2021; Makovhololo, 2018). Ultimately, all this would lead to improved service delivery from Government Departments.

Azmat and Coghill (2005) adds that optimum ICT governance seeks to provide effective and efficient support service to local Government authorities so that both short and long-term objectives of the organisation are achieved through the provision of state-of-the-art ICT together with good international Governmental relations. Moreover, through good ICT governance, high-quality networks are supported that will ultimately support the Government department's current and future network applications. Government The personnel mandated with ICTG should be dedicated to ensuring the integrity of data and improved service delivery all the time.

Furthermore, ICT governance practices are expected to align the IT platform with business productivity. The key objective is to ensure that the Government department meets business objectives of delivering services Government without disadvantaging the community (Frogeri *et al.*, 2019).

3.12 ICT governance practises

ITG is the duty of top management and executive management of a company. Other researchers have defined IT governance as part of the inclusive management of the company comprised of leadership and organizational structures and processes is to support the continuation of the IT organization and the development of strategies and goals of the organization (Erasmus & Oguntade)One key focus of ITG is to align IT with business objectives. As an explanation it can be said that the ITG is the combination of corporate governance and management of information technology (Ngoma & Erasmus, 2016).

ICT Governance provides strategic direction for the use of technology in an organisation. It facilitates the alignment of ICT projects and business objectives, this will subsequently alleviate the risk of substantial investments in ICT solutions (Gajdos *et al.*, 2018). An ICT corporate governance policy framework was approved by the SA Government in 2012. Governance of ICT framework seeks to align all ICT functions to the goals of the organisation while simultaneously minimising the risks that ICT directly or indirectly introduces (Makovhololo, 2018).

More so, proper ICTG ensures that there is substantial realisation of value in the investments made in ICT. As stated by DPSA (2012), the framework is meant to institutionalise ICTG in the public sector and prescribes a set of principles that all Government Departments ought to comply with. The framework articulates the following 2 layers of decision-making (Ncamphalala, 2019):

- a. Facilitating the achievement of department's strategic goals.
- b. Efficient and effective management of ICT service delivery.

The above are articulated as authority and accountability with the first one being essentially the corporate governance of ICT layer and the second being governance of ICT layer. COBIT policies are therefore a guide in the implementation of corporate governance of ICT policy framework. However, the policy framework prescribes 12 processes that are part of the implementation as listed by Neto *et al.* (2018) De Haes and Van Grembergen (2012) which are:

- I. Governance framework setting and maintenance
- II. Manage the ICT management framework
- III. Manage strategy
- IV. Manage enterprise architecture
- V. Manage portfolio
- VI. Manage suppliers
- VII. Manage risk
- VIII. Manage security
- IX. Manage programmes and projects
- X. Manage operations
- XI. Manage continuity
- XII. Monitor, evaluate and assess performance and conformance.

ICTG's effectiveness in public service can be measured through IT outcomes at both corporate and project levels. At the corporate level, ICTG is achieved by using cost-effective IT for business growth, asset utilisation, business flexibility, and service delivery in compliance with the regulatory and legal requirements. On the other hand, at the IT project implementation level, ICTG is determined through the ability to deliver maximum timely functionality within the allocated budget, providing sufficient information to shareholders, and satisfying various stakeholders with system quality(Huygh, De Haes, *et al.*, 2018).

3.13 Challenges in IT Governance

The deployment of IT artefacts brings many benefits to organizations and their customers. According to De Haes *et al.* (2020), many industries and sectors witnessed improvements in their lives and worked due to the deployment of IT, consequently resulting in inconvenience and benefits. However, the implementation of IT and its automation of business processes do not automatically guarantee a competitive edge to an organization IT, similar to other actors in the organization, faces and encounters challenges as well (Steuperaert, 2019).

On the one hand, IT artefacts have expanded rapidly over the last decades, and they will continue to do so in the future. On the other hand, the rapidity of the expansion makes it challenging and complex to select, use, support, and manage IT artefacts in the different environments where they are deployed. According to (Jerónimo, 2018), "IT is a complex, unique and difficult commodity to implement without the fundamental infrastructures .".These challenges have prompted Government ministries to implement IT management and control initiatives, such as IT governance. Harits *et al.* (2021), pointed out that the use of IT in public organizations needs to be well managed in order for it to be a vehicle in achieving organizational goals. Abdulrasool and Turnbull (2020), expresses that the universal use of IT in many organizations has resulted in ITG becoming a more substantial issue. ICT governance implementation is largely faced with various challenges and barriers. Although different studies indicate different factors, the main challenges and barriers are following (Gatautis *et al.*, 2015):

- Failure to align their IT Governance and IT Management practices to international best practices such as the King IV Corporate Governance code, COBIT 5 IT Governance Framework, and ISO 38500, the international standard for IT Governance.

- Lack of defined relationship between the stakeholders, the strategic goals of the Public Service, and the strategic goals of Departments individually.
- No development and adoption of various ICT Governance Policy, ICT Governance Charter, other ICT Policies, Structures, IT Governance and management Processes, Procedures, Mechanisms & Controls, ICT Strategic Plan, and an ICT Implementation Plan.
- None or limited adoption of an organizational change management program to create awareness and buy-in.
- Lack of Training staff.
- Limited resources to implement an IT Governance Implementation program.
- No ICT Governance Document Management System for storing and collaborating on documents, version control, searching, etc.
- Lack of proper assessment of ITG Maturity.
- Lack of alignment of organisational and ICT Strategies.

3.14 Conclusion

The use of IT has become pervasive in the operations of organisations. However, challenges associated with the deployment of ITG have affected the maturity of the whole process. These challenges vary from the choice of IT artefacts, implementation, support, and governance of IT in organisations.

From the literature review so far, IT Governance frameworks have been adopted by organizations with the aim of mitigating IT challenges and also ensuring better alignment between IT artefacts and business needs. IT Governance frameworks such as COBIT advocate that IT governance should be exercised by the policy decision -makers and the IT management to control the formulation, implementation, and use of ITG. The ITG structures serve top management that plays a key role in providing governance support of the Departments and also provide a strategic roadmap for the implementation of IS/IT solutions primarily to ensure the fusion of business and IT.

4.1 Introduction

The previous chapter discussed the evolution of ITG and its components, assessed ITG from a global and South African point of view. This study aims to evaluate ITG in ECGDs so that a framework that maps the way forward is proposed. Accordingly, this chapter presents a review of the ITG framework used by the South African Government, exploring in tandem how ICT could be aligned to the business model. The chapter strives to link ICT to some of the radical changes that could be effected in business enterprises. The chapter further explores various IT governance tools in the public domain.

4.2 Policy and Legal frameworks for ICT

South Africa has been at the forefront of telecommunications reform initiatives in the continent since the mid-1990s. However, these reform efforts have been adversely affected by the lack of robust policy implementation and legal framework. This is evident in less competitive market structures, relatively weak institutional arrangements and compromised regulatory effectiveness (Mwanza, 2019).

Significant progress has been made to improve ICT structures and policy frameworks under the current national leadership of President Cyril Ramaphosa. The ICT sector has, however, suffered from the effects of leadership discontinuity, with 8 Ministers of Communications having served since May 2009. Instability in the Department of Communications is a probable cause for the lack of prioritization of ICT programmes and projects on the national agenda (Commission, 2013).

Gillwald *et al.* (2018), argue that as much as the Government's New Growth Path (NGP) and the Presidential Infrastructure Coordinating Commission (PICC) of 2018 have emphasised the importance of ICT and its proper governance in driving the country forward, there is little to suggest that ICTs are considered a priority for the country. The PICC introduced a Strategic Integrated Project (SIP) in December 2012, which aimed at "ensuring a universal service and access to reliable, affordable and secure broadband services by all South Africans, prioritising rural and other marginalised areas and subsequently stimulating economic growth" (Gillwald *et al.*, 2018). The SIP would

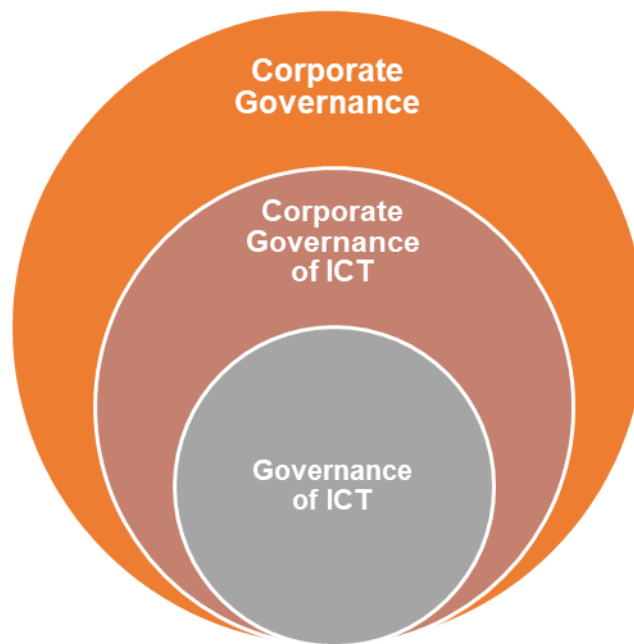
establish Points of Presence (POPs) in District Municipalities on behalf of the various Government Departments, extending new networks across provinces linking distributions and penetrating rural areas. In particular to the public sector on IT governance, the DPSA framework is one of the most recent initiatives undertaken by the South African Government (Lindros, 2017). This DPSA framework is explained in the next section.

4.3 DPSA framework

According to the Department of Public Service and Administration (Commission, 2013), corporate governance essentially consists of systems that focalise the way Departments should be managed. Through corporate governance, the relationships between various stakeholders, strategic goals of the entire public service, and those of individual Departments are articulated. Since corporate governance is significantly concerned with individual accountability and responsibilities within a department, as stated by (Fourie, 2018), it therefore provides a perfect vehicle through which value is created in public service delivery. Moreover, the strategic direction of Government Departments is clarified because of the accountable political and strategic leadership that is embraced within a good governance system.

The governance of ICT is implemented in two different ways, which are Corporate Governance of ICT and Governance of ICT. Corporate Governance of ICT is a system “by which the current and future use of ICT is directed and controlled” (Commission, 2013), whereas, Governance of ICT consists of individual processes and procedures which ensure compliance to the ICT environment based on previously agreed principles.

Corporate governance of ICT is part and parcel of the bigger corporate governance system. Alternatively, it is a subset of corporate governance, whereas the governance of ICT is a subset of the corporate governance of ICT, as shown in Figure 4.1.



Source:(Fourie, 2018)

Figure 4.1: Assigned responsibilities.

The DPSA framework propounds a 3-phase approach that Government Departments should follow when implementing governance. These phases are explained below (van der Walddt, 2018).

4.3.1 Phase 1 – Creating an enabling environment.

Phase 1 is designed for Government Departments creating an environment that makes the governance of IT feasible. This can be done by developing and implementing “strategies, architectures, plans, frameworks, policies, structures, procedures, processes, mechanisms and controls, and ethical culture” (DPSA, 2012); for example, coming up with an ICT strategy and seeing how this strategy aligns to the business strategy. Furthermore, business architectures and audit plans can also be developed. The same applies to frameworks for IT governance. DPSA has already recommended COBIT 5 as a tool that could be used in implementing IT governance following the Governance of ICT framework that was developed by DPSA for the South African public sector. Furthermore, important structures for IT governance should be identified and allocated their roles. This includes various committees such as the IT steering, risk, and audit committee. Establishing the Governance Champion and selecting policies are other important activities undertaken during this phase. DPSA framework states that those working on Phase 1 can be informed by documents that include

the Public Service Act, Public Finance Management Act, State IT Agency Act and Regulations, Cabinet Memorandum 38(a) of 2000, the GICTPF, selected policies in COBIT 5.

4.3.2 Phase 2 – Business and ICT Strategic Alignment

Phase 2 focuses on the alignment between the business strategy and the ICT strategy. This ensures that the implementation of ICT is guided by the business strategy. According to DPSA framework, the strategic business plan should have an operational plan in the form of a vision and a mission. This vision and mission should come with performance expectations or indicators. It is in this regard that the IT strategy gets mapped clearly, indicating how it would enable the strategic plan. The Government-wide Enterprise Architecture (GWEA) framework is one of the key reference documents that can be used by public sector Departments when handling requirements of Phase 2 (Fourie, 2018).

4.3.3 Phase 3: Continuous Improvement

Once IT governance has been successfully implemented, courtesy of Phase 1 and 2, Phase 3 ensures that IT governance implementation is improved on a continuous basis. The focus is on investigating whether the Departments have effectively implemented IT governance and exploring areas for improvement. This can be done by establishing the maturity of the business process and monitoring and evaluating business processes to ensure that there is effective IT governance (Fourie, 2018).

4.4 ICT alignment to business model

ICT alignment refers to the application of IT in an appropriate and timely way in harmony with business and administrative strategies, goals, and needs (Makovhololo, 2018). Another aspect of ICT alignment is the focus on applying IT instead of considering social aspects. In a different perspective, the realised strategic alignment that is typically reflected in the plans and strategies of an institution makes up business-IT alignment. (Motheogane & Pretorius), identified two major influences on alignment as IT implementation success and IT managerial resources. Both are explained below.

a. IT implementation success

IT implementation success has a positive influence on the state of strategic alignment. When an institution has enjoyed some success in implementing an IT project, its credibility is improved, hence enhancing commitment amongst the various stakeholders.

Previous success improves social alignment and mutual understanding between the ICT function and the administration team.

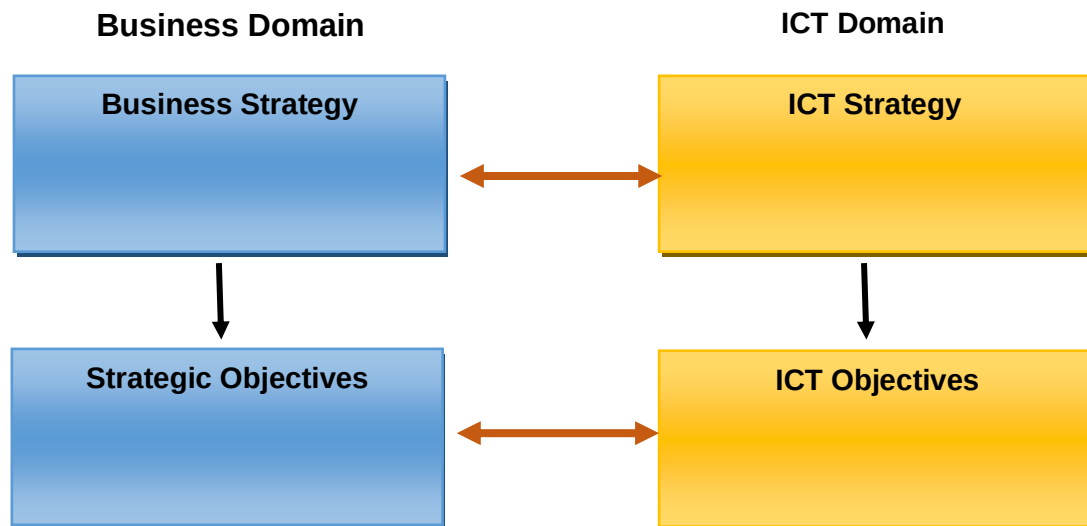
b. IT managerial resources

An organisation's top management and IT management are the IT organizational resources needed to influence IT implantation value. According to Héroux et al. (2018), the quality of IT organizational resources, particularly IT management that appreciates the business and provides committed leadership, positively impacts the state of strategic alignment between ICT and administrative processes of an institution.

When properly implemented, ICT governance provides mechanisms that enable effective management of information technology and development of integrated public service and ICT plans, allocating responsibilities, and prioritising ICT initiatives. The DPSA is responsible for driving ICT implementation by coordinating a public sector Government Information Technology Officers Council (GITOC).

In terms of institutional frameworks that can improve ICTG in South Africa, the Parliamentary Committee Group (PMG) on ICT, in a meeting held on 02 June 2015, recommended the development of clear mandates and clarity on the specific functions of different entities and government institutions. It would be essential to have periodic and regular reviews on the relevance of institutions and policy plans. Moreover, the recommendation is that there should be a balance between the principle of regulatory independence with appropriate mechanisms to ensure accountability in ICT governance (Madyibi, 2019).

Johl *et al.* (2013), came up with the following ICT alignment model that shows the relationship between business and ICT in terms of strategy and objectives:



Source: (Johl *et al.*, 2013)

Figure 4.2: ICT Alignment Model

The approach shown in Figure 4.2 above seeks to align the future ICT environment of Langberg Municipality on a strategic level. The interaction between the Business domain and the ICT domain is set out to determine what should be done by ICT to enable strategy execution by business functions and accomplish strategic objectives. Moreover, the approach provides what ICT can do to enhance service delivery within the Government Departments and how ICT can be governed to ensure continued alignment with administrative processes (Brown, 2020; Johl *et al.*, 2013).

Business outcomes are more important than technology. However, a shortage of business experts who translate the problem can make it challenging to align with ICT and business strategy. de Almeida *et al.* (2015), adds that it is difficult for ICT staff to understand how their service impacts the business. Administrators should shift from their narrow focus on applications, servers, and networks and seek to interact with business users to improve their awareness of business issues.

By properly aligning ICT and business strategy, an organisation benefits in the long run. (Motheogane & Pretorius), Identify improved firm performance as an outstanding benefit derived from ICT-business alignment. The positive relationship between ICT and business strategy alignment is attributed to an increased competitive advantage and better financial performance. Another benefit found by Obeidat *et al.* (2017), is increased ICT credibility within the institution due to increased IT effectiveness that is realised.

Alignment of ICT and business strategy promotes firm growth and paves the way for better ICT planning and better strategy execution.

Moreover, ICT operations and services ought to meet the demands of the business. The IT Operations Maturity model in Table 4.1 shows 5 Levels that an organisation should reach.

At each level shown in Table 4.1, institutions are evolving, and they gain an increased degree of maturity every step up the ladder. As an institution moves from one level to the other, it gains the ability to predict growth process and the results it yields. Steuperaert (2019), regards that maturity as “the evolution of process capability, where each maturity level provides a layer for the continuous improvement of the process.”

Table 4.1: ICT Maturity model

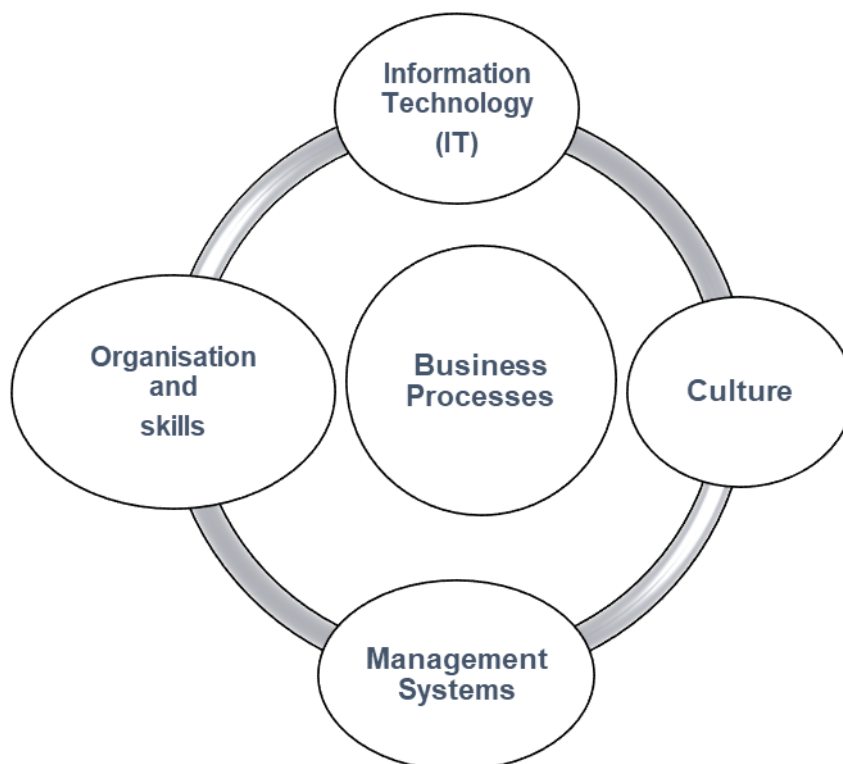
IT Operations Management Success requires a level of IT maturity	
Achieving excellence requires organisational excellence	
	<u>Level 5</u> Business Partner
<u>Level 4</u> Service Aligned -IT as a service provider -Define services, classes and pricing -Integrate processes -Capacity management	-IT as a strategic business partner -IT business collaboration improves business processes -Real time -Business innovation
<u>Level 3</u> Proactive -Analyse trends -See thresholds -Predict problems -Measure application availability	Tools: Service catalogue, Capacity management, Service governor, Financial management, Decision support.
<u>Level 2</u> Committed -Incident management -Initiate change and problem management -Little process integration	Tools: Asset management, Performance management, Configuration management (server, network, storage)
<u>Level 1</u> Awareness -Fight fires -Tools define processes -Alert/event management -No process documentation	Tools: Desktop, incident, problem, change, project management.
Tools: Inventory, monitoring, event management, backup	

Source: (Steuperaert, 2019)

On the other hand, Sibanda and von Solms (2019), argues that ICT-business strategy alignment is used as a mechanism for the ICT staff to get resources from the organisation. ICT projects tend to have strategic importance when they are just operational. Furthermore, Gillwald *et al.* (2018), points out that ICT-business alignment is difficult to achieve because getting all parties within an organization to unanimously agree on what is needed to achieve alignment is not easy. In light of this, alignment should therefore be an effort from both the IT function and top-level management to yield positive results for the organisation.

4.5 Link between ICT and Radical change

Information technology has become the centre at which organisational processes and structure evolve. Hence, (Trehan & Trehan, 2019) state that organisations should be IT-centred rather than being IT-enabled or IT-supported. CSC Index Foundations propounded a model that shows the links between conventional business systems, structures and IT. Their model termed a Re-engineering diamond framework shown in Figure 4.3 below delineates IT as an important function that enables an organisation to maintain and deliver its core business.



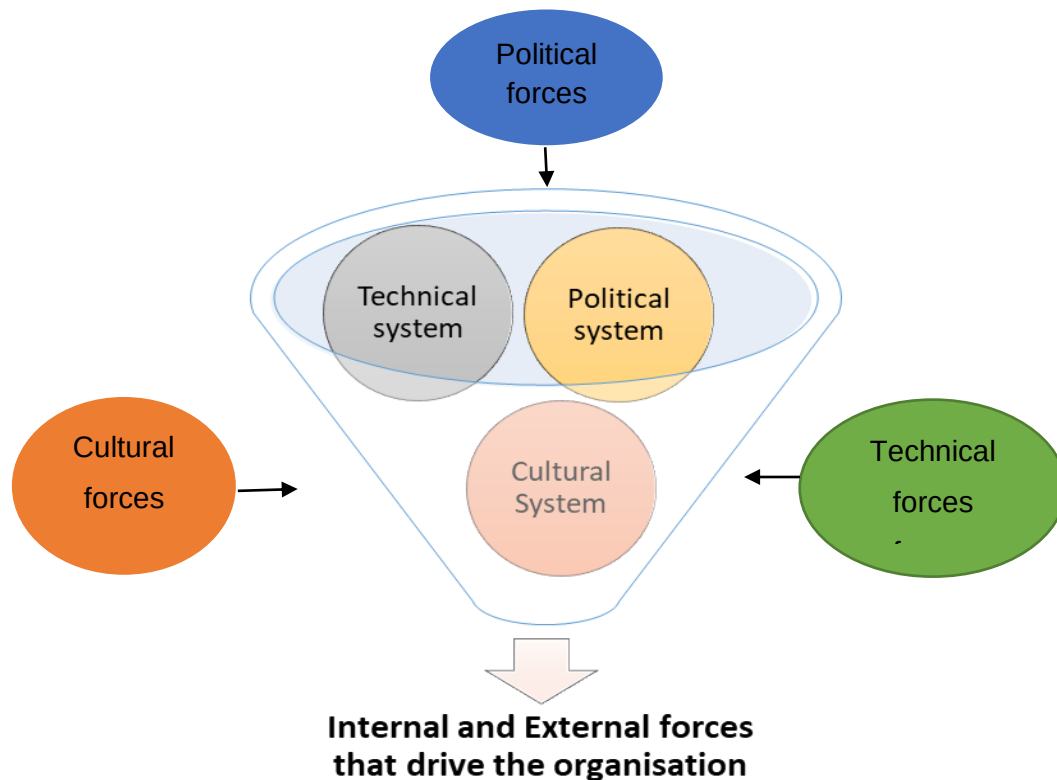
Source: (Harefa & Legowo, 2017)

Figure 4.3: The re-engineering diamond framework for the relationship between the information and business systems

The framework presented in Figure 4.3 above plays a critical role in linking business processes and ICT. Any re-engineering exercise within the organisation will ultimately involve the IT; hence, information flows in the organisation. On the other hand, the information will not flow if IT is not involved.

Appropriate organisational culture is a prerequisite for any radical change in the organisation and the surrounding society. The success of any ICT -related project can only be predicted and achieved if culture is recognised as an underlying factor in underwriting the objectives and strategy of any ICT initiative. Ncamphalala (2019), adds that culture should be considered from an individual, organisational and societal point of view because it is a complex phenomenon. Business processes may be engineered. There is a continuous cycle in which business processes determine the management systems, IT, and business skills such that culture can be transformed and reinforced, making existing business processes more effective and new processes possible.

In addition Birudavolu and Nag (2019), presented a model of radical change using IT, which propounds that change happens at three branches: Technical, Political, and Cultural, with all these determined by forces both internally and externally.



Source: (Birudavolu & Nag, 2019).

Figure 4.4: Tichy's model of forces that drive an organisation

The model shows that technology is one of three forces that drive change within an organisation. The Technical, Political, and Cultural forces reiterate, showing that they are indistinguishable; each strand will have more sub-strands and also that the strength of the organisation depends on the connection of the three different spurs within and outside the organisation. Tichy's model includes inputs, throughputs, and outputs that drive an organisation and identify critical variables in the change management processes. The change levers identified in the model include strategy, tasks, prescribed networks, people, organisational processes, and emergent networks and technologies.

However, the decision to implement technological change depends on the organization's readiness in terms of its cultural environment, information needs of the organisation, supply chain, and the specific IT delivery systems to be implemented (Gasco-Hernandez, 2018).

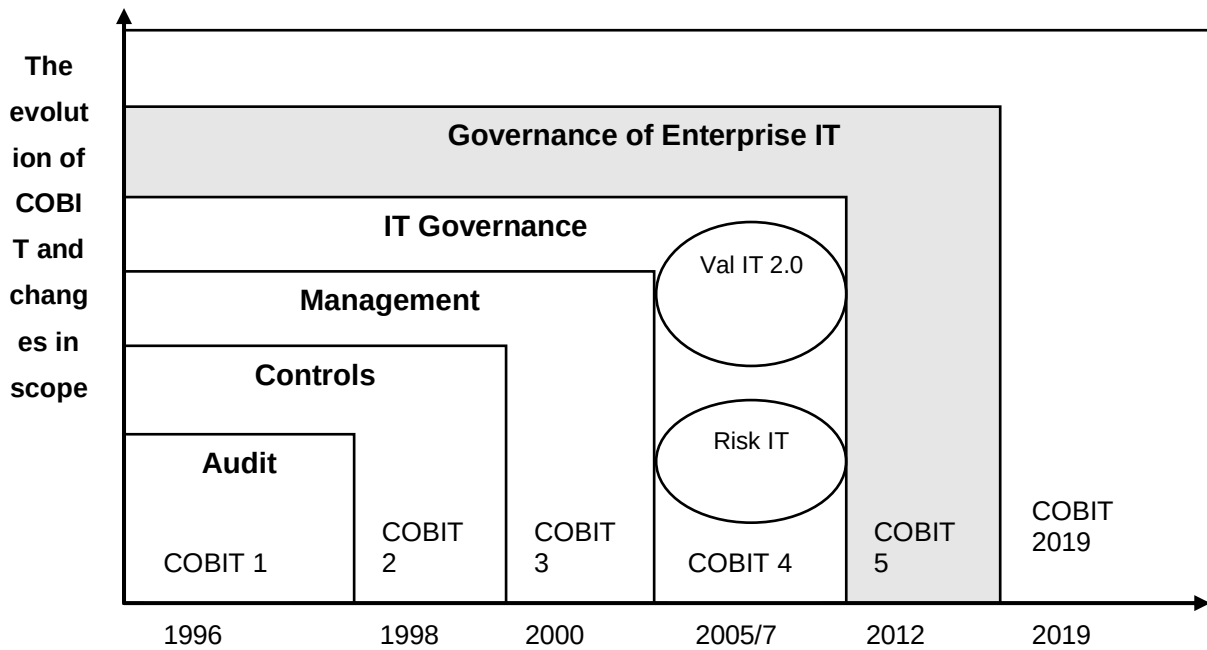
Instituting new ICT systems requires the organisation first to develop an IT vision that it wants to achieve. After that, an organisation then decides on what could be done to attain

the predetermined vision. This can be done either by embracing collaborative decision-making or engaging new leadership.

4.6 Common IT governance frameworks

The popularity of IT governance has been growing fast, as shown by the development and proposition of various frameworks for IT governance. Among them include the Committee of Sponsoring Organizations (COSO), COSO_ERM, ISO standards, COBIT frameworks, IT Infrastructure Library (ITIL), and TickIT (De Haes *et al.*, 2020; Johl *et al.*, 2013). All these point to how essential it is to realise that there are reservations over using some of the IT governance frameworks because of their inherent shortcomings. Even though famous, the internal control framework developed by COSO is too abstract, general, and does not put much emphasis on IT (Rowlands *et al.*, 2018). On the other hand, TickIT is seen as more of a technical tool for the IT function than an IT governance tool in that it is mainly used in software development (Johl *et al.*, 2013). Similarly, ITIL was always seen as a tool for IT management rather than one for governance purposes. However, the latest version of the ITIL has incorporated features that enable this framework to facilitate certain aspects of IT governance (De Haes *et al.*, 2020).

The criticism levelled at other frameworks and standards for IT governance has seen COBIT being recommended as one of the most preferred IT governance tools (Huygh *et al.*, 2017; Rowlands *et al.*, 2018). Huygh *et al.* (2017), weigh in by stating that COBIT is “the most extensive framework that can be used as a toolkit for enterprise governance and management of IT.” As such, COBIT has received a wide acceptance that has seen its use extending to both the private and public. Similarly, the DPSA recommended COBIT as its framework for guiding IT governance in the public sector. The following section offers an overview of COBIT.



Source: (ISACA White Paper 2020).

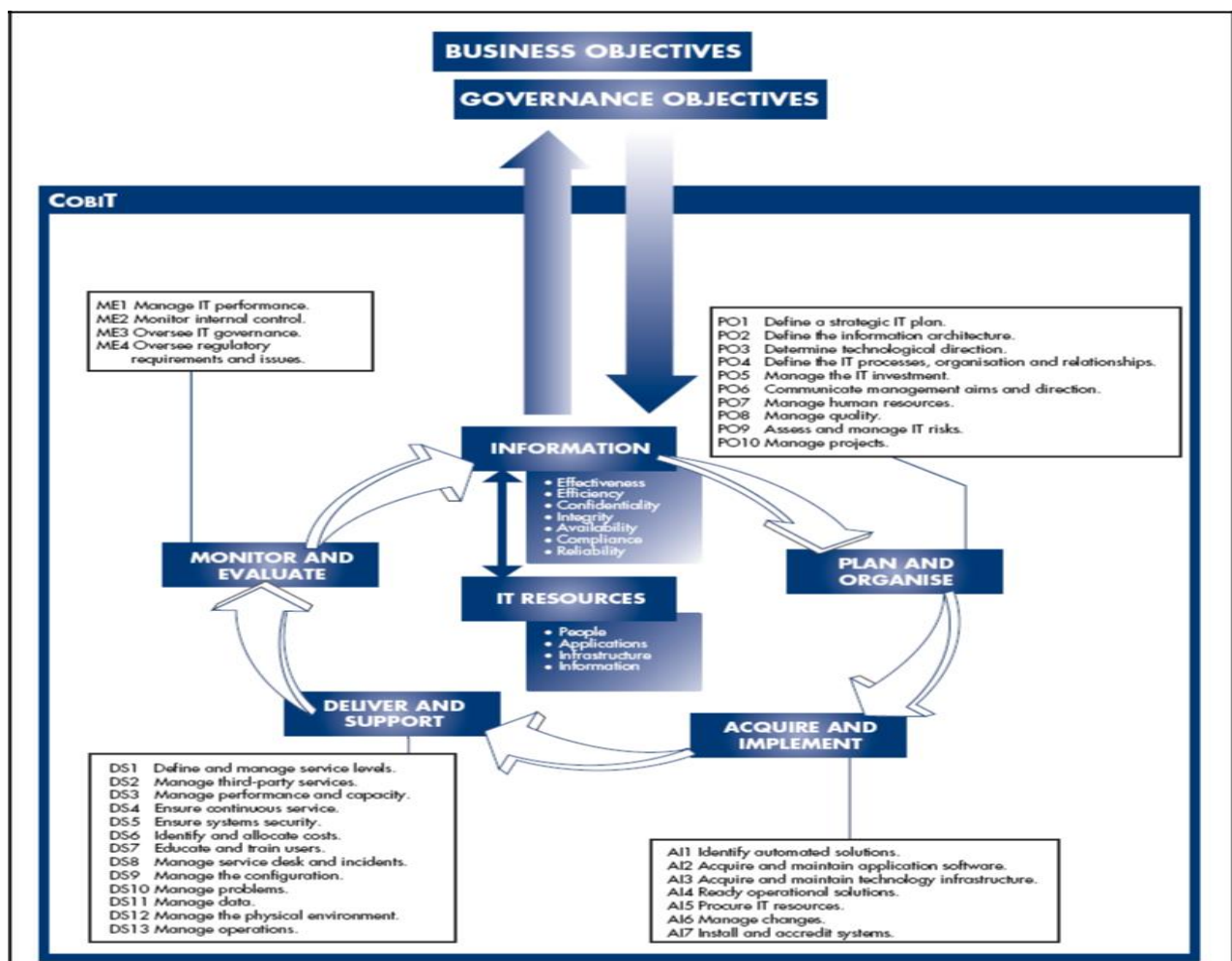
Figure 4.5: The evolution of COBIT from an IT audit to an IT governance tool

4.6.1 COBIT as an IT governance framework

COBIT is an IT governance tool that ISACA proposed. This COBIT was not initially developed as a tool for IT governance; instead, it was first developed to assist IT auditors in carrying out assessments of automated business processes. The focus of COBIT at the time was on “Control Objectives for IT Processes” (Anisingaraju, 2013; Neto *et al.*, 2018). De Haes *et al.* (2020), recognises the foundational idea of helping IT auditors evaluate the extent to which automated business processes met their objectives. Nonetheless, COBIT has changed over the past decades “to become the most important framework for IT governance since its inception in 1996” specifically in its latest version of COBIT 2019. Figure 4.5 summarises the evolution of COBIT over the past decades (Asmah, 2019; Lindros, 2017; Steuperaert, 2019).

Figure 4.5 shows that COBIT 1, an audit tool, evolved to COBIT 2 in 1998, then COBIT 3 in 2000. Today, the latest version is COBIT 2019. In 2005, COBIT 4 was released, the very first version that mainly focused on IT governance. COBIT 4 has 34 IT processes for meeting 17 IT goals. These IT goals could be mapped onto business goals in aligning IT processes to business goals. The IT processes in COBIT 4 are grouped into four main domains, namely

Acquisition and Implementation (AI), Plan and Organise (PO), Monitor and Evaluate (ME), and Delivery and Support (DS) (Alkhaldi *et al.*, 2017). COBIT 4 has additional IT governance tools such as the RACI chart that assists in allocating roles for each defined process. The RACI chart ensures that every defined process has four different key players. These players include individuals or a group of individuals who are either Responsible or Accountable or Consulted or Informed about the process (Alkhaldi *et al.*, 2017). In addition, COBIT 4 spawned the idea of a maturity model for evaluating the extent of development of defined processes. Other tools included in COBIT 4 are Val IT and Risk IT. These tools are essential to IT governance. Figure 4.6 shows COBIT 4.1 with its four domains and 34 processes.



Source: (De Haes & Van Grembergen, 2012)

Figure 4.6: COBIT 4.1 Framework

COBIT went on to evolve from COBIT 4.1 to COBIT 5 in 2012. Even though, COBIT 4.1 and 5 share a similar system, there are some notable differences. These differences are as follows:

- Changes were made to selected processes in COBIT 4.1.
- COBIT 5 consolidated fragmented knowledge areas that were in COBIT 4.1, Val IT, and Risk IT and developed a single framework.
- Unlike COBIT 4.1, COBIT 5 is built around five principles and its processes spread across five domains instead of four domains as is the case in COBIT 4.1.
- COBIT 5 moved away from using the Compatibility Maturity Model (CMM), a tool that is used in COBIT 4 to assess process maturity. Rather, COBIT 5 went on to adopt the Process Capability Model (PCM). The PCM is a tried and tested tool developed by ISO/IEC 15504.
- COBIT 5 includes seven key IT governance enabling factors that makes it possible to govern the enterprise IT. These include policies, frameworks and principles; organisational structures; processes; management culture and behaviour; information; IT infrastructure and, people, skills and competences (Maseko & Marx, 2016) .

4.6.1.1 An overview of COBIT 5

This section presents the building pillars of COBIT 5. This study focuses on COBIT 5 because it was used in IT governance when the DPSA frameworks were proposed. COBIT 5 is likely to have informed the instruments of IT governance in the South African public sector. This section presents COBIT 5 principles and its domains (Neto *et al.*, 2018)

4.6.1.2 COBIT 5 Principles

The design of COBIT 5 is centred on five principles, namely meeting stakeholder needs, covering the enterprise end-to-end, applying a single integrated framework, enabling a holistic approach, and separating governance from management. These principles are expanded in the following sub-sections.

4.6.1.2.1 Meeting stakeholder needs

Governance should always seek to meet critical stakeholders' needs or promote the attainment of stakeholder needs. This is important considering the ever-increasing cost of IT in business organisations. In particular, to the South African public sector, the emphasis on creating value or meeting the *Batho-Pele* principles suggests that Government Departments

need to enhance their governance structures and deliver value to their stakeholders. According to COBIT 5, the needs of stakeholders can best be attained by aligning IT goals to the business goals (De Haes *et al.*, 2020). This implies that every investment in IT should be made while focusing on contributing to organizational goals. To help with IT and business goals alignment, COBIT 5 proposed seventeen generic enterprise goals that could be considered. Organisations can still craft their own enterprise goals in addition to those proposed in COBIT 5 (Abdelbasset, 2019). To align IT goals to enterprise goals, they must be cascaded to 17 IT -related goals. Once that is done, these IT goals were put into action using IT processes. COBIT 5 identifies 37 IT processes from which organizations can prioritize related processes as they work towards achieving their IT goals (van der Walddt, 2018).

4.6.1.2.2 Covering the enterprise end-to-end

It is generally believed that IT governance is only the responsibility of the IT function. Instead, this principle emphasises that for IT governance to succeed, it must include different stakeholders within the organisation. This can be done by identifying important players for IT governance and defining their roles. Since COBIT 4, the RACI chart has been one of the essential instruments for defining the roles of those involved in IT governance (Governance, 2017).

4.6.1.2.3 Applying a single, integrated framework

As mentioned earlier, COBIT 5 moved away from a fragmented state that characterises COBIT 4, where knowledge areas are distributed across various instruments. In addition to combining the fragmented knowledge areas, COBIT 5 also aligned with other IT governance frameworks. Hence, COBIT 5 is an overarching framework for IT governance (Bernard, 2012).

4.6.1.2.4 Enabling a holistic approach

COBIT 5 proposes six factors known as “enablers” that should be in place for IT governance and management success. IT governance enablers create an environment that makes it feasible for all the parties and elements concerned to work together so that IT governance can succeed. The six enablers are as follows:

- **Processes:** business organisations should have a defined set of activities for accomplishing specific goals. Such processes cut across different units within an organisation. Hence, the relevant information for every activity carried out

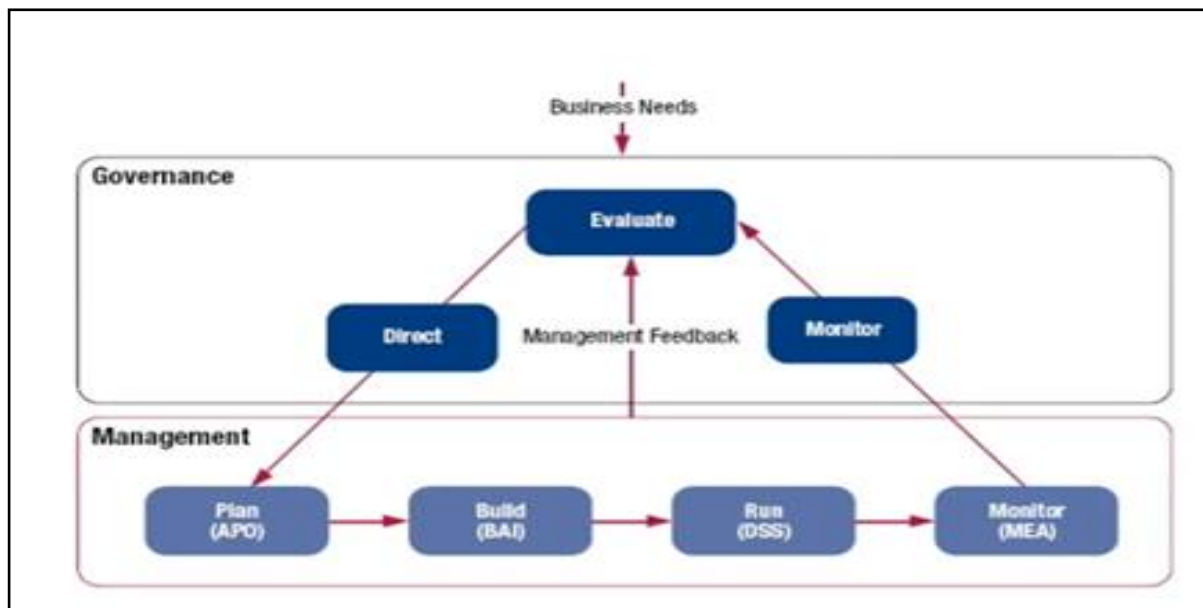
will also follow those key steps, cutting across business units until it reaches the end. Such processes can be computer-based or manual. Irrespective of the nature of the business process, it is vital that an organisation understand all its processes, can identify critical processes that lead to essential goals such that these processes are correctly governed and monitored.

- **Organisational structures:** an organisational structure shows vital decision-makers and the flow of authority. The RACI chart is one such instrument that can define the roles of all players in IT governance.
- **Culture, ethics and behaviour:** every organisation has defined practices and ethos that influence behaviour. These are often key to the success of any initiatives that are being done. Accordingly, understanding these informal structures can play a leading role in enabling IT governance ((Maseko & Marx, 2016); Da Veiga et al, 2015).
- **Information:** business processes inside organisations are facilitated by information. With technological advancements, information has become pervasive, it is imperative that the source, processing, storage, and output of information is understood if IT management and governance is to be both plausible and possible.
- **Services, infrastructure, and applications:** IT infrastructure can be used to enable specific business processes. Hence, also the critical services, infrastructures, and applications should be understood so that IT governance and management can be enabled accordingly.
- **People, skills and competences:** IT governance and management can only be possible where the necessary skills and competencies are available. This is important considering that IT governance and its various tools, i.e., COBIT, are often complex. Hence, equipping the organisation with the right skills is an essential ingredient for practicing IT governance.

4.6.1.2.5 Separating Governance from Management

It should be noted that versions of COBIT before COBIT 5 did not separate governance from management (Mulgund *et al.*, 2019). Not separating governance from management may have led to assumptions that IT governance could be facilitated by the IT function. Separating management from governance enabled COBIT 5 to describe the roles of managing IT and those governing IT, thereby clarifying what is expected from these different roles. It is expected that, by specifying what should be done, these roles would then be

assigned to the rightful positions within the organisation. COBIT 5 proposes that governance should involve Evaluating, Directing, and Monitoring, something that should be done by executive management. On the other hand, management could then plan their daily activities in line with what should be evaluated, directed, and monitored. This involves planning, building, running, and monitoring daily activities that are meant to see the achievement of enterprise goals, as depicted in Figure 4.7.



Source: (Ngoma, 2016)

Figure 4.7: COBIT 5 process reference model

4.6.1.3 COBIT 5 domains and IT processes

As indicated earlier, COBIT 5 comprises five domains, with four of these representing management level processes while the last one represents the IT governance processes, as shown in Figure 4.7. The domains at the management level are Align, Plan and Organise (APO); Build, Acquire and Implement (BAI); Deliver, Service and Support (DSS); Monitor, Evaluate and Assess (MEA) while the domain at governance level is Evaluate, Direct and Monitor (EDM) (Damayanti & Manuputty, 2019). Altogether, these domains represent 37 IT processes. However, organisations are not expected to adopt all these IT processes; rather, they should focus on domains and IT processes that help meet regulatory requirements (Neto *et al.*, 2018). Accordingly Andry and Setiawan (2019), recommended at least 10 IT processes they deemed were most effective and easy to implement. (De Haes *et al.*, 2017)) enlists 12 critical IT processes from the public sector of Queensland (Australia). Similarly,

DPSA identified 12 IT processes that the South African public sector should consider first when implementing IT governance. Based on this variation, this current study provides an overview of COBIT 5's five domains for IT governance and management (Bartens *et al.*, 2015; Ngoma & Erasmus, 2016; Van Grembergen & De Haes, 2018):

- **EDM:** the processes under EDM are for the board of directors responsible for governance. The focus is on ensuring optimum use of resources, risk management, and value generation from IT investments. EDM processes are among the most critical processes to be implemented first in IT governance.
- **APO:** processes in this domain focus on making plans that will see IT being used in the best possible manner for the organisation. Such processes are associated with managing costs, human resources, risk, security and relationships. There are suggestions that some of the processes falling under the APO domain should be among the first to be adopted when implementing IT governance in the public or private sector.
- **BAI:** BAI processes focus on acquiring, developing, and maintaining applications, software, and hardware that support IT governance. Accordingly, this domain ensures that the IT projects are appropriately managed and contribute to the business strategy. While selected BAI processes are some of the critical processes to be implemented first in the private sector, the processes falling under this domain are not so popular in studies that were conducted in the public sector.
- **DSS:** IT management processes under this domain promote IT services management, ensuring continuous service delivery. Such processes can include security, disaster recovery, and incident management. DSS IT processes are popular in the public sector even though they are not highly regarded in the private sector.
- **MEA:** Processes in this domain promote quality assurance. This can be done by monitoring and evaluating the effectiveness of the controls and testing for compliance with specific regulatory requirements. But, IT processes within the MEA domain are considered complex to implement and less effective; hence, they are not always adopted in both the private and public sectors.

4.6.1.3.1 M2A3-IT Governance Model

The M2A3-IT governance model is a Maturity Model for Analysis of Alignment of Activities related to ITG and it comprises twelve fields of action used to assess the degree of effectiveness of IT actions to meet the expectations of the Strategic Plan of the Organization (Smits & van Hillegersberg, 2019). The critical aspect of the M2A3-IT governance model is the Assessment Maturity Level. The indicators designed by the model are “direct, relevant and practical result” indicators. The key indicators derived from IT are auditing, compliance, development, knowledge, management, planning, production, project, quality, requirement, security, and testing (Smits & van Hillegersberg, 2019).

4.6.2 Nine IT Governance Categories

The nine ITG categories form a research model to investigate the effects of ITG categories on governance performance (Smits & van Hillegersberg, 2019). The nine IT governance categories are user support, top management decision-making, review and evaluation of IT tasks, ability and evaluation of IT department, risk management, CIO authority, budgeting process, outsourcing, and IT project development management (Smeureanu & Diab, 2020). In order to measure the governance performance, the Gregory formula was used. This formula measures four effects (“cost-effective use of IT,” “DS on vertical activities) adopted from measurable resource planning. It uses calculation and production schedule for every level, based on sales forecast. The pull model – focusing on horizontal activities – originated in the just-in-time (JIT) system used in manufacturing. In JIT, production is triggered by customer demand: the users are pulling what they need (Smeureanu & Diab, 2020).

4.6.3 Green IT Model

The Innovation Value Institute has developed a framework to improve sustainable IT capabilities: The Sustainable ICT-Capability Maturity Framework, based on the IT Capability Maturity Framework (IT-CMF) (Tonelli *et al.*, 2017).

The green IT governance model is based on the Sustainable ICT-Capability Maturity Framework and the four basic sustainable IT postures of the cost centre, the service centre, the investment centre, and the value centre. This results in four horizontal activities: IT data centre; IT efficiency technique; facility efficiency technique; integration efficiency technique; and vertical activities depending on material elements, comprising printing-paperless, reuse-recycle, and rules-policy (Patón-Romero *et al.*, 2018; Patón-Romero *et al.*, 2019).

4.6.4 IT Governance and Operation Framework

Sukarman and Putri (2018), designed an ITGF, operating model, and IT maturity model for IT transformation design. For the governance framework, four mechanisms have been acknowledged and integrated: the organization, processes, compliance, and transformation. This design was developed based on industry best practices and standards such as COBIT, Val-IT, and ITIL. The IT operating model covers IT functional structure, operational processes, consistent matching, and transformation management.

The IT maturity model was designed based on a survey's initial findings, which involved more than 100 large-scale chemical enterprises between 2008 and 2018. The study covered IT, and a business side with the following five levels: (1) Technology-driven – customer follows, (2) Controlled – customer chooses, Service-oriented – the customer decides, (4) Customer-driven – customer owns, (5) Business-driven – customer directs (Patón-Romero *et al.*, 2021).

4.6.5 The MIG Model

The MIG model is a focus area maturity model for hard and soft IT governance. A focus area for this maturity model is a specific type of maturity model in which an incremental development is based on the progress of a collection of focus areas (Smits & van Hillegersberg, 2019). Focus area maturity models differ from the other approaches already discussed because they define a specific number of maturity levels for a set of focus areas, including concrete capabilities to achieve maturity in a targeted domain (Sanchez *et al.*, 2017). Focus area models are much less common than fixed-level models. The researcher shares the view that different dimensions have different maturity levels, and the assumption of generic maturity levels is an oversimplification.

There is always debate about whether higher maturity levels are better than lower ones (Kosasi *et al.*, 2018). This might not be true for all levels, especially for the highest. This is an issue that is discussed later in this study.

4.7 ITOMAT

IT Organization Modelling Assessment Tool (ITOMAT) is a model-based maturity assessments method for IT governance. This tool is a formalized method for IT governance maturity assessments based on the COBIT framework. ITOMAT gives a clear and formalized analysis framework that enables the combination of single metrics to show

total maturity scores on both the process and enterprise levels. ITOMAT has identified four generic metrics: activity execution, assigned responsibilities, documents in place, and metrics monitoring in COBIT 19. Several roles for IT governance are presented. According to ITOMAT, few organizations employ all 19 different roles, and therefore ITOMAT features a more simplified representation of only five different roles (Gajdos *et al.*, 2018).

4.8 COBIT Assessment Tool

This online application tool was designed to make the self-assessment of IT-enabled enterprise processes more efficient, effective, and inclusive. It can be used to conduct self-assessments to prepare for an independent, third -party assessment or determine process capability levels within any discipline of enterprise operations. The COBIT 5 Self-Assessment Tool simplifies and streamlines the assessment process of maturity assessments of the world's leading framework for the governance and management of enterprise IT (Neto *et al.*, 2018).

The COBIT 5 Self-Assessment Tool allows the assessor to enter basic information about the self-assessment they will be conducting. Furthermore, it allows for set goals or Expected Capability Levels for each process capability before the assessment and selects only those processes to be assessed. The tool then describes the assessment and reports the self-assessment results (Neto *et al.*, 2018).

4.9 Other Types of Maturity-related Research

A theoretical study using data from 20 Emirati organizations to evaluate how a firm's five governance domains affect the level of IT governance maturity and how a firm's five was conducted to show how proposed governance mechanisms shape the overall effectiveness of IT governance (Alagha, 2018). In this study, Nicho *et al.*, (2017) mentioned that five IT governance domains are used: (1) Alignment of business and IT, (2) Monitoring of IT resources, risks, and management, (3) Monitoring of IT performance measurement, (4) Evaluation of value delivery, (5) IT governance development. Eze *et al.* (2019) described an integrated reference model for IT performance measurement based on a life-cycle model and a performance-oriented framework. However, the reference model does not include a maturity model.

Bianchi *et al.* (2017), described the intended design science approach to develop an IT governance model with structures, processes, and relational mechanisms suitable for

public sector universities with guidelines for effective and efficient IT governance. A short paper – 3 pages – describing a study based on data from 20 organizations within financial services, telecommunications, manufacturing, and public service as identified as the most influential IT governance domain for increasing the level of IT governance maturity (Scalabrin Bianchi *et al.*, 2021) (Scalabrin Bianchi *et al.*, 2021). It used partial least squares path modelling and found monitoring IT performance measurement to be the most influential IT governance domain and implementing a corporate communication system as the most effective IT governance mechanism.

Vejseli and Rossmann (2018), have developed a research framework for investigating effective IT governance implementation using the Duality of Technology and the Adaptive Structuration Theory. This is interesting because they can be considered alternative hard and soft governance representations. The Duality of Technology model concerns the dualism between objective, structural features of organizations and subjective, knowledgeable action of human agents. In other words: the interplay between the types of structures inherent to technologies and the structures that emerge in human action as people interact with these technologies.

A study using a survey questionnaire to determine the status of IT governance in universities in a developing country (Ghana) through assessing the drivers and barriers to pursuing formal IT governance has measured the extent to which universities align IT goals with academic and business objectives in order to determine the IT governance maturity level (Yaokumah *et al.*, 2015).

Johl *et al.* (2013), developed an ICT governance framework for universities in South Africa. The framework investigated the level of ICT pervasiveness within universities, and the framework design followed COBIT 4.1 processes. Furthermore, the framework investigated whether there was alignment between ICT process maturity and institutional processes within universities. The paper was high level in nature, and ICT process maturity were compared to the institution's age; that is, whether business perceptions and treatment of ICT had improved over time in the respective universities.

4.10 Conclusion

This chapter discussed the various maturity models that exist and the governance models that are used in Africa and world-wide. The framework investigated the level of ICT pervasiveness within different organisations. Furthermore, the we investigated whether there was alignment between ICT process maturity and institutional processes

within different organisations. In addition, ICT process maturity were compared frameworks and the different theories were discussed.

CHAPTER 5: FINDINGS

5.1 Introduction

This study aims to assess the IT governance process maturity for the ECGDs. The previous chapter explained the methodology and literature used in this study. This chapter presents findings from the data generated. These findings give an overview of the case studies included in this study, specifically the qualitative data. The Actor -Network Theory (ANT), discussed in Chapter 2, is used to present the findings. This is followed by document analysis and quantitative data findings. Finally, the chapter presents findings on the maturity of processes of the ECGDs.

5.2 Overview of case study

The case studies that were considered in this research were grouped into two groups to improve the presentation of findings. These two groups were labelled Group A and Group B. The cases were grouped using the following classification criteria:

- Size of the IT Department
- IT Reporting structure
- IT Governance implementation status

A pre-analysis based on the departmental structure based on the COBIT Framework was done to determine the possible processes that each department is likely to be using. The summary of this is as shown in Appendix B.

5.2.1 Group A cases

The cases in Group A have a fully-fledged ICT department which is headed by the Chief Information Officer. These Departments (cases) have an ICT staff complement that ranged between 15-and-20 employees. Figure 5.1 summarises cases that belonged to Group A. Furthermore, the general organogram for Group A cases is shown in Figure 5.1 in which four executives were identified within the ICT department.

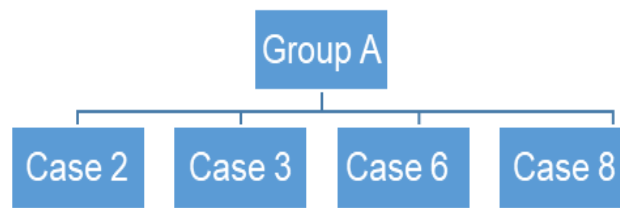


Figure 5.1: Cases in Group A

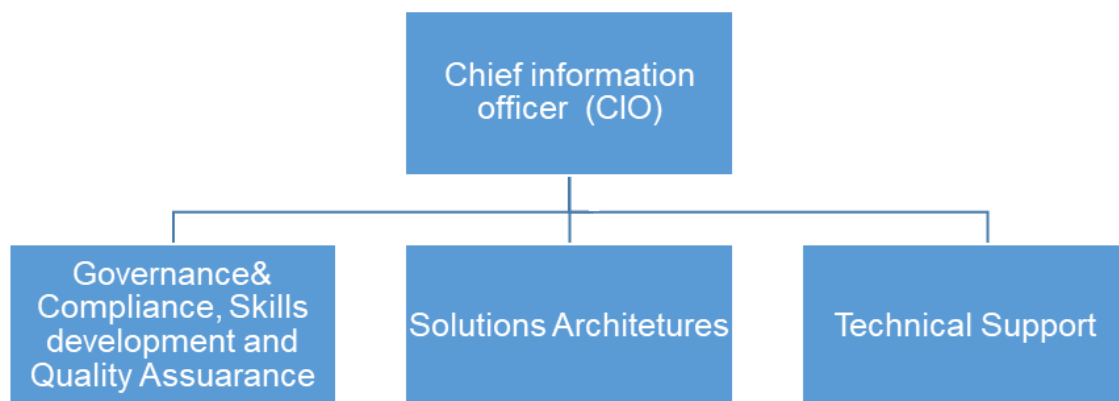


Figure 5.2: ICT Structure for Group A Cases

5.2.2 Group B Cases

The majority (5) of cases investigated in this study belong to Group B. Figure 5.3 shows these cases. The cases in Group B have relatively smaller IT Departments that have a staff complement of 5-to-10 employees. Furthermore, these IT Departments are headed by an IT Manager and they have one System Administrator and Technicians as illustrated in Figure 5.4.

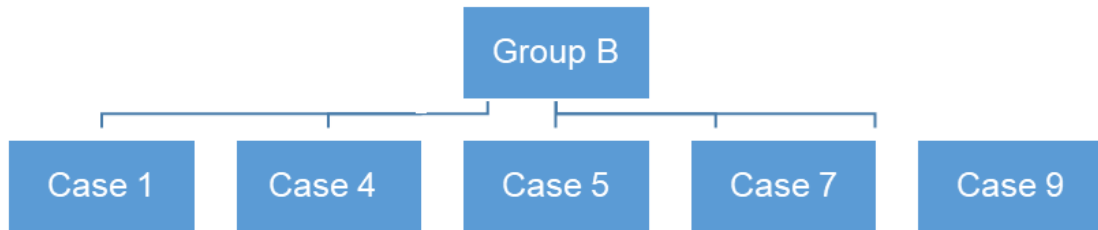


Figure 5.3: Cases in Group B

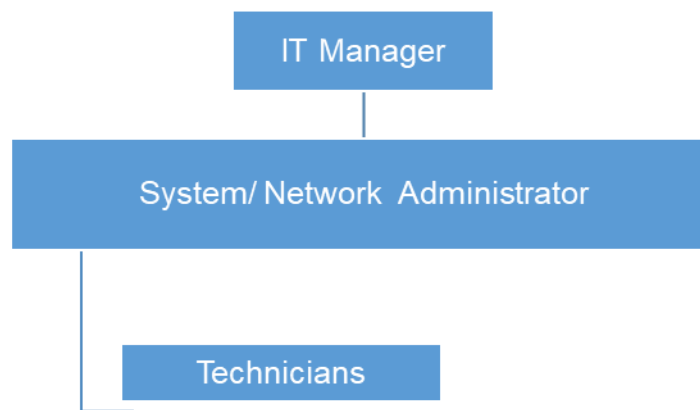


Figure 5.4: ICT Structure for Group B Cases

5.3 Interview findings

Actor-Networktheory (ANT) was adapted to guide the data analysis for this study. As discussed in Chapter 3, ANT was adapted primarily because it focuses on actors, and networks, including the relationships and interactions between human and non-human actors. Thus, from the viewpoint of ANT, the moment of translation was employed to examine how IT activities were negotiated and transformed within heterogeneous networks towards IT governance in the sampled cases in the Eastern Cape Government Departments.

As discussed in Chapter 2, qualitative data was collected from nine (9) Departments used as cases in the study. The Departments were labelled Case #1, Case #2, Case #3, Case #4, Case #4, Case #6, Case #7, Case #8 and Case #9. As explained in Chapter 2, the data was compiled into two Microsoft word documents following their similarities, and two groups were derived from these case similarities. In each of the cases, the participants were labelled anonymously to avoid using their identities in adherence to their company policies of non-

disclosure. Thus, the participants were labelled Case 101, Case 201, Case 301, Case 401, Case 501, Case 601, Case 701, Case 801, and Case 901. The documents were also annotated by page and line number. Labelling of the participants and line numbering of the documents were purposely done to ease the use of the data in the analysis. The format for referencing was the participant, page number, and line number. For example, Case101:2, 2-4 means Case1, participant number 1, page 2, and lines 2 to 4.

5.4 Group A case findings

This section presents findings on cases that were categorised as Group A. As indicated above, Group A comprised Case#2, Case #3, Case#6, and Case #8. More comprehensive detail about the cases has already been presented in Chapter 2. Following the four moments of translation from the perspective of ANT, the analysis is presented as follows:

5.4.1 Actors

Different actors engaged in the IT environment of the Group A participants were identified. ANT defines an actor as both human and non-human that have the capability of making a difference in its network.

5.4.1.1 Human actors

The data collected in this study shows that the human actors involved in the activities that influenced the IT activities in the Departments were from both IT and business units. These human actors included IT directors from the IT unit, and the actors from the business unit perspective comprised the Corporate Service Directors. These actors had different roles and performed various activities that directly or indirectly influenced IT governance in the Departments in Group A.

The actors from the business unit were considered focal actors in that they were the main drivers of IT activities in the department that they fell under. As described by one of the IT Directors during an interview, *"IT systems and technologies are established behind the business needs that is established by the business Departments"* (Case 601: pg. 03, 225-226). This was attributed to the businesspeople driving the requirements within which the IT activities were developed and implemented. However, national policy documents are also a driver of IT activities. According to one of the IT managers, *"Things have changed now, we do not look at user demands only, right now, we are driven by national policy documents"* (Case 601, pg. 01: 6-7). The business actors, also referred to as the end-users, serve on the

decision-making body of the department. They are expected to influence the decisions of IS/IT operations directly. This was confirmed by Case101, who explained that *"our superiors do not make decisions as fast enough which can be a challenge [to] governance implementation"* (Case 201, pg. 06: 253-254). The Business Manager further confirmed that decisions are not made quickly due to an insufficient budget.

5.4.1.2 Non-human Actors

The non-human actors consist of technological and non-technological artefacts. The technological artefacts included policies (such as ICT Policies, ICT Charter, and ICT governance frameworks). The IS/IT artefacts were either developed internally (in-house) or outsourced to service providers, and they are used for both strategic and operational needs in the department. *"Some policies are developed in-house while the other more technical ones are outsourced to suppliers"* (Case 301, pg. 04: 183-184), explains the Director ICT. The non-technological artefacts included IT skills, finance, and processes such as Service Level Agreement (SLA) and training.

There were two main processes at the time of this study: communicative and activity. Through the communicative process, communications were carried out between business and IT unit personnel. This was purposely designed to align IT activities with the business goals and objectives. However, the communication between the units was not always cordial and well understood by either side. According to the Director ICT, *"there is miscommunication between the IT division and the business units at the ministries"* (Case 201, pg. 02: 157-158). This could be attributed to a lack of a formal approach such as workflow systems that document details of communication among interested actors in an activity.

In addition, another aspect of communication was verified by a Director ICT Governance, who stated that *"there is a communication gap between the Government Departments in the province as a result, the actors work in silos"* (Case 301 pg. 3: 346). This type of silo approach promotes duplication and replication of processes and deployment of IS/IT artefacts within the environment, which is costly and counterproductive. Also, working in silos promotes misalignment between the units, including the IT activities. The activity process enabled and facilitated the department's development, procurement, and implementation of IS/IT artefacts. In addition, the SLA process was used to define and manage the support provided through the IS/IT activities and operations in the department.

The finance department plays a critical role in determining and influencing the procurement of IS/IT systems within Group A. According to the Director ICT, *"the social factor of funds influences the implementation of the governance policies"* (Case 801, pg. 01: 25-26).

Lack of or shortage of IT skills was considered a detrimental factor in implementing ICT governance policies. The Director ICT alluded that *"availability of local IT skills influences our decision to implement policies. This is because without IT skills and training the processes will not be maintained or supported"* (Case 601 pg. 01: 22-23). According to the Director ICT Governance, *"the public service has many needs, but the capacity or IT skills and training are scarce to find within the ECGDs"* (Case 301, pg3 :221-224). However, this was contrary to the manager's view, as briefly explained by one Analyst Programmer who voiced that *"the Government has enough skills, but they are not exposed or given the opportunity to grow"* (Case 201, pg. 08: 347-348). These contrasting views can be ascribed to a lack of understanding or misalignment of functions and activities within the environment.

The actors had relationships that were defined by their interactions and associations. This was based on actors' roles and activities that depended upon or complemented each other within networks. No actor operates in isolation or outside a network as was established in this study.

5.4.1.3 Networks

In Group A, various networks existed at different levels, with the main ones including the Departments (Cases) themselves. Within these networks, business and IT units existed as networks. One Director ICT explained that *"Case 3 is the provider of governance services to the whole province"* (Case 302, pg. 02: 47-48). There were other networks, such as the management and technical personnel community. The networks were consciously formed following the departmental structure. This included executive managers, senior managers, and technicians. There were also networks, which were unconsciously formed and operated within the formal structure of the department, such as groups of friends or associates. These networks directly or indirectly influenced the activities and operations of ICT within the department.

In addition, there was a network of external stakeholders that were the suppliers. *"We rely on suppliers for the delivery of systems and other complex ICT services"* (Case 201, pg. 02: 179-180), explained one IT employee. Within the business unit, ICT Director, senior managers were the networks. The ICT management team, programmers' team, network administrators, and others were the networks that existed in the ICT unit of the department.

The ICT Director was responsible for the developed requirements that ultimately determined the ICT solutions. The senior managers formulated the vision and policies on behalf of Group A Departments. According to one of the participants, *“we have Departmental ICT Governance frameworks and policies, from there we derive the process we have to implement for ICT”* (Case 302, pg. 03: 70-71).

The Director ICT was the custodian of ICT infrastructure and services in the Government. According to one of the Directors in the department, *“the ICT Steering Committee advises the Departments on the ICT Governance implementation and assessment* (Case302, pg. 3: 223-225). The ICT Steering committee is a network that comprises directors from the various units within the Departments and is responsible for advising on ICT matters. This is primarily because, as the executive team of the Departments, they are collectively responsible for the strategic management of the department’s operations.

5.4.2 Moments of Translation

5.4.2.1 Moments of Translation: Problematisation

Problematisation aims to identify a solution to a problem situation to attract the attention of actants (Crawford, 2020). Problematisation is initiated by a focal person (or actor) who initiates a process that requires an outcome or a solution. The focal actor in this study is the business division that relies on ICT to efficiently and effectively improve its operations.

In the department, operations and activities were problematized through various means, such as workshops, awareness sessions, and stakeholders’ meetings. Sometimes, ICT activities were problematized through email, telephone calls, and meetings. According to the ICT Director, *“We went for governance training and took the IT managers to understand the governance structures and expectations of the Government Departments.”* (Case 302, pg. 1: 213-215). This was intended to sensitise and get IT staff members on the importance of ICT governance. The management team is aware that engagement of other stakeholders during the initiation of a project can enhance harmony towards successful accomplishment of an objective.

5.4.2.2 Moments of Translation: Interessement

Interessement is the stage of translation moments where the actor’s interest in an activity is established. The interest manifests from knowledge, awareness, and know-how that is often based on how the activity was problematized. In ANT, interest can be negative or positive;

consciously or unconsciously formed based on negotiation. The interest helps define the relevance or significance of the problematized activity within the environment (network).

The operations and activities of the ICT unit were always considered significant to the department's goals and objectives. This is the result of negotiation between the ICT and top management. Activities are better explained and understood during the negotiation process - through which the different types of interests are formed.

Due to its significance in the Departments, there were internal and external interests of various types in ICT activities that included planning, strategy, and operations. The internal interest groups or stakeholders included different networks and actors such as the IT unit itself, business unit, and executive management of the department. Some individual staff members of the department also showed particular interests informed by various and specific factors.

The ICT unit is the custodian of all ICT projects and activities within the department: it must plan and oversee the implementation and support of ICT Governance projects within the department. It is thus imperative that the Business unit approach the IT unit regarding their ICT Governance needs.

Executive management consists of members from both the business and the ICT units. The executive management is the strategic unit in the department that is the decision-maker on the IS/IT projects. The executive management is interested in implementing ICT Governance *"because the DPSCA committee directs them to introduce the said standards within the stipulated phases"* (Case 601, pg. 03: 227-229). It is thus crucial that the successful implementation become a cardinal focus for the executive team. The executive team is liable for the successful execution of projects.

Case 3 is mandated to oversee the implementation and support of ICT governance. Based on this mandate, it is obligatory for all Departments to be interested in ICT-related activities and processes in the department. It is thus obvious that all ICT governance needs have to be directed to Case 3. According to the ICT Director, *"I told our Case 3 Provincial office that we want a centralised governance monitoring and assessment platform so that all the departmental ICT Governance needs are addressed centrally"* (Case 801, pg.7-8: 481-482).

Some staff members, including technical personnel and managers, had a personal interest in some of the governance activities carried out within the IT environment of the department.

Some of the employees try to influence the choice of technology based on their skills and preferences. This is alluded to by the Business Director, who prefers “*to work with suppliers who have rendered services to them before*” (Case 301, pg. 4:433- 434).

In order to increase the adoption of the ICT governance acceptance, it is essential to involve the affected stakeholders from the inception of the development of all documentation. The users’ specific interests in the various areas were identified through these consultations. This assisted with the formulation of specific policies and frameworks. In addition, it helped to ease users’ acceptance of the system that is key to investment and competitiveness. The focal person enticed stakeholders affected by the implementation of users from other Departments to be interested in ICT governance.

5.4.2.3 Moments of Translation: Enrolment

As explained in Chapter 2, enrolment is a participatory stage in the moments of translation, the third stage. This is critical because not every actor interested in an activity participated in the actual execution. For example, the management team is interested in the ITG frameworks that are prescribed by DPSA but do not participate in the actual (hands-on) implementation of the policy thereof and the eventual deployment of the solution. Thus, based on the interest of the individuals and groups, tasks are allocated using different means such as negotiation. The actions to allocate tasks to the employees are often carried out legitimately using the department’s rules and regulations.

The focal person is responsible for suggesting and allocating roles to stakeholders who partake in ITG policies and frameworks. Actors such as the Business Director, IT Director, System Analyst and Analyst Programmer, vendors, and suppliers all accepted the roles defined for them. Discussions about the roles of stakeholders held in the management/executive meetings and confirmed in the planning document. These actors are all permanent employees in the department, and they must partake in the assigned roles. even more important is how the employees choose to participate in an activity. This is primarily because such actions are not obligatory; no actor has total control over another actor from the ANT perspective. However, the roles defined for the vendors and suppliers were negotiable because they were invited to participate. The vendors’ participation was always influenced by the limitations or gaps within the department.

It is the mandatory role of the IT unit to develop ITG documentation within the department, and they are also responsible for the implementation of ITG policies. The IT manager explained how IT projects that were initiated through policy directives were ultimately executed: *“the DPSA directs us to introduce certain IT projects that can enhance the implementation of ITG”* (Case 302, pg. 06: 228-229). The IT division not only participated in projects that were driven by business needs, as alluded by the IT Director, *“ITG projects are established behind a business need driven by the business Departments”* (Case 302, pg. 06: 227). However, the Business and IT managers, both from the executive team, are accountable and responsible for the successful process maturity of ITG in the department.

Due to the magnitude of the ITG, the implementation of the IT project is managed by an ITG Champion who oversees, plans, and coordinates the implementation of the ITG policies. Members of the ICT steering committee appointed the ITG Champion. However, this has proved to be a challenge to the successful implementation of the policies as explained by the IT Director, *“we select the person to be an ITG Champion from that business unit, but they do not have ICT qualifications, just because you are a director in that unit, does not mean that you are qualified to run the implementation of ITG”* (Case 601 93, pg. 06: 249-250). This frustration emanates from a lack of successful IS/IT project implementation. The challenges with the implementation range from the system requirements cost escalation and extended implementation time.

5.4.2.4 Moments of Translation: Mobilisation

ICT policies that enable business goals and objectives do not happen automatically or by default; this process happens through negotiations carried out via mobilisation and awareness sessions. The process of mobilisation and awareness happens through diverse channels, such as workshops, training, meetings, and seminars. During mobilization, the focal actors are the spokesperson for the other actors represented. Two spokespersons were identified, the Business Director and the IT Director. The IT Director speaks on behalf of the IT unit and engages in activities to implement the policies. With the decision to outsource, the IT Director expressed his role, *“I approach the vendors if they will be interested in helping to look for IT solutions”* (Case 201, pg. 01: 34-35). Employees such as the Analyst Programmer and the Systems Analyst are all conscious of their defined roles to meet the IS/IT deployment objectives.

5.5 Group B cases findings

As indicated above, Group B comprised of Case#1, Case #4, Case#5, Case#7 and Case #9. More comprehensive detail about the Cases has already been presented in Chapter 4. Following the four moments of translation from the perspective of ANT, the analysis is presented as follows:

5.5.1 Actors

Within Group B different actors existed. The actors were both human and non-human who exert an impact on the implementation and maturity of ITG activities within the Departments' environment. The impacts were either direct or indirect. Also, the actions of the actors were either conscious or unconscious but made a difference in ITG process maturity.

5.5.1.1 Human Actors

Group B consists of many units such as corporate services, procurement, human resource, and the IT unit, which provide support to the various business units (IS/IT) needs. All the identified actors influence the IT activities in the Departments. Both IT and business units comprise human actors who are referred to by their roles or the positions that they hold in the department. Some of the positions within the IT unit include Deputy Director, who is the IT executive, Chief Systems Administrator, who is the IT manager, Analyst Programmer, and Systems Administrator. Some of the positions were Deputy Permanent Secretary, Deputy Director, and Chief human resource from the business units.

The activities of ITG were influenced by both technical and non-technical (business requirements) within the department. According to the IT executive, *"systems and technologies are determined by the needs of the different business Departments"* (Case 401: pg. 02, 89-90). However, other factors that determine the establishment of IT activities have also been identified. Explaining this, the Business executive reasons, *"ITG activities rely on a strategy from OTP and national requirements because technology is prescribed by OTP"* (Case 01: pg. 06, 225-227). OTP in this respect initiates projects that are driven by national and political strategies.

5.5.1.2 Non-human actors

The non-human actors are the technological artefacts such as hardware and software and non-technological processes and policies used in the selection, development, and implementation of IT solutions. The IT executive described the technical factors that were considered during systems selection as follows: *"The physical server, all hardware machines, the infrastructure, network integration, licenses, and security, as well as the*

combination of all those” (Case 701: pg. 03, 93-95). Within the Department of Finance, standards, communication, politics, structure, IT skills, funds are some non-technical factors identified.

In order to better manage the ITG activities within the Government, policies and standards have been defined in the department to guide and enforce consistency for the intended activities. A lack thereof can create a challenge, as indicated by the IT executive that *“we do not have a retention policy to retain IT skills”* (Case 901: pg. 03, 108).

Standards need to be followed to create uniformity in the services and processes to ensure quality and better management of ITG. It is thus imperative that standards are enforced. According to the IT executive, *“we need to stick to the standards as defined by national treasury”* (Case901: pg. 03, 128-129).

Quality communication is critical amongst actors to ensure standards and enhanced ITG Process maturity. Communication between the department and Case 3 because Case 3 is mandated to plan and approve ITG frameworks deployed in the department. Group B Departments thus communicate their ITG intentions to Case 3 regularly. However, communication with OTP has proved a challenge for the Departments. According to the Director ICT, the communication between Departments and OTP has proven *“quite challenging”* (Case 401: pg. 06, 238). The IT Manager shared the same sentiments, stating that *“the communication process with Case 3 is long and frustrating, and they take long to respond”* (Case 701: pg. 05, 193).

Actors use power to select, develop, and implement the ITG framework. As a result, governance activities are associated with politics. Explaining the power of politics on corporate services, the Director ICT stated, *“You should understand that there is a political aspect that decides when a policy should be approved and implemented. So, we are under pressure where the accounting officer is biased towards specific governance issues and neglects other areas.”* (Case 701: pg. 02, 64-67).

The actor's roles and responsibilities are allocated on the basis of the department's structure. The Accounting officer's structure should respond to the department's strategic objective. However, this is not always easy as strategic objectives change gradually for the department to stay competitive. Therefore, the departmental structure must adapt accordingly. However, the IT structure poses a challenge, as alluded to by the IT executive, *“It is a challenge because our structure is not flexible”* (Case 701: pg. 03, 110). The structure

needs to provide the functional and technical skills to enable IS/IT implementation and support. Skills enable self-reliance for systems deployment, but the department has been challenged by the lack of necessary IS/IT skills. According to the IT executive, *"We do not have the skills and structure"* (Case 701: pg. 03, 104); however, this was not in line with the Systems Administrator's views who reasons that *"systems are always outsourced to vendors, because management believes we don't have skills, but we are able"* (Case 901: pg. 01, 34-35).

Financial resources are a critical factor in influencing the process maturity of ITG in the department. For example, the availability of financial resources influences the implementation of the policies and frameworks; as explained by the Director ICT, *"we sometimes do not have sufficient budget to buy the systems that we need"* (Case 401: pg. 07, 279-280).

5.5.1.3 Networks

The actors create networks during the ITG policy implementation in the department. These networks exist within the Business and IT units. The IT unit is a network of professionals working together to deploy IT solutions in the department. The Business unit creates a network that seeks IT-driven solutions actioned by business operations. According to one of the participants, *"we have different business Departments with different needs"* (Case 901: pg. 03, 90).

The IT unit of the Group B Departments relies on the IT unit of Case 3 for ITG support and guidance, hence the establishment of a network between the two units. According to the Director ICT, *"IT here is not a stand-alone, because they rely on a strategy from Case 3"* (Case 501: pg. 06, 225-227). Due to various factors such as lack of skills, not all policies are developed internally. The Director ICT stated, *"Policy development is always outsourced to vendors"* (Case 701: pg. 01, 34). Vendors establish a network with the Business unit to develop IT policies.

Actors gain power based on the type of networks to which they belong. Thus, the selection, development, and implementation of IT are influenced by the network actors. As a result, due to the networks in which actors belong, some actors use their power to make decisions that best fit their personal development rather than the department at large.

5.5.1.4 Heterogeneous networks

Heterogeneous networks are established during the ITG activities. Heterogeneous networks are established when actors belonging to a particular group become members of another group, and as a result, they belong to multiple networks. For example, the IT unit from OTP is heterogeneous because it replicates itself within the IT unit from the Group B Departments to deploy ITG solutions.

Staff members responsible for developing technical requirements of the ITG frameworks and policies comprise both technical and management staff members. According to the IT Manager, *“technical representatives such as analyst programmers and system administrators are not included to give the technical input of a system in the development of the frameworks, but IT managers are.”* He further reasons, *“management should be involved more in strategic matters of IT”* (Case701: pg. 02, 77-81). These actors replicate themselves in the functional IT unit and the management unit.

5.5.2 Moments of Translation

5.5.2.1 Moments of Translation: Problematisation

Different factors in the department drive the deployment of ITG artefacts. The implemented ITG artifacts are expected to fulfil specific needs in the department; however, various challenges are associated with the deployment of the ITG artefact. Both the business and IT units experience the same challenges. The Director explains, *“Systems and technologies are selected from the strategy prescribed by National Treasury, and we select our IT projects specifically related to our department as prescribed by the National Treasury, and as much as the department has its wishes, it is a challenge to incorporate because technology has been prescribed overall by National Treasury”* (Case 401: pg. 06, 226-229).

The business needs to drive the selection, development, and implementation of ITG and systems. A senior IT staff explained, *“system selection and development depend on the business process and the needs that arise from the users”* (Case 501: pg. 07, 284). This is done in conjunction with strategies identified by National Treasury. National Treasury is mandated to drive the implementation of all ITG and systems that have been initiated through political and national ambitions of the Government and approve the ones initiated on the ministerial level.

5.5.2.2 Moment of Translation: Interessement

Different factors are involved in the deployment of ITG artifacts in the department. Due to different interests in the deployment of ITG artifacts, actors are recruited by the focal actor. The focal actor, the Business unit, recruits internal and external units to partake in deploying the ITG artifacts.

The internal IT unit is recruited by default because they are mandated to oversee the department's planning, implementation, and support of ITG implementation. Furthermore, their interest is to successfully fulfil their departmental role to implement and support ITG artifacts. The internal IT unit works closely with the IT unit from OTP for the deployment and support of the ITG artifact.

National Treasury introduces ITG projects to all Departments of national and political importance. OTP is interested in virtue of their mandate in initiating and overseeing the successful implementation of ITG projects initiated within the Eastern Cape Province. According to the Business executive, *"the development of ITG policies and frameworks is not a responsibility of IT alone, because they rely on a strategy from Case 3 and National Treasury"* the executive further explains that *"it is because the maturity stages have been prescribed overall by National Treasury"* (Case 401: pg. 06, 226-229).

External factors such as the vendors are recruited for the deployment of policies. This is done through various means, such as initiated interest from the vendors. According to the IT executive, *"Some of the users get exposed to new ideas by presentations made by the vendors"* (Case 701: pg. 03, 91-92). However, the department also recruits the vendors by sourcing their services; as explained by the IT Manager, *"all the policies are developed internally or outsourced to vendors"* (Case 901: pg. 05, 186). The interest of vendors is cemented in the business, and profit goals are to be gained by providing the requested IT policies.

5.5.2.3 Moment of Translation: Enrolment

The Enrolment stage is the third stage of the moment of translations, a stage where participants are established because not all actors that show interest in the activities of IT challenges ultimately take part in finding solutions at the department. For example, the politicians from Cabinet who initiated the IT challenges did not participate in attempts to find solutions to the deployment and implementation of the IT challenges.

The actors that enrolled did so based on various interests. Their ambitions influenced some; others participated in the activities based on the Department's interest. The enrolment of actors was subjected to different considerations such as their roles and duties in the department, which were meant to guarantee the successful implementation and deployment of IS/IT solutions. The actors successfully enrolled are assigned different roles to implement and deploy IT solutions.

All the actors from the Government were aware of their roles, and these roles were defined under their official duties in the department. The Government's national IS/IT policy directives Government are deployed through OTP is the leading department, as described by the Director ICT *"We rely on Case 3 to give us directives for the IT national projects related to our Department"* (Case 701, pg. 06: 227-230). In addition, the IT Manager also reiterated the role of Case 3 as a regulator of the Departments *"We need to stick to the standards defined by OPM"* (Case 401, pg. 03: 130).

Within the department, the IT division is the custodian of the IT projects, and they undertake the responsibility of implementers of the IT projects. According to the IT Manager, *"The IT division is not involved in selecting the policies to be developed; IT is only involved in the implementation of the policies"* (Case 901, pg. 03: 118-119). Different personnel in the divisions, such as the Head of IT, Analyst Programmer, and Systems Administrator, were involved in implementing systems. All these roles are defined in the department, and their involvement in implementing the project is accepted according to their official roles and responsibilities. This personnel is thus enrolled because of their job roles in the department and the Government's directives.

The participation of individuals in finding solutions to ITG challenges occurs at different stages during the tenure of the project. This approach was, on its own, a challenge to the successful implementation of the IT solutions. As explained by a System Administrator, *"Technical representatives such as Analyst Programmers and System Administrators are not included at the beginning of the project, and they are only included later when they are faced with technical challenges"* (Case 901, pg. 01: 77-79). This is also emphasised by the IT manager that *"IT is not involved in the selection of policies, but only in the implementation and support of the system"* (Case 901, pg. 01: 77-79).

Services that vendors and suppliers provided were due to a lack of such internal resources as a skills-set. The participation of vendors in the activities of IS/IT was based on the assumption that they could fill the gap or challenges identified in the department. According

to an ICT director, *"Policy development is outsourced to vendors because management does not trust that we have the skills to develop our policies"* (Case 501, pg. 01: 34-35). The vendors participated by invitation, and their involvement was motivated purely by financial rewards.

Many of the IT projects were established through policy directives; some were driven internally from the business units. As explained by the IT manager, *"we have different business units with different needs, and they are the ones who decide on the policy needs"* (Case 101, pg. 03: 90-91).

Even though roles are clearly defined through official duties, certain personnel in the department lacked the commitment towards achieving the objectives of the business. Airing his frustration is the IT Management, who stated: *"business people are key in implementing systems and they are not committed. They will choose to go on leave during the critical phase of the project implementation"* (Case 401, pg. 05: 202-205). The IT manager further reiterates that *"business units need to be committed to developing and implementing the system; otherwise they will rely on IT to fulfil non-IT activities such as business processes"* (Case 401, pg. 04: 153-156). However, for the successful deployment of the policies, activities such as user acceptance tests and awareness should be completed by the business users, which has affected the successful implementation of policies.

5.5.2.4 Moments of Translation: Mobilisation

The mobilisation stage is the last stage of the moments of translation. At this stage, a different person, officially or unofficially, speaks on behalf of the group involved in a project or trying to provide IS/IT solution to the department. The Business Director is identified as the spokesperson, who speaks on behalf of the business division, the IT division, and the department at large.

OTP influences the selection and implementation of IS/IT projects through national policy, which is contrary to the choice of technology of the department. The Business Director explained that *"IT projects are prescribed by Case 3, sometimes against the Department's wishes because of different choices of technology"* Case 501, pg. 07: 276-277). The business director alludes to the need for autonomy for IS/IT selection. Departments in addition, the policies and standards imposed by the department can also be restrictive to the specific operations of the Department. According to the Director ICT, *"Each department should be allowed to have the independence to implement what is required for their institution is IT, because needs differ"* (Case 501, pg. 07: 276-277).

The Director ICT also speaks on behalf of the needs of the IT division and referring to the technical directive from OTP; the Director posits that *“our IT has the capability of advising and implementing technologies, and they have the in-house capacity”* (Case101, pg. 06: 252-253). The Director’s expressions were more in line with the challenges faced with selecting and implementing ITG in the Department.

5.6 Document analysis findings

The documents were analysed and reviewed in line with the 12 processes from Cobit 5. The processes were selected because they are critical dimensions in the DPSA framework requirements for the Government Departments and below is a summary of findings for Groups A and B from the Transversal Internal Audit Services report.

Table 5.1: CGICTPF Implementation Report based on the ICT Internal Audit Findings

DPSA Framework requirement derived from COBIT5	Document review findings
EDM01: Governance framework setting and maintenance	Inadequate IT governance controls
APO01: Manage the ICT management framework	Non-submission of information; IT policies have not been reviewed / are draft; Non-Compliance with the policy guidelines for the South African Government Websites
APO02: Manage strategy	Inadequate ICT Strategic Plan
APO03: Manage enterprise architecture	Inadequate ICT Strategic Plan
APO05: Manage portfolio	Lack of change management process and procedure; Lack of alignment to system development life cycle and project management methodology; There is no system acquisition policy and development policy has not been approved.
APO10: Manage Suppliers	Lack of IT contract performance management;
APO12: Manage Risk	No IT Risk Register and management thereof
APO13: Manage security	Inadequately designed and implemented ICT Security management controls; Inadequately designed and implemented user access controls – AD; Password configurations have not been aligned with the documented guidelines.

BAI01: Manage programmes and projects: Manage security	Lack of user and administration review; Insecure configurations on external facing systems; Insecure configuration on internal facing systems.
DSS01: Manage operations	Inadequately implemented user account management processes; Inadequate access controls and environmental controls within the server room; No formal hardware maintenance plan; No evidence for monitoring of helpdesk logs; No software upgrade and maintenance plan..
DSS04: Manage continuity	Inadequately designed and implemented IT Service Continuity Controls; No monitoring of network availability, system and network downtime and capacity management
MEA01: Monitor, evaluate and assess performance and conformance	Lack of IT staff capacity; Lack of succession plan and staff training.

1. An analysis of Table 5.1 confirms that:
 - 1.1. All prioritised COBIT 5 Process areas are not being managed in the Eastern Cape.
 - 1.2. Portfolio and Project Management, Operation Management, Security Management and Continuity Management are areas of the greatest weakness.
 - 1.3. Governance and Planning for ICT continue to of poor quality.
2. A key concern is that Departments do not have adequate internal ICT skills and ICT capacity to fulfil their ICT control obligations.
3. This is as a result of poorly formulated ICT organisational structures and inadequate budget allocation.
4. The network environment currently available in the province further hampers the implementation of best practice ICT solutions for critical control areas e.g. Operations, Security, Business Continuity Management and Disaster Recovery.
5. The following root causes were identified during the ICT internal audits:
 - 5.1. Lack of ICT Capacity and Skills
 - 5.2. Limited ICT Budgets and Resources
 - 5.3. Poor ICT Infrastructure,
 - 5.4. Lack of Network Vulnerability Scanning Tools,
 - 5.5. ICT Governance and Management Challenges
 - 5.6. Corporate Governance Failure

Furthermore, the pervasive nature of ICT has resulted in several centres of power of ICT in Departments e.g. DoH FIS, DoH CIO, DoH Hospital Management Systems, and DoH Health Information Systems with disparate structures, budgets and resources.

To ascertain the document review findings, questionnaires were also distributed to IT Staff as part of an assessment of the maturity levels using COBIT 5 maturity assessment tool. Based on the outcome of the assessments as well as through discussions with relevant stakeholders within the ICT executives the following results were obtained

5.7 Questionnaire findings

This section presents findings from data that was gathered through the use of a questionnaire. Sixty copies of the questionnaire were distributed across the targeted Departments. However, 22 of the target respondents completed the questionnaire giving a response rate of approximately 37%. In a quantitative tradition, this return rate is too low to make informed conclusions.

5.7.1 IT governance awareness

Respondents were asked to indicate if they had received IT governance training or awareness programs. Most of the respondents (68%) indicated that they had received some form of IT governance training as shown in Figure 5.5 which is 13 out of the 19 respondents.



Figure 5.5: Percentage of staff that recieved IT governance training and awareness

5.7.2 The frequency of IT governance awareness

Figure 5.6 illustrates that most respondents indicated that they always or often attend IT governance awareness training events. However, a significant number of those indicated that they have never attended an IT governance awareness or training session. This could be explained by the fact that this training or awareness is limited to certain people, such as senior managers or executive positions. This implies that there is a need to improve membership or attendance of the awareness and training on ICT governance.

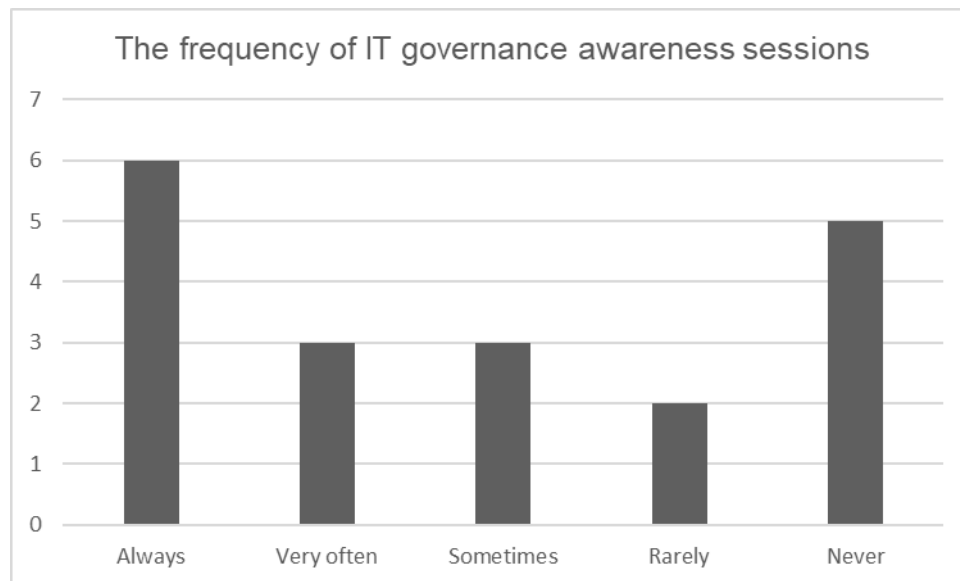


Figure 5.6: Frequency of conducting IT governance training and awareness sessions

5.7.3 Drivers of ICT infrastructure expenditure

Respondents were asked to select factors that they felt were mainly driving the ICT infrastructure expenditure within their Departments. Respondents were expected to indicate if they felt that ICT infrastructure expenditure resulted from a need to cut costs, or it was becoming a factor of business strategy, or the business strategy was already driving it. Study findings show that most respondents (40%) indicated that ICT infrastructure expenditure was becoming more of a factor of the business strategy. In comparison, another significant percentage (30%) of respondents believed that ICT infrastructure expenditure was already being determined or driven by the business strategy. Hence, it could be stated that 70% of the respondents believe that the expenditure on ICT infrastructure in their Departments is linked to the business strategy, as shown in Figure 5.7. However, is a significant number of respondents (30%) felt that the expenditure on their ICT infrastructure was more to do with a

desire to reduce costs. This result implies that there is still a need for a section of top management to learn and appreciate ICT as an enabler in achieving strategic goals.

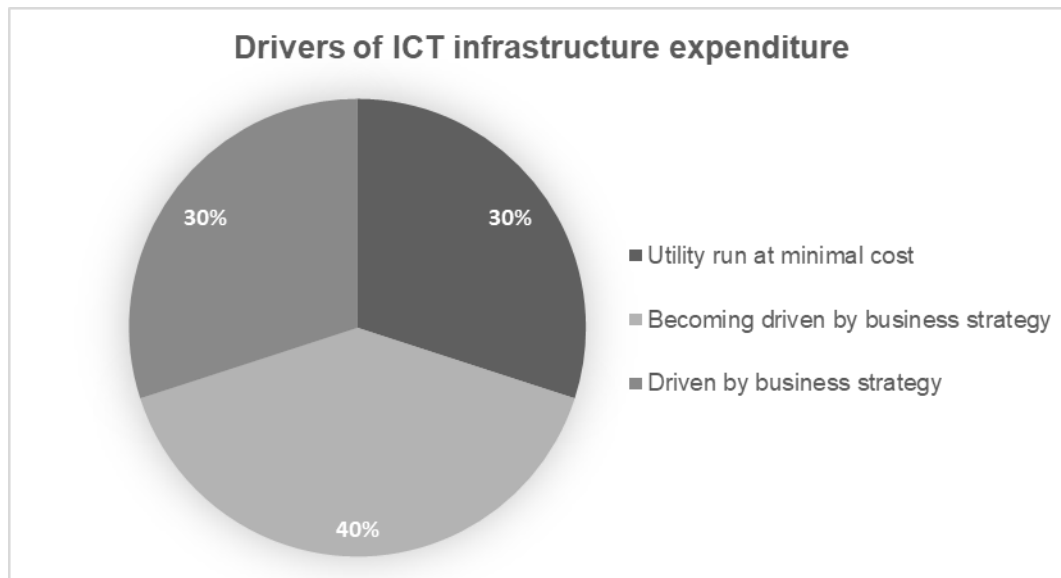


Figure 5.7: Drivers of ICT infrastructure

5.7.4 The availability of an ICT strategy in Government Departments

Figure 5.8 illustrates that the majority (16 of the respondents agreed that an ICT strategy or a document is equivalent to an ICT strategy within their departments. Only two were unaware that there is an ICT strategy in their Government Departments. These findings suggest that a fair number of employees are aware of ICT strategies within their department.

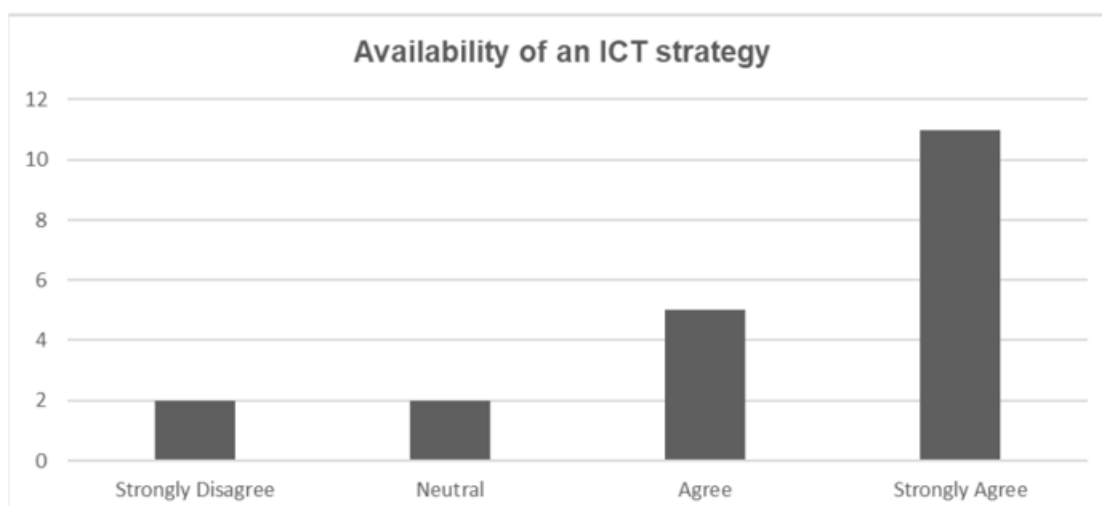


Figure 5.8: The availability of an ICT strategy in the ECGDs

5.7.5 The implemented measures for ICT process monitoring

Respondents were also invited to indicate if their departments had implemented measures for monitoring ICT process. As shown in Figure 5.9 ten (10) of the respondents agree that there are measures in place to monitor ICT processes. This implies that there is need to raise awareness on methods that are in place to measure ICT Governance performance processes. Figure 5.9 show these findings.

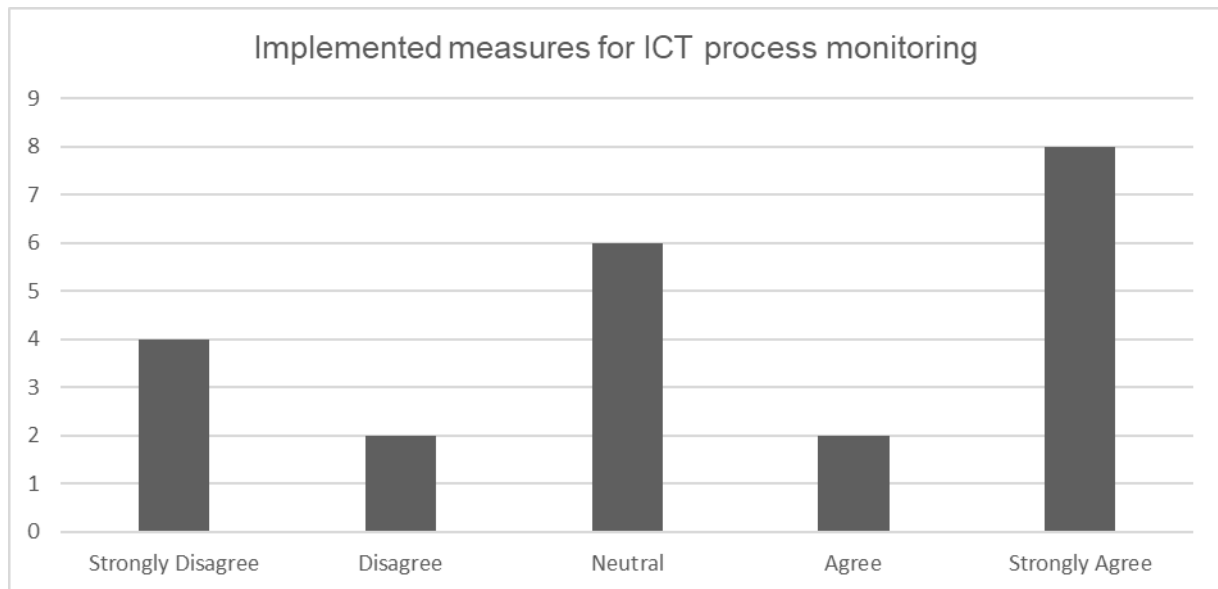


Figure 5.9: Implementation of measures for ICT process monitoring.

5.8 Findings on ECGD process maturity

Data was gathered to evaluate the maturity of business processes at the ECGDs considered in this study. COBIT is one of the tools recommended to the public sector organisations by DPSA. Hence, data was gathered to evaluate the business process in the selected ECGDs according to processes in COBIT 5. As a result, the focus was on evaluating the maturity of business processes that align to Plan and Organise, Acquire and Implement, Deliver and Support, and Monitor and evaluate. The maturity model in COBIT 5 was used. Accordingly, findings on these processes are reported within these four categories in COBIT 5. Furthermore, this section presents consolidated findings from all the Departments considered in this study. Given that most public sector organisations struggle to implement

IT governance, this study simplified the maturity level evaluation by focusing on a scale of 0 to 5 according to the maturity model. The scales are summarised below.

Table 5.2: Maturity Assessment Levels

Level	Status	Description
0	Non-existent	Process is not applied at all.
1	Initial/ <i>ad hoc</i>	Process is ad hoc and disorganized.
2	Repeatable but intuitive	Process follows regular patterns.
3	Defined process	Process is documented and communicated.
4	Managed and measurable	Process is monitored and measured.
5	Optimized	Process follows best practices and automated

5.8.1 Findings on Plan and Organise (PO) business processes

Table 5.3: Maturity level of PO business processes

Process	Process description	Maturity Level Group A	Maturity Level Group B	Expected Maturity Level
PO1	Define a strategic IT Plan	3	1	5
PO2	Define the information architecture	0	0	5
PO3	Determine technological direction	1	0	5
PO4	Define the IT processes, organisation and relationship	3	0	5
PO5	Manage the IT investment	1	0	5
PO6	Communicate management aims and direction	2	0	5
PO7	Manage IT Human resources	2	1	5
PO8	Manage quality	2	0	5
PO9	Assess and manage IT risks	3	2	5
PO10	Manage projects	1	0	5

Data was gathered to evaluate the maturity of PO business processes in the researched ECGDs. According to COBIT 5, PO has ten processes, as shown in Table 5.3. Study findings suggest that only two (PO7 and PO9) have reached at least level three of the maturity model (the defined stage). Processes at level three are those that have been documented for reference purposes. Nonetheless, findings from the other processes show that they are not yet defined and remain ad hoc in nature. These non-existent or ad hoc or undefined business processes constitute a more significant proportion within this category. As such, ECGD still has a long way to go to develop its business processes.

Furthermore, none of the Departments have an Information Architecture, and as a result, the technical direction and management of IT investments need to be designed and implemented.

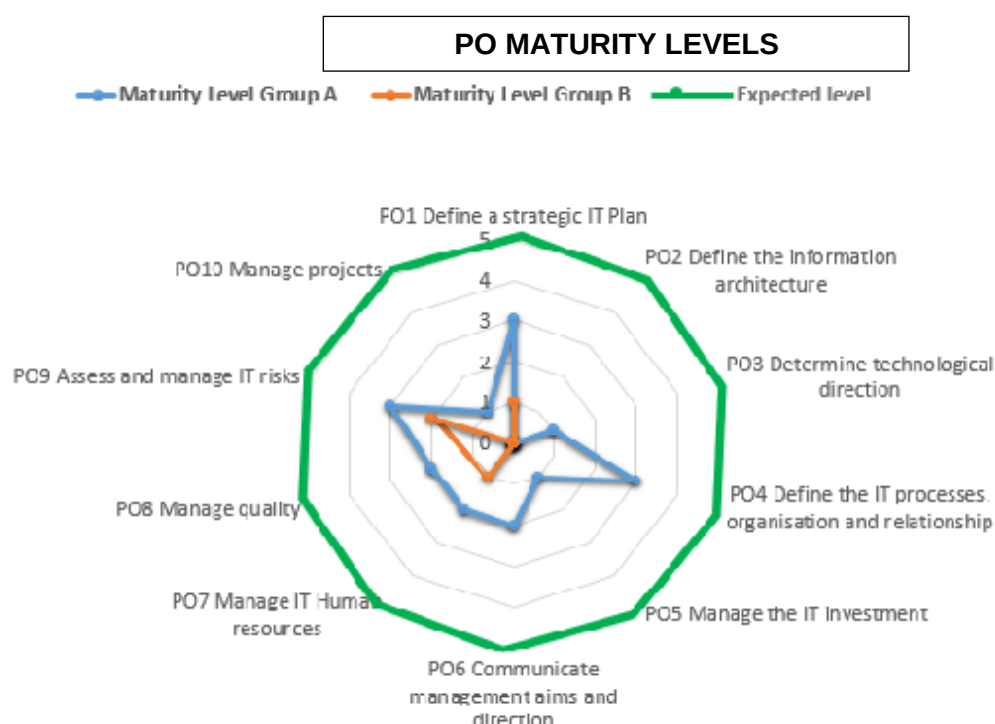


Figure 5.10: Graph of PO business process maturity levels

5.8.2 Findings on Acquire and Implement (AI) business processes

Table 5.4: Maturity level of AI business processes

Process	Process description	Maturity Level Group A	Maturity Level Group B	Expected Maturity Level
AI1	Identify automated solutions	2	0	5
AI2	Acquire and maintain application software	2	1	5
AI3	Acquire and maintain technology infrastructure	2	2	5
AI4	Enable operation and use	1	0	5

AI5	Procure IT resources	2	1	5
AI6	Manage changes	1	1	5
AI7	Install and accredit solutions and changes	0	0	5

Data was gathered to assess the maturity of processes that fall under the AI. COBIT 5 shows that AI has seven business processes an organisation can adopt to improve IT governance.

The departments were grouped into two depending on their size and adopted organogram. As shown in Table 5.4 two business processes in Group A (AI4 and AI6) had a maturity rating of 1 indicating that the processes are ad hoc and disorganised. Still on group A, four processes (AI1, AI2, AI3 and AI5) had a rating of two meaning the processes follow a regular pattern. Lastly on group A one processes (AI7) had the rating of zero meaning these processes have not been implemented within the departments that are in group A.

On the other hand, for Group B three processes (AI1, AI4 and AI7) had the maturity rating of zero meaning these processes have not been implemented within the departments that are in group B. Furthermore, three processes (AI2, AI5 and AI6) had maturity level of 1 which means that these processes are adhoc and disorganised. In group B AI3 had the highest maturity level of 2 which means the process for ICT asset management follows a regular patter. Concluding based on these maturity levels for AI business processes, the departments in Group A and B should focus and improve more on all the processes because their maturity level are way below 5 which is the expected level.

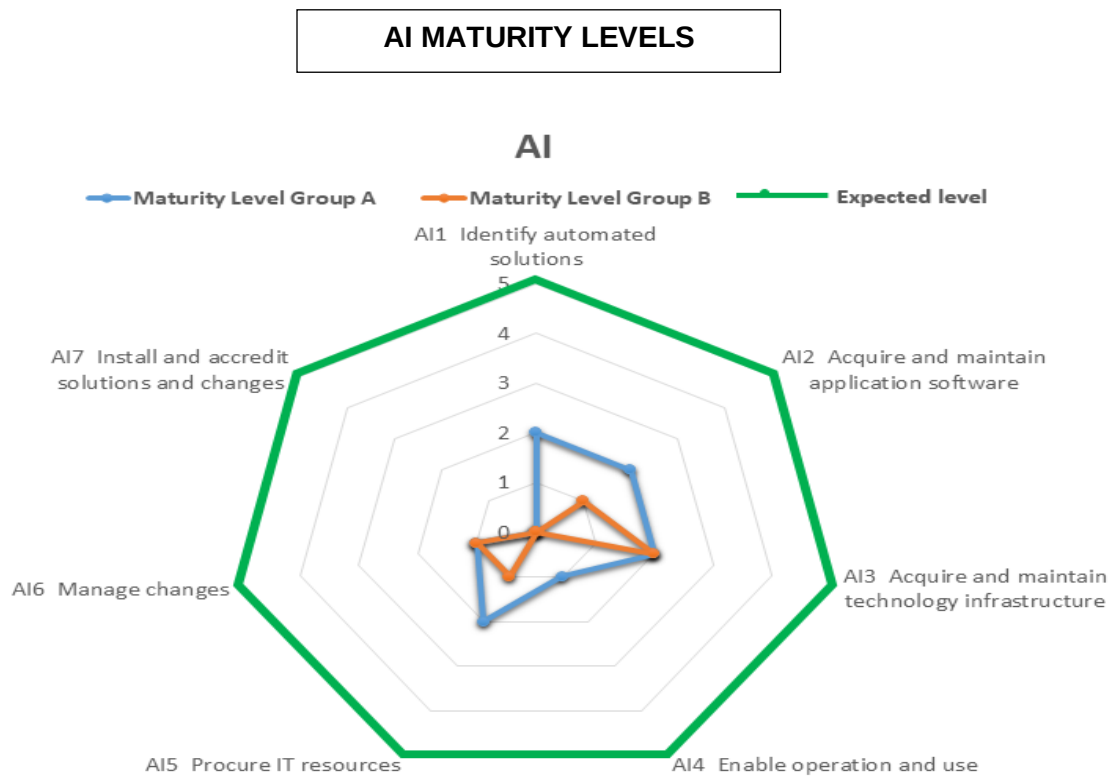


Figure 5.11: Graph of AI business process maturity levels

5.8.3 Findings on Deliver Service Support (DSS) business processes

Table 5.5: Maturity level of DSS business processes

Process	Description	Maturity Level Group A	Maturity Level Group B	Expected Maturity Level
DSS1	Define and manage service levels	3	1	5
DSS2	Manage third-party services	3	2	5
DSS3	Manage performance and capacity	2	0	5
DSS4	Ensure continuous service	3	1	5
DSS5	Ensure systems security	1	0	5
DSS6	Identify and allocate costs	3	1	5
DSS7	Educate and train users	2	1	5

DSS8	Manage service desk and incidents	4	2	5
DSS9	Manage the configuration	3	0	5
DSS10	Manage problems	3	1	5
DSS11	Manage data	3	0	5
DSS12	Manage the physical environment	4	3	5
DSS13	Manage operations	3	2	5

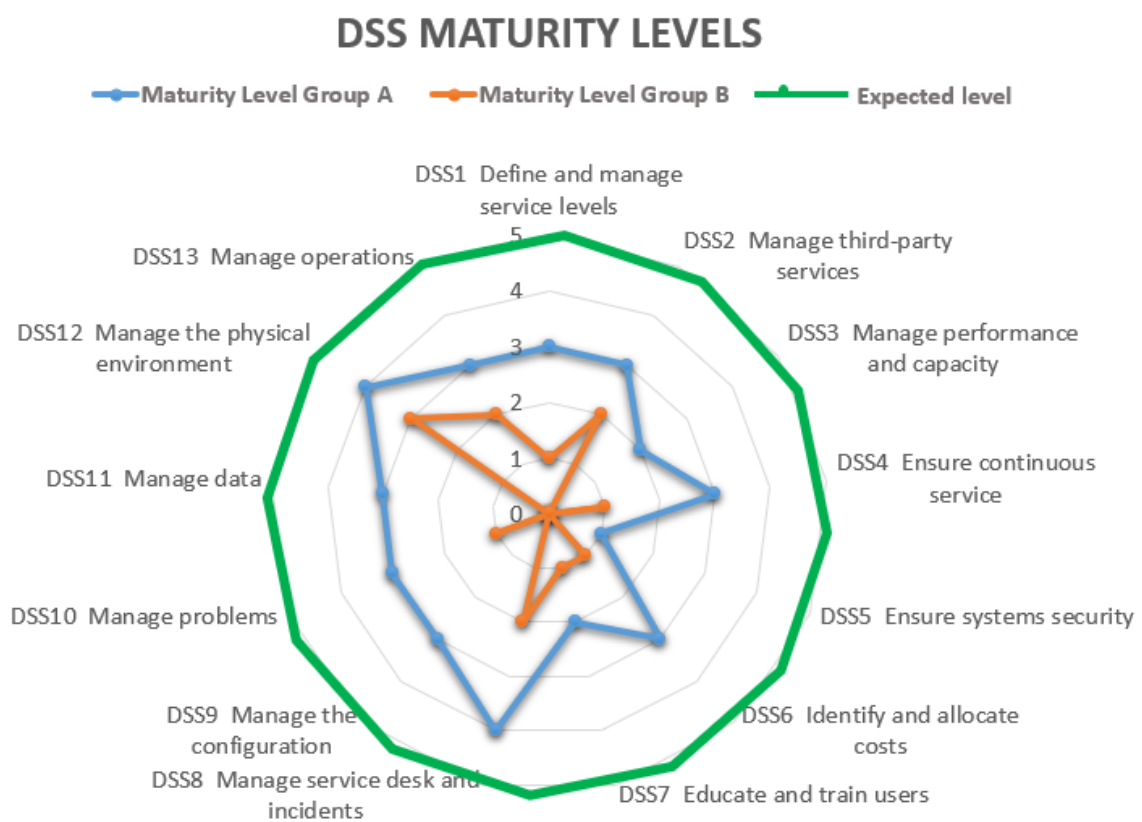


Figure 5.12: Graph of DSS business process maturity levels

Data was gathered to assess the maturity of processes that fall under DSS. Exactly 13 processes were evaluated. As shown in Table 5.5 one business process in Group A (DSS5) had a rating of 1 indicating that the processes are ad hoc and disorganised and the Group A indicating that it had attained at least the defined stage of maturity. Still on group A, two processes (DSS2 and DSS7) had a rating of two meaning the processes follow a regular pattern. Furthermore, eight processes (DSS1, DSS2,DSS4,DSS6,DSS9,DSS10,DSS11 and

DSS13) had the rating of 3 meaning the processes are documented and communicated. Lastly two processes (DSS8 and DSS12) had a maturity rating of 4 meaning the processes are monitored and mature. On the other hand, for Group B four processes (DSS3, DSS5,DSS9 and DSS12) had the maturity rating of zero meaning these processes have not been implemented within the departments that are in group B. Furthermore, five processes (DSS1, DSS4,DSS6,DSS7and DSS10) had maturity level of 1 which means that these processes are adhoc and disorganised. Lastly in group B DSS12 had the highest maturity level of 3 which means the process is documented and communicated for the management of the physical environment. Overallly the departments in Group A should focus and improve more on processes that have maturity levels below 2 while group B departments should focus on maturing in all processes.

5.8.4 Findings on Monitor, Evaluate and Assess (MEA) business processes

Table 5.6: Maturity level of MEA business processes

Process	Process description	Maturity Level Group A	Maturity Level Group B	Expected Maturity Level
MEAA1	Monitor and evaluate IT performance	1	0	5
MEA2	Monitor and evaluate internal control	1	0	5
MEA3	Ensure regulatory compliance	1	1	5
MEA4	Provide IT Governance	2	1	5

Data was gathered to assess the maturity of processes that fall under MEA. Exactly 4 processes were evaluated. As shown in Table 5.5 only one business process (MEA4) was given a rating of at least 2 in Group A indicating that it had attained at least the defined stage of maturity. The remaining 3 (MEA1, MEA2 and MEA3) processes for Group A were found to be either ad hoc or undocumented or non-existent as they had the maturity rating of one. While in Group B, 2 processes (MEA1&MEA2) had a maturity level of 0 meaning these two processes are not implemented or fails to achieve its process purpose and processes MEA3 and MEA4 have a maturity level of 1 meaning they are achieving their intended process.

Therefore, considering these results departments in groups A and B Both needs to mature to at least level 3 before they can aim for the expected level.

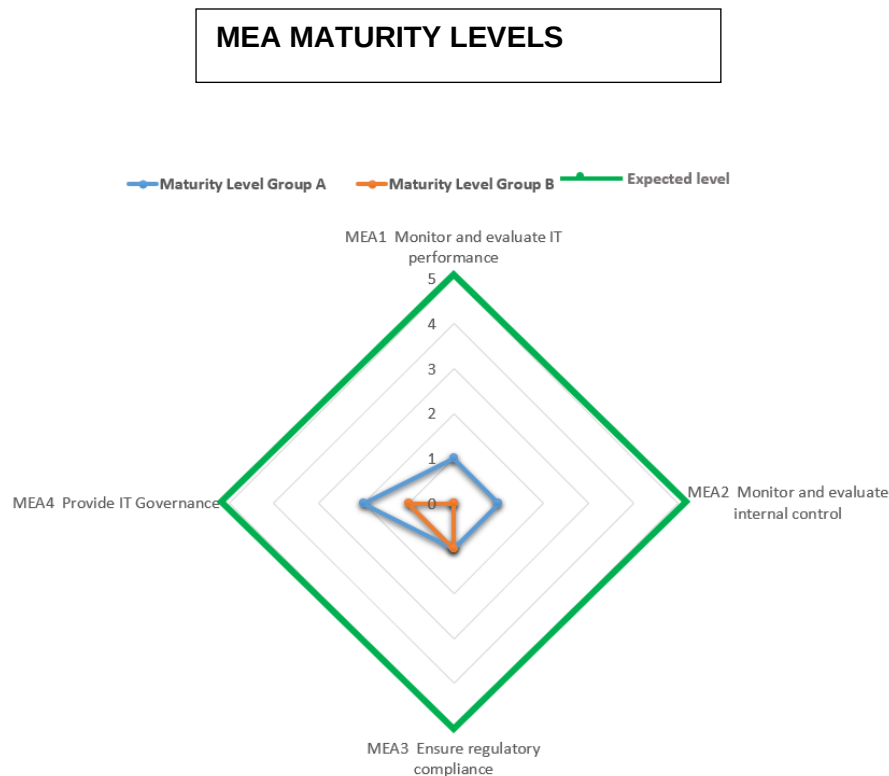


Figure 5.13: Graph of MEA business process maturity levels

5.9 Summary of Findings

Findings show that the ECGDs need still needs to mature in the COBIT 5 Processes and knowledge should be provided on how to move from one level to the next until they mature to the expected level of 5. In addition, ECGDs findings show that have ICT -related policies and ICT strategies; however, implementation challenges affect ITG plans. There is evidence that the current guiding National governance framework (DPSA) is outdated and does not accommodate the new changes in other governance frameworks. The study provides the maturity levels for the engaged Departments and produces a guiding ITG maturity assessment framework. The primary outcome of the research should assist Eastern Cape

Government Departments in assessing their ITG process maturity levels and knowing how to move from a lower maturity level to a higher level.

5.10 Conclusion

The overall result reveals that ITG processes are not fully implemented and documented referring to the performed standard process, in which it allows the organization to achieve positive outcomes. Despite that, the departments are obliged to enhance the processes, due to the current maturity level is quite distant from the desired level, i.e., level 5 (optimised). The significant gap exists the four processes for the two groups. This illustrates the importance of the personnel's' knowledge upgrade in handling IT governance issues by engaging in training, apprenticeship, and certification and raising awareness. On top of that, it needs full commitment from all academicians to ensure the information availability and ease of access within each department. By that, it is essential for the Department to implement well-prepared planning and to execute the planning consistently to comply with organizational strategy and goals.

CHAPTER 6: INTERPRETATION OF FINDINGS

6.1 Introduction

This chapter interprets the findings from the data analysis, which is presented in Chapter 5. As shown in the analysis, there were two cases and the findings from both groups were combined in this chapter. The findings are interpreted through an interpretive approach, wherein the aim was to assess the process maturity of ITG within the two groups. The interpretation guides the study towards gaining an in-depth understanding of how to design a framework that assesses the ITG process maturity and could ultimately assist the Departments in moving from one maturity level to the next.

The remainder of this chapter is structured into three segments: the first discusses and presents the findings and interpretations from the data analysis; segment two presents the framework for assessing the process maturity, while the third segment concludes the chapter.

6.2 ECGDs IT governance mechanisms

Study findings in Chapter 5 that were presented using the ANT identified different IT governance mechanisms of ECGDs. This is in line with the literature that suggests mechanisms for IT governance include structures, processes and relational mechanisms. This section makes an analysis of the mechanisms that characterise ECGDs IT governance.

6.2.1 ECGDs IT governance structures

The study findings suggest that the IT governance structures in the ECGDs are constituted of the IT Directors, Corporate Service Directors, and the end-users. In some cases, IT managers are also part of the IT governance structures in the ECGDs. Furthermore, there are instances where the Departments have an ICT steering committee consisted of directors from different business units. This committee advises on ICT matters. While most of the structures were expected, the IT steering committee is more prevalent across all industries than simply the IT strategy committee (Bianchi *et al.*, 2017). In addition, there are suggestions that the members making up the structures have defined roles and responsibilities. For example, the IT Director states that *“ITG projects are established behind*

a business need driven by the business Departments,” thereby suggesting that the business directors were responsible for identifying areas of interest in ITG.

The IT units in each department will oversee the implementation of ITG as required by the business unit. The implementation of ITG at each department is done with coordination to Case 3, a Ministerial department responsible for IT governance. These offices ensure that IT governance aligns with the national strategic and political version as envisaged by the DPSA. However, the biggest challenge is that, at the provincial level, one department may not ultimately have the same IT governance structures as the other department(s). It is down to each department's ability to motivate for the allocation of resources to develop all the necessary structures. Such motivations are presented to the Finance department. One of the ICT Directors stated that *“So, we are under pressure where the Accounting officer is biased towards certain governance issues and neglecting other areas.”* This can be a considerable challenge, especially where there are no adequate skills within a department. The skills were cited as one key challenge area as the Director ICT stated that *“we don't have the skills and structure.”* Hence, DPSA may need to recommend the minimum, and maximum IT Government structures per department to be uniform and have enough resources to foster IT governance.

6.2.2 ECGDs IT governance processes

Chapter 5 identified different processes that the ECGDs adopted. Core to the adopted processes is the COBIT tool used to guide IT governance in the public sector. COBIT is a popular tool in IT governance in the public sector (Tonelli *et al.*, 2017). Other processes in use include SLA, ICT Policies, ICT Charter, and ICT governance frameworks. However, some processes that were found widespread in public sectors of other countries like the BSC and ITIL were not common in the ECGDs. It appears the ECGDs are still at the periphery of implementation IT governance; hence, there is a limited degree of flexibility in terms of the adopted process. There is more focus on doing enough for compliance with the DPSA.

6.2.3 ECGDs IT governance relational mechanisms

The relational mechanism is one of the critical elements that could lead to successful IT governance (Tonelli *et al.*, 2017). The ECGDs investigated in this study reflected a synergy from DPSA through political and strategic guidance moving to the OTP and then Case 3, a department responsible for overseeing IT governance in ECGDs. From then, business and

IT units within each department work together as IT aligns to the business strategy observed that effective implementation of relational mechanisms would positively reflect on IT governance processes and structures while at the same time improving IT and organizational performance. As such, defining relational mechanisms is seen as a critical starting point to come up with IT governance mechanisms (Bianchi *et al.*, 2017).

However, the ECGDs appear to be experiencing some challenges in setting up their IT governance mechanisms. For instance, there are communication challenges between IT and business units as stated by one interviewee: *“there is a miscommunication between the IT division and the business units at the ministries.”* This is made worse by the existence of *“a communication gap between the Government Departments in the province as a result, they work in silos.”* While there are periodic ICT forums through the OTP, only IT staff attend such forums. This is a huge concern given that, other institutions such as success in IT governance is partly attributed to sharing information within and across public institutions (Bianchi *et al.*, 2017).

6.3 ECGDs IT governance enablers

COBIT 5 identified six IT governance enablers, making it possible for IT governance to be a success. This section presents ECGDs IT governance enablers and analyse them according to those in COBIT 5.

6.3.1 Principles, policies and frameworks

As noted through document analysis, audit reports suggest that ECGDs do not have updated policies or still have a draft version of the policy. Policies, procedures, and frameworks are critical as they guide employees' daily activities (Scalabrin Bianchi *et al.*, 2021). The mere lack of these documents suggests that it would be challenging to put IT governance into practice.

6.3.2 Processes

The Departments in this study all had a different line of business; as such, they have different processes for their operations. However, Chapter 5 identified consolidated processes that have reached a maturity level of 3 and above. The maturity of these processes was arrived at after considering the ratings given by participants. On the other hand, the DPSA identified 12 key processes prioritizing when implementing IT governance. None of the ECGDs processes that have reached a maturity level of at least 3 are among

the prioritised processes by DPSA. Similarly, none of the prioritised processes by the ECGDs appear to be among the top practiced processes by other public sectors in the literature. For instance, the public sector of Queensland in Australia prioritised 12 processes, namely DSS05, EDM03, APO13, DSS04, EDM02, APO12, BAI06, APO02, DSS01, EDM01, DSS03, and DSS02 (Garsoux, 2013). A plausible reason for this could be that the ECGDs may have other prioritised processes for IT governance.

6.3.3 Organisational structures

The ECGDs appear to have defined organisational structures as discussed in Section 6.2. However, the RACI chart can play an instrumental role in clarifying the roles and responsibilities when defining processes that have been identified for IT governance. This will aid in monitoring and evaluation. For every business process set of IT governance, the RACI chart can help define the Responsible, Accountable, Consulted, and who should be informed about the process (De Haes *et al.*, 2017).

6.3.4 Culture, ethics and behaviour

There are suggestions that IT governance within this regard has witnessed progress at a slow pace. For instance, document analysis shows no compliance with the policy guidelines for the South African Government Websites; no IT risk register; inadequately designed and implemented ICT security management controls; inadequately designed and implemented user access controls and password configurations have not been aligned with the documented guidelines. The relational mechanism also indicated that political power may, to some extent, influence the prioritisation of IT projects. Hence, a good understanding of the culture, ethics, and behaviour is essential for the success of IT Governments among ECGDs.

6.3.5 Services, infrastructure, and applications

The infrastructure that supports applications and services is essential to IT governance. However, document analysis verified that the network environment currently available in the EC province further hampers the implementation of best practice ICT solutions for critical control areas. This is mainly due to limited ICT budgets, resources, and poor infrastructure. As a result, for IT governance to succeed in the EC, services, infrastructure, and applications need to be understood, and solutions are provided.

6.3.6 People, skills, and competences

Another area of concern to the governance of the IT in ECGDs is the lack of the necessary skills and competencies. This was confirmed by interviewees and findings from document analysis. For example, the ITG Champion who oversees, plans, and coordinates the implementation of the ITG policies is seen as someone with no adequate skills and competencies to assume such a role. It was stated that *“we select the person to be an ITG Champion from that business unit, but they do not have ICT qualifications. Just because you are a director in that unit does not mean that you are qualified to run the implementation of ITG”*. The Lack of people with the necessary skills was further confirmed in a document that was analysed during data collection. It was noted in the analysed document that the ECGDs lack ICT capacity and skills.

6.4 Interpretation of findings

The data from Group A and B, as presented in Chapter five, established and confirmed factors that consistently influenced activities and processes in the selection, development, and deployment, and implementation of ITG in the ECGDs. These factors are influential to the process maturity of ITG, which encompasses IT plans, solutions, and processes. The combination of the findings from interviews, questionnaires, and document analysis for the two groups can be summarised into six key factors, which are governance, requirements, process, interactive scheme, IT skillsets, and culture. As shown in Figure 6.1, the factors are interrelated based on the ITOMAT model. In order to fully comprehend how the findings were used to enable the assessment of ITG maturity through the six factors, the next paragraphs should be read with the diagram in mind.

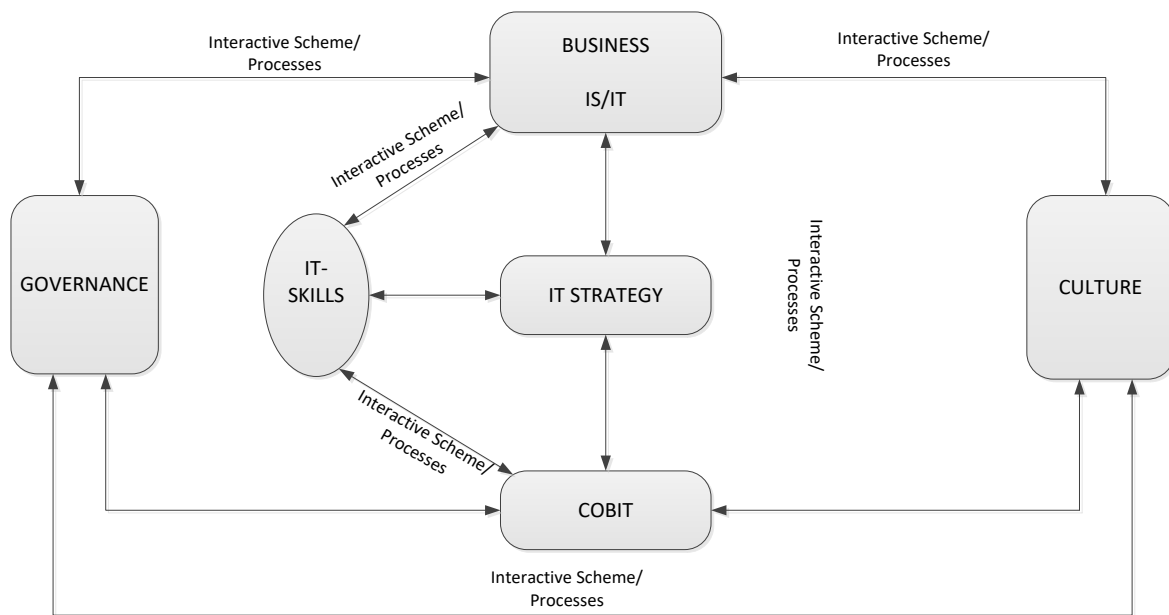


Figure 6.1: Key factors derived from the findings.

The six factors outlined in the framing above were used as key pillars for the development of the framework. For the purpose of this study, these factors were also regarded as enablers for the development of ITG using COBIT. De Haes, Debreceny, and Vam Grembergen (2013) define an enabler as a factor that can influence the fulfilment of governance goals. The enablers are defined and structured methodologically because they are imperative to the success of the IT strategy. Bernard (2012) further postulates that the enablers should be interconnected, meaning that one enabler exerts an impact upon the next enabler. The implementation of COBIT ensures the roadmap of its IT governance and the benefit of mitigating its related risk (Neto *et al.*, 2018).

The findings tentatively established that Departments could operate in different environments with different factors determining their operations and activities, hence the adaption of different governing and management styles that best suit the department. Each department needs to map and adapt to COBIT and DPSA frameworks in accordance with their business needs, organisation structure, and operations. This indicates that the development of the ICT Governance structures and documentation should follow specific processes and factors derived from the department's environment. The following section highlights how each of the factors relates to the development of the framework.

6.4.1 Governance

Governance represents an approach, structure, and activities of the executive management of an organisation, which are entrusted with establishing directives, monitoring performance against set expectations by ensuring that organisational goals are achieved. Governance includes standardisation, principles, and policies. The lack of standardisation and consistency in the processes ITG implementation and indicates a shortfall of governance. Through the overall departmental governance, ITG can be developed, implemented, and supported in enabling the business goals and objectives. This is achieved by, amongst others, formulating the software and hardware standards that guide the selection and deployments of products and IT solutions.

The involvement of both IT and the business units strengthens the implementation of the ITG in an organisation. The framework is intended to empower the business and IT stakeholders to take ownership of IT-related governance and management decisions through which they can facilitate and enable change. Within an environment, each change has its own imperatives. Thus, in enabling change, specific requirements are formulated.

6.4.2 Requirements

Different units within the Departments have different expectations and needs. The needs are guided and constitute specific factors and elements which are interpreted as requirements. From such a viewpoint, requirements are the substance that drives the constant need for improvement and business efficiency. These requirements consist of both technical and business together which drive the development and implementation of the ITG in the department.

The need for fast and improved business operations is the cornerstone for business thriving. The business requirements consist mostly of the need to improve and automate business processes that drive the IT requirements. The fulfilment of business requirements is thus attained through the selection, development, and deployment of ITG artifacts. The IT requirements determine the type of application, hardware, and systems to be deployed, which in turn drive the ITG. Requirements are dynamic because they are influenced by both internal and external factors through governance. The constant monitoring and translation of business requirements are thus imperative. However, requirements are never easy to put together in that it is not fit all situations. The framework shall be employed to collect business and IT requirements towards the development and implementation of an ITG within a

department. Governance cannot be successfully implemented or exist without processes and the maturity thereof.

6.4.3 Interactive scheme

The interactive scheme includes communication and interaction connections between business and IT units in order to enact the ITG in the organisation. Through the scheme, alignments are enabled towards the development and implementation of the ITG for business and IT solutions in the organisation.

The interactive scheme is vital for the selection and deployment of ITG solutions between the business and IT units and thus needs to be applied consistently as a policy. This improves the workflow and communication in the department as it is not only limited to human interactions but also to the approach of non-human elements such as technologies, standards, policies, and SLA to the vendors.

A communication strategy is developed articulating a communication vision to the department. Furthermore, awareness, training, and communication are commitments that are supposed to be driven by the top management in the organisation. People must be skilled in order to make use of the communication tools and enable interactive technology tools in the development and implementation of ITG in their environments.

6.4.4 IT Skills sets

In order to develop, implement and support the ITG within a department, different IT skillsets, such as communication, software development, infrastructure management, and network administration, are required. The IT skills represent the organisation stock of knowledge used by employees to carry out IT activities. The findings showed that skills are the learned capacity to achieve predetermined results, whilst expertise is the ability to perform a specific task, action, or function successfully. IT skills are imperative for the selection, development, and implementation of ITG artefacts towards the provision of both business and IT solutions.

IT changes rapidly and requires employees to be on board with the latest technological trends and skills, thus building the necessary expertise. The skillsets are required for the various roles and responsibilities towards the development, implementation, and support of the ITG maturity. Some of the roles include project management, business managers, partners, recruiters, and technical IT specialists.

COBIT provides guidelines that can be used to map skillsets with roles and responsibilities. This is achieved through the RACI (Responsible, Accountable, Consulted, and Informed) chart of who needs to be consulted or informed about processes and who is accountable or responsible for activities. Furthermore, training is a key aspect in ensuring that the employees have the required skills sets.

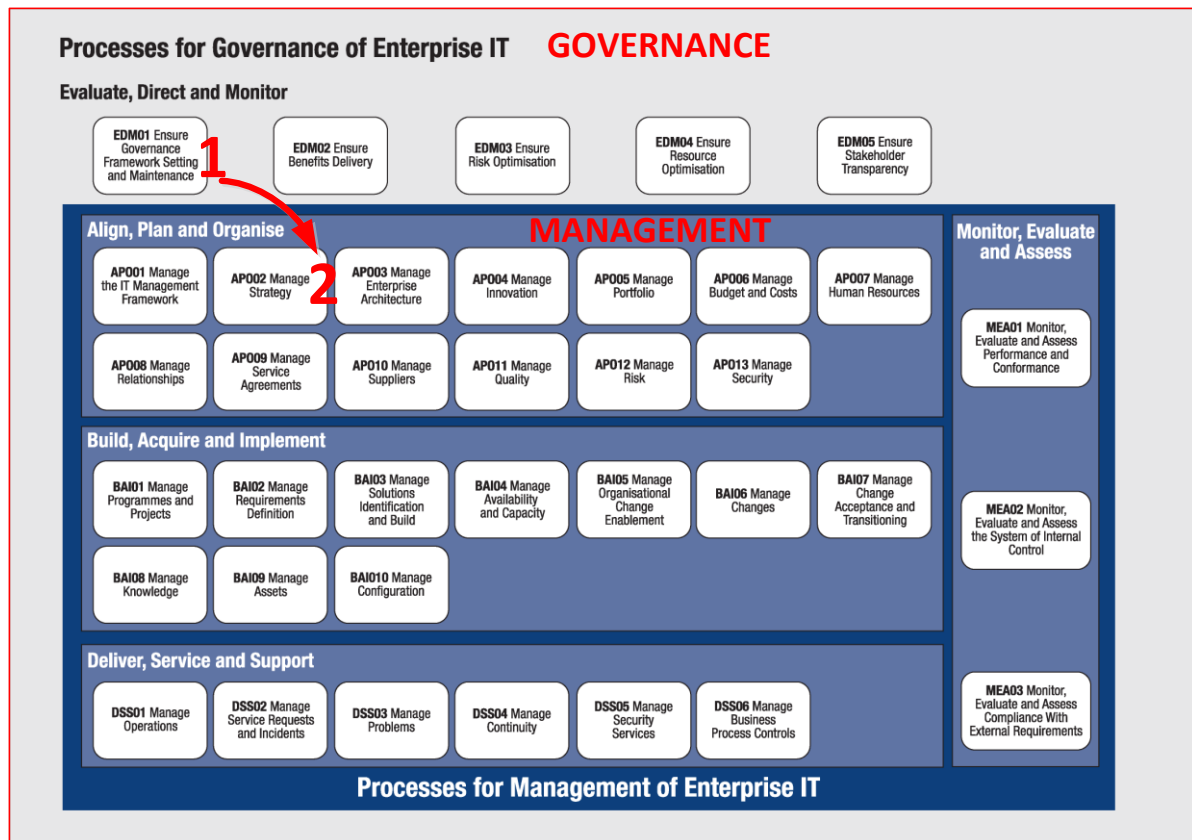
6.4.5 Culture

Culture is broadly viewed as the normative understanding of doing things. The understanding of an organisation's culture is very critical because it has a strong bearing on the outcome of the successful implementation of ITG and the maturity thereof.

The process and method of development and implementation, and maturity of the ITG in the department can become a culture, a way of doing things. Only then can a successful ITG be established. Without the establishment of ITGF, there will continue to be a virtual circle in the development and implementation, and maturity of the ITG in the department. The Departments need a crucial mind shift and culture where business executive needs to take accountability for the success and failure of ITG implementation within the department. The department needs to work on a governance strategy to change the way employees view and change the way they work together. The success of the governance strategy depends on the commitment from top management.

6.5 Interpretation of experiment results

Based on the results that were generated from the Cobit 5 Assessment tool, it was noted that in order to develop a customised ITG framework, two main factors are involved. The first factor is the framework processes, and the second is the maturity which comprises of different defined levels. The framework advocates that executives, decision-makers, and both the business and IT management should control the formulation, implementation, and use of ITG. The framework has distinctive roles and responsibilities for governance and management.



Source: (Garsoux, 2013)

Figure 6.2: COBIT 5 Process Reference Model

The application of COBIT was established through the domain of processes, as indicated in Figure 6.2. The COBIT framework has a total of thirty-seven processes. The governance processes consisted of five processes with the main activities of Evaluation, Directing, and Monitoring (EDM) whilst the management processes are subdivided into four domains with different activities.

In order to use COBIT for the application of an ITG, steps one and two were followed, as highlighted in Figure 6.2. Step one represents the governance activities undertaken by the executives in the department who are responsible for the establishment and management of the COBIT framework as indicated as EDM01. EDM (Evaluate, Direct, and Monitor) are the governance activities practiced by the executives. The executives are thus responsible for the evaluation and monitoring of the establishment of the COBIT 5 framework as well as the development of the ITG.

With the COBIT framework in place, both the business and IT management are guided by the executive personnel on how to implement ITG, which is number two, APO02, as highlighted in figure 6.2. From the domain to the establishment of an IT strategy, activities such as Align, Plan, and Organise (APO) are practiced by management. In this study, the IT strategy is used to cover ITG as a whole. Thus, planning the business and aligning it to IT are carried out by the business and IT management. This process enables the ITG to comply with the COBIT standards, processes, and templates set in order to encourage conformance. The development of ITG has a total of nine processes, as directed by the COBIT processes. The identified governance domain EDM01 and the management domain APO02 from the Reference Process Model are used in the framework to develop the assessment of process maturity ITG, using COBIT.

6.6 Conclusion

This chapter presented the results and provided a robust interpretation of the findings. It is this interpretation that guides the generation and development of the framework components presented in Chapter 7.

CHAPTER 7: ICT GOVERNANCE PROCESS MATURITY ASSESSMENT FRAMEWORK DEVELOPMENT

7.1 Introduction

The previous chapters explicated the current literature, key findings, and related studies conducted in relation to this particular research. The earlier chapters explained the significant views of ICT Governance researchers in providing vital information that helps in formulating a sustainable ICT Governance Process Maturity Assessment Framework (ICTGPMAF). This enabled the researcher to identify and appraise the key requirements of ECGDs ICTGPMAF, which is the focus of this chapter. The exact components and elements of the ICTGPMAF are amplified in the following segments of this chapter.

7.2 ICTGPMAF design process

In order to formulate and design the proposed ICTGPMAF, a series of steps were considered, specifically those derived from some tried and tested theories, strategies, and techniques for ICT Governance frameworks. The main phases that were adapted are outlined by Jabareen (2009). Not all of the phases were considered; only the main ones were adapted and refined as specified hereunder:

- Detailed reading and classification of related data;
- Key concepts naming and identification;
- Integration of the key concepts;
- Classification and categorisation and making sense of the key concepts;
- Validation of the framework

These phases enabled the researcher to consider all the relevant ICT Governance information available. It was important to unpack the different frameworks and policies available on ICT Governance. This information was obtained through the research methods clarified earlier in this study. Both secondary and primary data were necessary to enable the development of the framework. It is worth mentioning that the framework was designed specifically for the needs of the ECGDs. However, the framework could also be adopted by other Departments within South Africa. Furthermore, the framework should assist with the assessment of the ICTG process in the future as the province only has two Departments that have implemented Enterprise Architectures (EAs) fully.

Additionally, ICTG processes are vicariously affected by technological, social, economic, political, and societal dynamics, which makes it difficult to generate a comprehensive framework that applies to the diverse contexts. Such challenges were considered, and the researcher opted to integrate certain aspects rather than attempt an ambitious framework that would be generalisable. Selected phases (listed above) in Jabareen's (2009) proposed eight phases were preferred for this study depending on their suitability. The current ICT governance frameworks and tools such as the ITOMAT, GWEA, COBIT 2019, and the DPSA framework supported by numerous ICT governance strategies within the Eastern Cape were considered. These selected phases also aligned to existing models and helped the researcher in formulating a series of steps that were important in the development of the ICTGPMAF. Table 7.1 shows the phases adopted and adapted from Jabareen's (2009) research as they directly mapped onto the design envisaged in this specific study.

Table 7.1: Jabareen phases matched to ICTGMAPF Design steps

Jabareen (2009) Phases Selected	Research matching Step
Phase 1: Detailed reading and classification of related data	Step 2: Identifying ICTG frameworks and components Step 6: Strategies implementation evaluation and monitoring plan
Phase2: Key concepts naming and identification;	Step 1a: Identify key stakeholders or participants Step 1b: Assess if participants have received training on any ICTG key areas Step 4: Formulate the needed skills essential in implementing ICT Governance process
Phase 3: Integration of the concepts;	Step 3: Assess the level of implementation of ICTG Frameworks within the Province
Phase 4: Classification and categorisation and making sense of the concepts;	Step 5: Draw up assessment criteria Step 6: Strategies implementation evaluation and monitoring plan Step 7: Categorisation of related theories and strategies
Phase 5: Validation of the framework	Step 8: The provision of an explanation of the ICTGPMAF leading to the evaluation process

These steps are further explained in the next section.

Step 1a: Identify key stakeholders or participants

ICTG processes bring together different stakeholders. Within ICTG, business, Government, industry, and citizens all work together. Projects and solutions are shared and suggested by different stakeholders to enable sustainable service delivery. This part clarifies an important component of information sharing within the Departments.

Step 1b: Assess if participants have received training on any ICTG key areas

Step 2: Identifying ICTG frameworks and components

Several researchers have presented different characteristics and features that can help to explain ICTG. Even from the primary data collected both through interviews and online questionnaires, a number of expectations of a smart city were indicated. The following Figure 7.1 shows some characteristics and components.

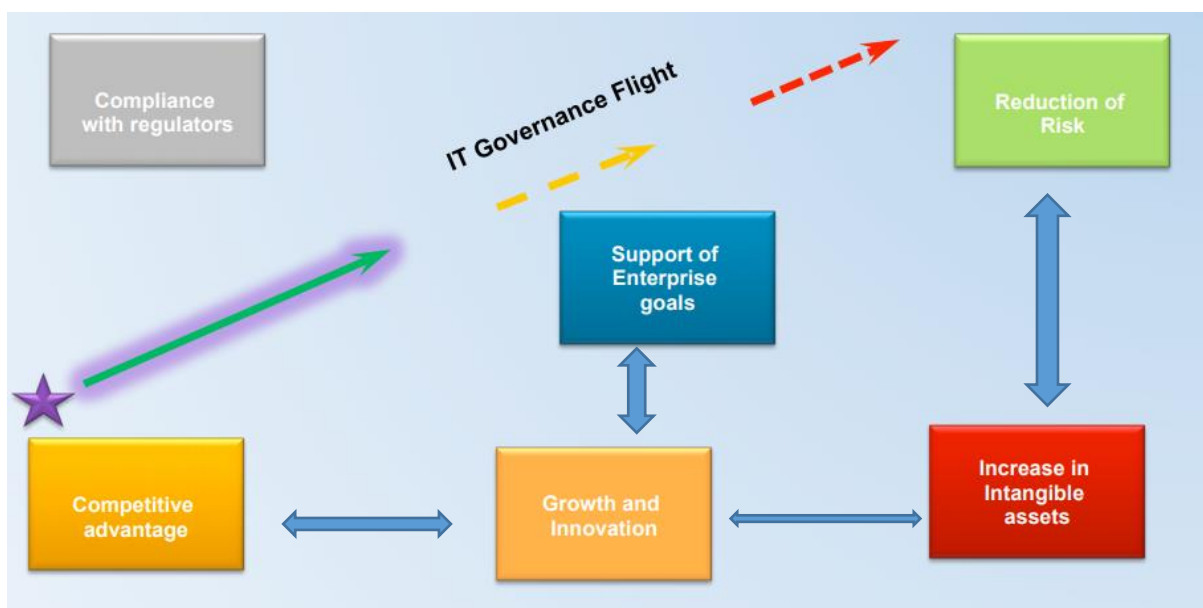


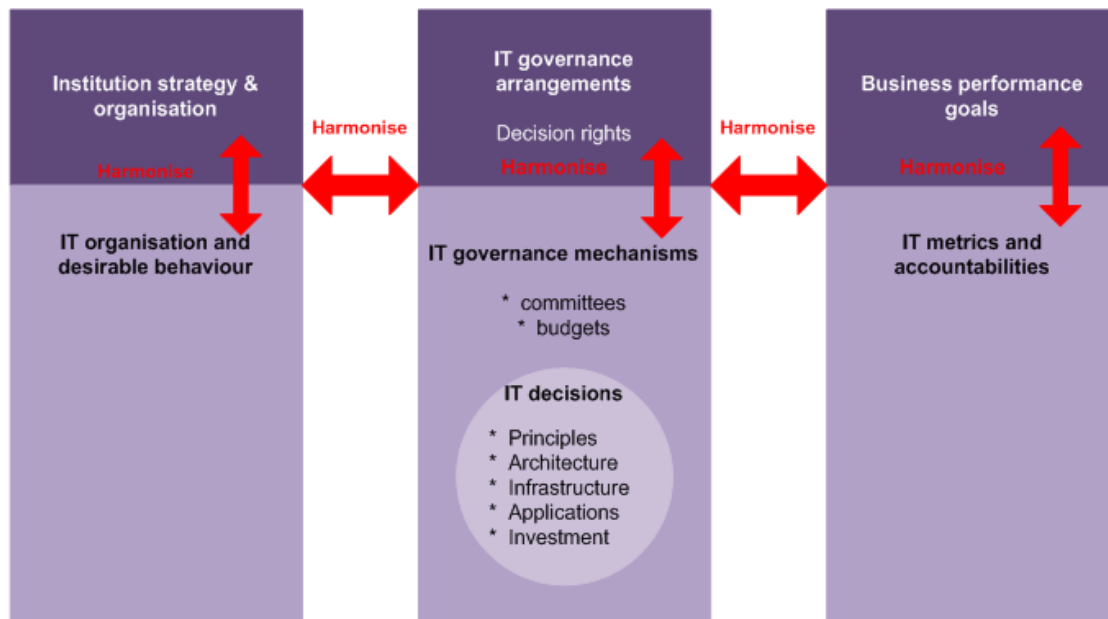
Figure 7.1: Key aspects in ICTG

Step 3: Assess the level of implementation of ICTG Frameworks within the Province

This step allows the researcher to assess the level of implementation of ICTG processes within ECGDs. This is critical to understand and for the Departments to know what to expect. This allows the Departments to contribute and engage with a clear expectation of what should be done as best practice. From the data collected and available information, the following is a summary of the ICTGP implementation benefits:

- Centralised budget management services;
- Improved communication among stakeholders;
- Modern infrastructure;
- Reliable and efficient Government services;
- Improved implementation of ICT Strategy

In summing up the benefits of smart cities, there is a capability framework that characterises our departments.



Source: (adapted from Devos et al 2015)

Figure 7.2: ICT governance framework

Step 4: Formulate the needed skills to implement ICT Governance process

IT governance is the responsibility of the board of directors and executive management. It is an integral part of enterprise governance and consists of the leadership and organizational structures and processes that ensure that the organization's IT sustains and extends the organisation's strategies and objectives. The diagram below shows the key areas that should be focused upon for the successful implementation of the ICTG process.

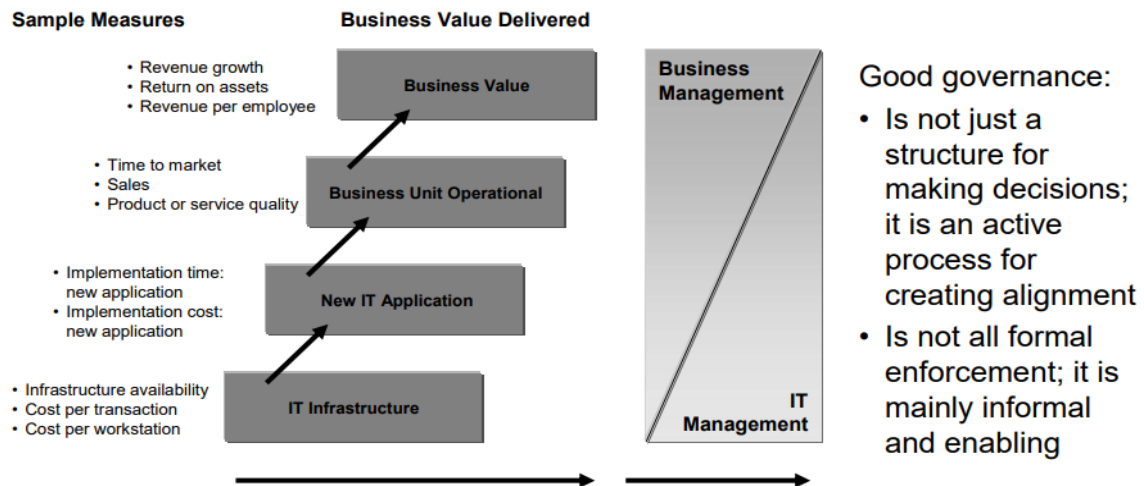
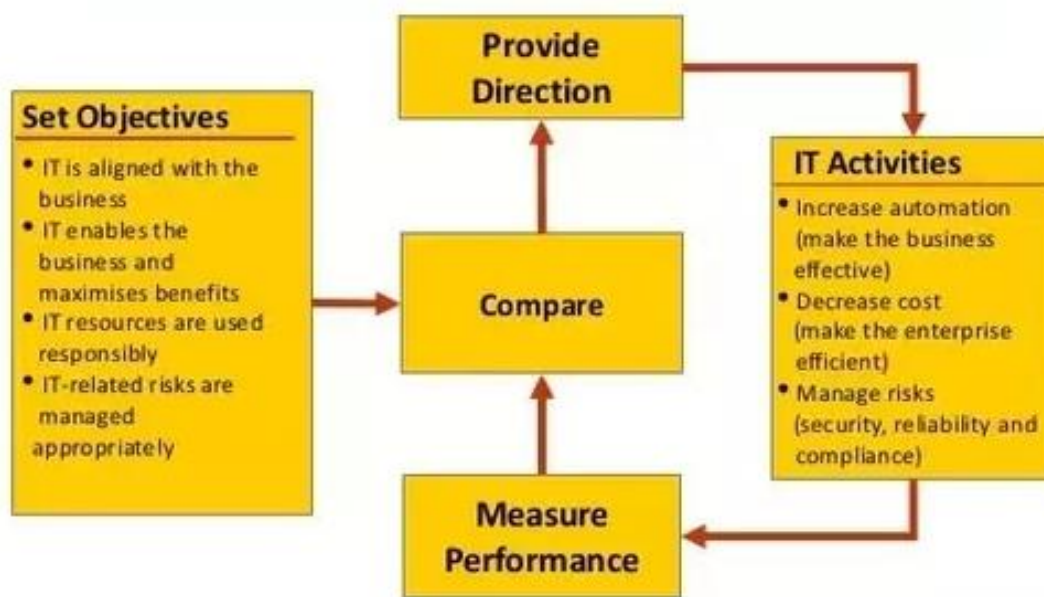


Figure 7.3: Key areas that are in ICTG process implementation

Step 5: Draw up assessment criteria

In unpacking the different ICTG aspects, it is vital to classify the exact components that governance affects. It is also important to note that ICTG is too broad, and in one research, one may not cover fully all the components. This step aims to establish a uniform way of assessing the ICTG process within the ECGDs. These issues have a great impact on how the ICTG and solutions could be improved. Each environment has its own challenges and affordances. Once the challenges are exposed, it is vital to rate them to establish the main areas of focus, as shown below in Figure 7.4.



Source: (Gattia, 2016)

Figure 7.4: Assessment criteria for IT Governance Framework

Step 6: Strategies implementation evaluation and monitoring plan

This step enables the researcher to draw up the main pillars of the ICTG. These are summarised as follows:

- Governance and planning
- Assessment criteria
- Generating economic activities
- Cultural, societal and background

Step 7: Categorisation of related theories and strategies

This step was considered to share what other strategies, theories, and steps come into play in assessing the ICTG process. These involve proper planning, good governance, and establishing of committees. These strategies are almost similar to what was pointed out during data collection. In order to reboot, these are listed as follows:

- i. ICT strategy plan;
- ii. Establishment of ICT Steering Committee;
- iii. Engage stakeholders.

This step was considered to show how ICTG within ECGDs could be implemented and maintained. It is also important to know what has to be done to ensure that the ICT strategy functions as envisaged. From the previous steps, it is clear that there are a number of stakeholders required in the full implementation of ICTG. The researcher carefully considered this step since it is not only the ICTGAPF that could assess the ICTG process within ECGDs. It is evident that ICTGPMAF should require proper planning, strategies of governance, and best approaches on how to implement the framework.

Step 8: The provision of an explanation of the ICTGPMAF leading to the evaluation process

The final step was the explanation of the framework components and outlining the significance of each of the components. These steps sum up why the researcher has considered the indicated ICTGPMAF components. Before the actual development of the ICTGPMAF, there was a need to clarify and explain the relationships between the three terms commonly used in this research, i.e., smart city, security, and Information Infrastructure. The following section explains the beginning of the ICTGPMAF components.

7.3 ICTGPMAF framework components formulation

Having interrogated the eight steps mentioned and the key phases recommended, the researcher also considered the Design Science Research (DSR) for Information Systems. In this case, the design science was applied to satisfy the gaps and inconsistencies clarified in previous chapters. The researcher privileged the Jabareen (2009) conceptual framework phases in the formulation of the ICTGPMAF steps. Essentially, these steps facilitated a robust understanding of the framework processes and what needed to be included. DSR helped to understand the Eastern Cape environment where the study was conducted. There was a need to understand the views of the people, the organisational systems, and the

cultural background and views on governance. Also of significance was the identification of the problems and opportunities that would be generated by the ICTGPMAF.

The DSR assisted in building the knowledge base. The researcher consulted a number of appropriate theories and models to help in understanding and getting the required knowledge. The researcher's own experience in the field and engagement of experts also assisted in considering the DSR. Finally, all these enabled the building of the framework that followed a sequential process. It was important to combine the Jabareen (2009) conceptual framework design and the DSR in the formulation of the framework process and components.

The researcher considered design science as it satisfies the research approach and the process that this research followed. The proposed ICTGPMAF adds value and knowledge as a generic guide to ICT experts in the field of ICTG. The proposed ICTGPMAF is based on the input from data collection, Director, and ICT researchers' ideas. These ideas were generated to solve a particular problem. As mentioned in Chapter 1, the research problem is the lack of a governance process assessment framework that could be used by public sector organisations as they implement ICTG.

As advised by Heiner (2007), the following guidelines for design science research were appropriate for the research.

- **Design as an artefact:** the research must produce a construct, a model, framework, a method, or an instantiation.
- **Problem relevance:** The developed solution has to address the problems at hand and enable business growth.
- **Design evaluation:** Design has to be evaluated by engaging key users and experts using appropriate evaluation methods.
- **Research contributions:** The design must show the contribution that it brings to a specific field.
- **Research rigor:** Design-science research requires a thorough application of related research.

The researcher concedes that the processes of Design Science were necessary to formulate the ICTGPMAF discussed below. The proposed framework components were derived from the current lessons learned from ICTG, the findings from engaged participants, and the researcher's own experience. The researcher works as an ICT Lecturer and a part-time ICT Auditor and has experience with the status of ICTG in the EC public sectors. As such,

thorough and detailed engagements facilitated the development of the proposed framework that envisions a sustainable solution that could be adopted within South Africa, African Governments, or other underdeveloped areas in terms of ICTG.

7.4 ICTG Framework Components

The proposed framework was designed following the outlined phases, guided by the findings as explained in the previous chapter, application of related theories, and the researcher's interpretation of findings. The framework could be termed a 3-in-1 generic framework as it accommodates the views of three research fields. For example, the framework accommodates the views of experts from ICT governance fields, administration and change-innovation design science.

The main components of the framework are crucial steps that one could follow. The researcher understands the significance of keeping to the basics and simplicity, even when the research itself complicates the multidisciplinary of its orientation.

Setting the basics, priorities, stakeholders, and governance engagement mean that for any researcher in the field, there is a need to engage all key stakeholders. It is critical to get input and research on the current state of the ICTG process. Understanding the environment and available information is a valuable asset in designing such a framework and this enabled the researcher to understand the problem at hand and current initiatives available within the EC.

Identifying key participants – once the ICTG process is available, the next step is to engage all key stakeholders to draw up the intended framework. As indicated from the findings and summarised in the framework, the services needed were outlined. These services are also standard in Government Departments according to the literature on ICTG. At this stage, the stakeholders must be aware and alerted of the need to ensure all the intended services are secured. For this research, ICTG maturity and implementation are considered critical aspects. The researcher supports the fact that the maturity of ICTG must be prioritised.

Defining key performance indicators, standards, and monitoring - the next step after the engagement of stakeholders is to outline the KPIs. This defines the supporting policies on managing, maintaining, and measuring success. This is important as it shows areas to improve and changes required. This is one of the missing links in most ICT initiatives and governance -related research. Typically, once services are rolled out, almost everyone celebrates and enjoys them, and no one thinks about maintaining, updating, and monitoring.

From this study, a separate team of experts is proposed for monitoring and updating the ICTG status to maintain a compliant environment.

The framework exposes the different elements that were considered and could be critical in enabling the adoption of ICTGPMAF. The main components that the security should address are outlined in the ICTGPMAF.

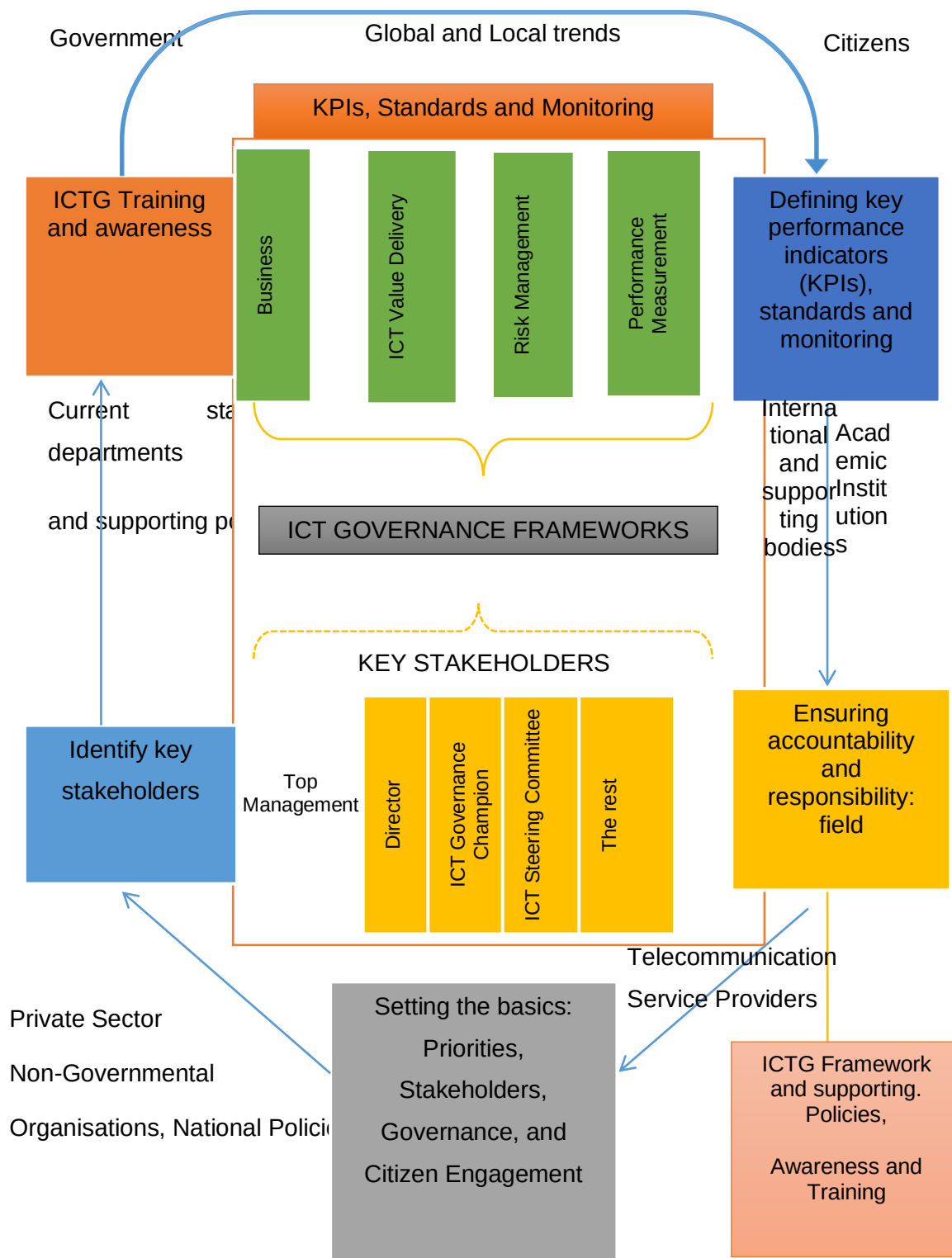


Figure 7.5: Framework ICTG

This framework had to be evaluated to satisfy the theories that were adapted in its development and the design science approach. The researcher understands that this evaluation could take many years and may not be possible during the study, as it may

require this framework to be implemented and monitored. For academic requirements, the evaluation of the framework was done using related literature and other ICTG models. In addition to this, evaluation was also done by engaging experts, especially the critical readers and promoters of this study.

7.5 Evaluation of ICTGPMAF

The evaluation of the framework was based on the available ITG frameworks and the observations on how the ITG process is implemented. The researcher is an ICT Auditor with experience in ITG within the South African context, mainly in the Eastern Cape.

Understandably, proper evaluation of such a framework would require significant time to engage in full implementation. The COBIT 2019 framework, DPSA implementation lesson learned, and the Eastern Cape Provisional ICT plan were considered for this study. The aim was to align the approach to the suggested components of the framework. It was important to note that for successful maturity assessment and effective ICT governance within a government department, the following features must be adequately addressed:

- a) Identifying the key resources
- b) Defining key processes and activities
- c) Key stakeholders' consideration
- d) Training and awareness
- e) Monitoring and evaluation

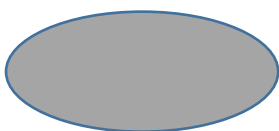
The key features are mentioned in successful ICTG framework implementation and applications. The features must be aligned to other related components and internal and external requirements. The main findings from the evaluation were the need to be more specific and avoid generalisation. The final version of the framework is presented next.

7.5.1 Final version of ICTGPMAF after initial review

The researcher considered the comments from the experts and revised the ICTGPMAF framework.

The explanation of the components is in table 7.2:

Table 7.2: ICTGPMAF Final Framework key

Symbol	Description
	Key aspects that describe the major categories. These should be engaged and involved in all key ICTG assessment exercises.
	This shows the major categories/ steps of the proposed framework. Though the numbering is just for guiding, it is not compulsory to follow the numbering. This contains the critical phases /stages /aspects/components that the framework should contain.
	This shows that the framework should be an integrated platform, enabling one to monitor and track all the ICTG processes.
	In ensuring ICTG assessment, the main components that have to be considered are: ICT Implementation Strategies Monitoring Plan Assessment Criteria

The final framework includes the key steps and the sequence. It then shows the key areas for the ICTGAP required in ECGDs. Then the framework outlines the key areas that should be addressed.

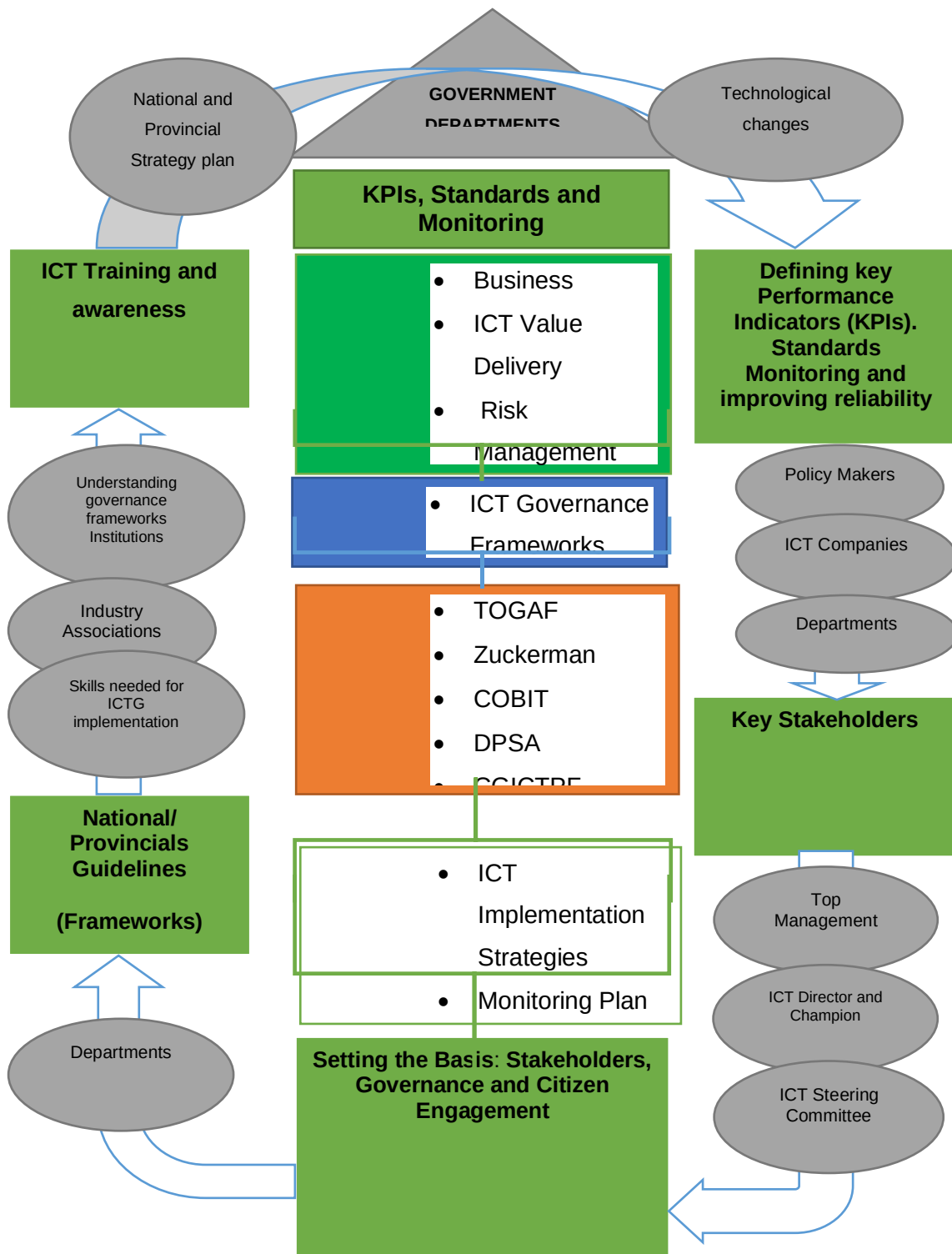


Figure 7.6: ICTGPMF Final Framework

7.5.2 Strengths of the proposed ICTGPMAF

The framework is based on the current information that was available at the time of study. It has the following strengths:

- Derived from experts and participants who understand ICT governance;
- Combines a good mixture of experts from all the key stakeholders;
- Aligned to the primary documents and policies in EC;
- Designed by the researcher who has the required experience and knowledge on the current ICT environment;
- Incorporates knowledge from experts, literature, and current environment;
- Evaluated through comparison to COBIT 5; and
- Design based on thorough evidence and documents available at the time of the study.

7.5.3 Weaknesses of the proposed ICTGPMAF

Despite the framework having been developed with the inputs from current literature and key experts, the framework has the following weaknesses:

- It is purely based on academic theories and processes which may not be the best for final implementation;
- It is based on a single Province that has not yet fully matured in terms of ICTG implementation; most ideas are based on lessons learned or what is known in other areas;
- The framework is based on the researcher's interpretation of data collected;
- Though evaluation was done, this could be considered analysis meta-analysis of the framework, as proper evaluation would require the framework to be fully implemented and practically evaluated. This could take an extended period, which is beyond the scope of this submission.

7.6 Conclusion

This chapter presented the proposed ICTGPMAF for ECGDs. The process and the steps that were formulated are outlined in this chapter. The chapter presents the proposed framework, which was evaluated against other internationally recognized frameworks and it

has demonstrated the critical questions considered in framing the framework. The next chapter is the final for the thesis and proffers conclusions derived from the entire study.

8.1 Introduction

This is the closing chapter of this study, providing significant achievements of the research, together with possible recommendations that other researchers could consider in the future. Though the proposed framework could be criticised and further improved, at this time, it addresses ECGDS needs, and the directors engaged are ready to adopt the framework for the enhancement of the maturity of their ITG implementation through assessment of maturity levels.

8.2 Research Summary

This study showed that the ECGDS are slowly accepting the value of ICT as an enabler; however, much work still needs to be done to increase the return on ICT investments and ensure that top management is involved in ICT activities. Furthermore, the research demonstrated that many training and awareness programmes need to be undertaken within the ECGDS on ICTG. The research proposes a framework that the ECGDS could use to move from one level of maturity to the next.

8.3 Research Achievements

The research has produced an ICTGPMAF for ECGDS. The framework's design was based on current information and engagements from key stakeholders. The research set the following sub-objectives at the onset:

- Assessment of the ICTG level of maturity
- Examination of the current ICTG challenges within ECGDS

This study managed to address the research objectives crafted at the beginning. The researcher formulated and designed the framework considered in the ECGDS. The summary of the research objectives and the specific methods used to achieve the objectives are presented in Table 8.1.

Table 8.1: Research sub-objectives and methods used

Research Objective	Document review	Interviews	Questionnaire	Experiment
<i>To ascertain the Level of ICT usage and value recognition in ECGDs</i>		X	X	X
<i>To identify the ICT Governance Practices in ECGDs</i>	X	X	X	X
<i>To determine the Level of Alignment of ICT to the Administrative Processes in Government Departments</i>	X		X	X
<i>To assess the level of knowledge on ITG within the Departments and the training that is currently offered.</i>	X	X	X	X

Table 8.1 shows the specific methods utilised to achieve the sub-research objectives. The research competently addressed the initial research questions already identified. The researcher considered several techniques such as interviews, questionnaires, and document reviews to address the research questions. As outlined in Chapter 6, the study answered the formulated research questions. Most of these questions were adequately covered either during the questionnaire or the interviews. The main research question was answered by interrogating and analysing current literature and engaging the ECGDs ICT directors. Chapter 2 and chapter 3 provided sufficient details that answered the sub-questions.

8.4 Research reflection

This section provides general comments from the researcher's understanding of how the proposed ICTGPMAF was designed. The research was undertaken in one South African Province that is significantly rural and very poor, with many challenges. These spatial and developmental limitations complicate the implementation of ICT solutions, making it challenging to improve ICTG. The challenges at hand and the passion driving ICTG initiatives in the Eastern Cape Province motivated the researcher to carry out the study. The

scientific and methodological perspectives were considered in writing up the reflection section.

From the **scientific point** of view, the complexity of the issues around ICT governance and COBIT maturity assessment was a daunting task. Additionally, the ICT challenges facing the Eastern Cape Province themselves are also complex. The two terms bring some misunderstanding and reluctance on the part of many Government Departments. As a result, bringing together and engaging key stakeholders on such a subject matter was a vexing undertaking. Therefore, to design and implement a sustainable ICTGPMAF for excellent governance adoption, it is vital that critical stakeholders and ICT service providers participate. This could be achieved through discussions that are not too technical and complicated for the political leaders in the Government Departments. Though the research at hand could become more technical and challenging for the current ICT directors in Departments, it is imperative to be inclusive and engage all stakeholders. One of the joint statements proclaims, "*ICTs can transform service delivery*," and it is essential that ICT governance towards sustainable adoption by Government Departments should be inclusive of every Eastern Cape Department ICT stakeholder pulling in one direction.

The other part of the reflection is the **methodological reflection**. There were several techniques used in this study, including interviews, questionnaires, experiments, and desktop research. Considering current ICT governance frameworks, tools such as the DPSA, GWEA, COBIT, ITOMAT, and other research-related theories such as design science and the ANT were also critical in this study. The research adopted a hybrid approach where both qualitative and quantitative approaches were adapted to accomplish the stated objectives. The researcher applied different related models, considered existing literature, and feedback from the findings to draw conclusions relevant for the ultimate design and development of the research framework. This enabled the researcher to address the complexity and challenges facing the Eastern Cape Province.

The research was undertaken within the bigger ambit of a case study, and it was essential to understand the current Eastern Cape Government Department ICT governance plans and vision and stakeholders. All these actions were directed at specifying current initiatives and the stakes of ICT governance in the province.

8.5 Limitations of the research

Although the study achieved the set objectives, solved the conundrum, and provided many contributions that academics and ICT Departments could use, there are also limitations. It is not easy to identify such limitations from one's study. As pointed out in the reflection section, the following limitations are evident.

The complexity of ICTG within the Eastern Cape Province could not have been fully addressed from the participants' point of view. Most participants were not technically equipped to contribute much to the proposed framework design, despite indicating that it should be kept simple with only a few technical points. Possibly, more experts and researchers from other provinces and nations could have been considered in order to benchmark the proposed framework thoroughly.

Combining the ICTG processes and needs from different Departments within the Province was not easy, so it may take time for an outsider to grapple with the constructs. Though the processes are outlined, one would have to read thoroughly to understand this.

After designing the framework, it was essential to evaluate the ICTGPMAF. However, in this case, evaluation was limited to the information available in the current models and the researcher's interpretation. Complete evaluation of such a framework would require full implementation of the ICTGPMAF, which may take a long time. The evaluation was done to improve the proposed initial framework, which could be perceived as a meta-analysis of the framework.

ICG and COBIT maturity assessment is a practical subject. Without implementing the framework and not having services available to the province based on the solution, this research remains a theoretical guiding document. The proposed framework could not be tested and deployed before complete implementation and approval from the Provincial ICTG team. Of course, this is beyond the scope of the research.

The research on ICTG and frameworks depends on many stakeholders and the availability of keen stakeholders. This means it is not only in the Eastern Cape where the ICTG challenges are prevalent, but all the channels and other stakeholders at the National level and other provinces are involved. This includes other stakeholders outside the province, and

engagements at that level may take a while. This is obviously beyond this research, but it is essential to have as many stakeholders involved early.

Finally, it was impossible to address the problems and formulate the framework using one model or approach. In the end, several eclectic approaches and frameworks were considered. This could be confusing to the others; however, the outlined steps and summary of the critical components, in the end, are clearly outlined. The approaches and other frameworks guided the researcher on components formulation.

The limitations indicated here are necessary as the research could provide sufficient background and clarity for future implementation. These limitations are critical to understand in proposing future work and recommendations.

8.6 Future Research

Like any other research, a single study cannot exhaust everything but paves the way for future studies in the same niche. This is the case for this study. The researcher managed to present the ICTGPMAF. This is well-summarised, and future researchers interested in this research line may consider the framework weaknesses outlined in Chapter 7. The critical considerations relate to the following:

- I. Further discussions on ICTG in the province are recommended. This could imply that different ICTG groups are established within South Africa and other regions. This is important to alert and prepare good practices for sustainable ICTG solutions in the country and Africa.
- II. Development of ICTG awareness programmes must be prioritised. These programmes should be inclusive and engage all stakeholders, including the citizens. This is currently happening but mainly targets only the senior management. It is critical to include everyone/department interested in ICTG.
- III. There is a dire need to conduct a study that could pilot the proposed framework in another environment. It is important to carry out this study in a different environment, for example in a different Province in South Africa with better ICTG practices.
- IV. Comprehensive nationwide research is recommended to understand the views of the Provincial citizens on ICTG. Such a study shall provide an understanding of the community factors that seriously affect the adoption of ICT services. This would measure the acceptance levels and determine how information and ICT Government services could be able to reach and sustain the community.

8.7 Recommendations

The research concludes by making a few recommendations that could be useful for any interested researcher in this field:

- Consider and refer to the weaknesses mentioned in Chapter 7;
- Work and engage all key ICTG stakeholders including citizens;
- Bring in different expertise;
- Establish committees, teams and work groups with different expertise.

The following key recommendations are proposed:

Recommendation 1: *Draw up an ICTG awareness strategy for all departments –* Sustainable ICT solutions must be a concern for every department. The communities should be educated and well informed about good governance.

Recommendation 2: *Developing a well-planned ICT evaluation and monitoring strategy –* All future ICT services rely on good monitoring and evaluation strategies. This is possible if ICT stakeholders in the province formulate strategies to measure the level of success for ICT implementation. The planning process requires the commitment of all key ICT stakeholders. This recommendation is backed by various ICT stakeholders, including the best ICTG best standards.

Recommendation 3: *Align ICT policies and strategies to ICTG and community needs –* Crafting and generating ICT policies that support emerging infrastructural developments is vital in ensuring sustainable services. Again, good ICT policies would enable Government Departments to realise the benefits of ICTG.

Recommendation 4: *Stakeholder engagement and appropriate technical ICTG adoption models –* The need for all ICT stakeholders to work together and develop ICTG that works for specific provinces is critical. The alone-size-fits-all approach does not work in ICTG as different Departments have different needs. As a result, there is a need to consider ICTG and apply the frameworks that work well within specific environments.

Recommendation 5: It is crucial for the department to engage in the clear and well-structured standardization of governance and management to minimize potential gaps in data and information flows needed when formulating policy.

Recommendation 6: Enhancement in ITG is essential within every work unit of the organization in accordance with the characteristics of ITG requirements of each department.

Recommendation 7: The organization is required to implement integration with pre-existing applications to validate data, from which it provides ease for the users to experience service of the accurate and effective information accessing.

Recommendation 8: Upgrade and optimization in ICT service system are vital for the organization to conduct to achieve good governance.

8.8 Concluding remarks

The final chapter amplified how the research objectives were achieved and addressed. The chapter also presented the achievements, overall research conclusion, limitations, future work, and recommendations. The research contribution is revisited, offering cogent reflections and the researcher's opinions on the study. The reflection segment clarified key points based on the scientific and methodological aspects.

Finally, the ICTG within the Eastern Province requires a different approach. The reliance on the DPSA and GWEA frameworks has not fully benefited the Government Departments. The investments and financial resources spent by Government Departments on ICTG cannot be justified as the application and utilisation of many frameworks is relatively low and the benefits hardly tangible.

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APPENDICES

APPENDIX A: INTERVIEW QUESTIONS

INTERVIEW QUESTIONS FOR CIO AND DIRECTORS

Research Topic: Assessment of IT Governance process maturity for Eastern Cape Government Department

My name is Memory Ranga, I am a PhD student, currently researching on the

Assessment of IT Governance Process Maturity in the Eastern Cape Government Departments (ECGDs). I would like to invite you to take part in this research by completing the attached detailed questionnaire.

Purpose of Research:

The purpose of this research is to assess the IT Governance Process Maturity of ECGDs and to develop a framework that will be as a guideline to enable the departments to move from one maturity level to the next.

Instructions:

This interview will take approximately 45-60 minutes to complete depending on the depth of your responses.

Benefits to You:

A key outcome of this research will be assessment results of the IT Governance Process Maturity of ECGDs and an Eastern Cape customized framework that will enable departments to move from one maturity level to the next.

Confidentiality:

The information you provide will remain confidential and will only be used for the purpose of this study.

The Ethical Conduct of this Research:

This research will be reviewed and approved by the human research committee of North West University in accordance with the national statement on ethical conduct in research involving humans. If potential participants have any concerns or complaints about the ethical conduct of the research, please feel free to contact the Research Ethics Support Officer. Any complaint you make will be treated in confidence and investigated, and you will be informed of the outcome.

Consent of Research Participant:

Your consent to participate in this research is implied when you complete the interview session. Please detach this sheet/cover letter and retain it for your later reference. Your cooperation in participating in this research is sincerely appreciated and will greatly enrich the outcome of my research.

SECTION A: GENERAL QUESTIONS

- 1.** Do you consider that IT governance is an effective tool that most Departments do or should have?
- 2.** What relationship do you see between IT governance and corporate Governance?
- 3.** Which IT policies do you have within your department, and are they approved and implemented?
- 4.** Which IT governance framework have you implemented within your department?
- 5.** How would you describe the IT department's organisational culture?
- 6.** Which business benefit have been gained from implementing your IT governance structure?
- 7.** How do you relate with other departments/ units?
- 8.** Does corporate management perceive IT governance as a cost or a value-added process?
- 9.** What challenges to Departments do you see from your experiences in implementing your IT governance structure?

SECTION B: IMPORTANCE OF IT SUPPORT

- 10.** Which IT support services do you offer to the department?
- 11.** To what extent does your IT function inform the enterprise about potential business opportunities enabled by new technologies?

SECTION C: IT PERFORMANCE AND CHALLENGES

- 12.** How have IT investments created value for your department?
- 13.** Are there any barriers that are preventing your enterprise from realizing the full value from IT investments?

SECTION D: IT ACCOUNTABILITY

- 14.** Who is ultimately accountable for IT governance in your enterprise? Who are the key champions of IT governance in your enterprise?
- 15.** Is the CIO part of the executive management?
- 16.** Does his/her opinion carry equal weight compared to the other members of the executive team?
- 17.** To whom does he/she report? If he/she is not part of the executive team, why not?

SECTION E: EFFECTIVENESS OF IT GOVERNANCE

- 18.** How frequently is IT included on your department's board agenda? What is the typical focus of board discussions about IT?

- 19.** Does your department establish and maintain alignment between business and IT strategy?
If so, how?
- 20.** In your department, is IT governance an integrated part of the overall enterprise governance arrangements or an effort distinct from enterprise governance?
- 21.** Which mechanism do you use in assessing the process maturity of its IT Governance framework implementation process?
- Which ICT governance awareness programs have you implemented within your department?

APPENDIX B: QUESTIONNAIRE

Research Topic: Assessment of IT Governance process maturity for Eastern Cape Government Department

My name is Memory Ranga, I am a PhD student, currently researching on the Assessment of IT Governance Process Maturity in the Eastern Cape Government Departments (ECGDs). I would like to invite you to take part in this research by completing the attached detailed questionnaire.

Purpose of Research:

The purpose of this research is to assess the IT Governance Process Maturity of ECGDs and to develop a framework that will be as a guideline to enable the departments to move from one maturity level to the next.

Instructions:

This questionnaire will take approximately 45-60 minutes to complete depending on the depth of your responses. If completed electronically, please email the completed document. If printed and responses then hand written, please scan the completed questionnaire and return by email. Please do not hesitate to contact me directly with any queries you might have.

Benefits to You:

A key outcome of this research will be assessment results of the IT Governance Process Maturity of ECGDs and an Eastern Cape customized framework that will enable departments to move from one maturity level to the next.

Confidentiality:

The information you provide will remain confidential and will only be used for the purpose of this study.

The Ethical Conduct of this Research:

This research will be reviewed and approved by the North West University in accordance with the national statement on ethical conduct in research involving humans. If potential participants have any concerns or complaints about the ethical conduct of the research, please feel free to contact the Research Ethics Support Officer. Any complaint you make will be treated in confidence and investigated, and you will be informed of the outcome.

Consent of Research Participant:

Your consent to participate in this research is implied when you complete and return the questionnaire. Please detach this sheet/cover letter and retain it for your later reference. Your

cooperation in participating in this research is sincerely appreciated and will greatly enrich the outcome of my research.

PART A. GENERAL BUSINESS QUESTIONS

1. Which department are you from? (Tick the appropriate)

Office of the Premier	
Department of Health (DOH)	
Department of Transport (DOT)	
Department of Road and Public Works	
Department of Education	
Department of development and economics	
Department of home affairs	
Department of Rural development	
Department of sport and recreation	
Provincial Treasury	
Department of Cooperative Governance and Traditional Affairs	
Department of safety and liaison	
Department of transport;	

2. Have you received training or awareness programs in relation to IT Governance?

Yes	
No	

4. If yes how often do you attend these governance related training or awareness programs?

Duration of Business	Tick most appropriate
Always	
Very often	
Sometimes	
Rarely	
Never	

PART B : UNDERSTANDING ICT AND GOVERNANCE

Please select the most appropriate level.

1. Understanding of ICT by the business:	Tick the most appropriate box
IT management lacks understanding	
Understanding encouraged amongst ICT staff	
2. Organizational learning	Tick the most appropriate box
Casual conversation and meetings	
Newsletters, reports and group email	
Training and departmental meetings	
Formal methods sponsored by senior management	
Learning monitored for effectiveness	
3. Style and ease of access	Tick the most

	appropriate box
Business to ICT only; formal	
One way, somewhat informal	
Two way informal and flexible	
4. ICT and Business liaison staff	Tick the most appropriate box
None or use only as needed	
Primary ICT and business link	
Facilitate relationship building	

5: Link between ICT and business metrics	Tick the most appropriate box
Value of ICT investments rarely measured	
Business and ICT metrics not linked	
Business and ICT metrics becoming linked	
Balanced scorecard and includes partners	
6: Formally assess ICT investment	Tick the most appropriate box
Don't assess	
Becoming a routine occurrence	
4	
Routinely assess and act on findings	
Routinely assess, act and measure results	
7: Continuous improvement practices	Tick the most appropriate box
Few, effectiveness not measured	

Many, frequently measure effectiveness	
Practices and measures well established	
8: Senior level ICT steering committee	Tick the most appropriate box
Meet informally as needed	
Formal committees meet regularly	
Proven to be effective	
C9: How projects are prioritized	Tick the most appropriate box
React to business or ICT need	
Determined by business function	
10: How ICT infrastructure is perceived	Tick the most appropriate box
Utility run at minimal cost	
Becoming driven by business strategy	
Driven by business strategy	

PART C: COBIT PROCESS MATURITY ASSESSMENT

DEFINE STRATEGIC PLAN: indicate to what extent the following is/are correct about the department by ticking the most appropriate box	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The department has a documented ICT strategy, or equivalent document.	☐	☐	☐	☐	☐

The ICT strategy has been approved by the appropriate ICT governance committee and by the Executive Management	☐	☐	☐	☐	☐
The ICT Steering committee, or equivalent group, is made up of management who represent all departmental stakeholders in ICT.	☐	☐	☐	☐	☐
All institutional investment in ICT is approved through the appropriate ICT governance committee	☐	☐	☐	☐	☐
The institution has measured the value of ICT governance in meeting institutional ICT requirements	☐	☐	☐	☐	☐
Is there awareness amongst management that strategic IT planning is needed to support business goals?	☐	☐	☐	☐	☐
The need for IT strategic planning known by IT management?					
The ICT Steering committee, or equivalent group, oversees the implementation of ICT strategy and receives periodic progress reports on ICT services and projects under its remit.	☐	☐	☐	☐	☐
Post implementation reviews are completed for projects to establish and report on achievement against objectives and success criteria.	☐	☐	☐	☐	☐
The policies in place define when and how to perform strategic IT planning?	☐	☐	☐	☐	☐

ASSESS AND MANAGE IT RISK – Tick the most appropriate box	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

IT risk assessments for IT processes and business decisions occur	☐	☐	☐	☐	☐
The department considers the business impacts associated with security vulnerabilities and development project uncertainties	☐	☐	☐	☐	☐
Risk management has been identified as relevant to acquiring IT solutions and delivering IT services	☐	☐	☐	☐	☐
IT risks are considered in an ad hoc manner	☐	☐	☐	☐	☐
Specific IT -related risks such as security, availability and integrity occasionally considered	☐	☐	☐	☐	☐
IT-related risks that affecting day -to-day operations are discussed at management meetings	☐	☐	☐	☐	☐
Where risks have been considered, mitigation often inconsistent	☐	☐	☐	☐	☐
There is an emerging understanding that IT risks are important and need to be considered	☐	☐	☐	☐	☐
An immature and developing risk assessment approach exist which is being implemented at the discretion of IT management	☐	☐	☐	☐	☐
Processes to mitigate risks starting to be implemented when risks are identified	☐	☐	☐	☐	☐

The organisations-wide risk management policy define when and how to conduct risk assessment	☐	☐	☐	☐	☐
Risk management follow a defined and documented process	☐	☐	☐	☐	☐
Risk management training available to all staff	☐	☐	☐	☐	☐

Manage change– To what extent do you agree with the following statements? Tick the most appropriate box	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
There is a defined change management process to prevent changes being made without any control	☐	☐	☐	☐	☐
There is awareness that change can be disruptive for IT and business operations, and therefore good change management will provide many benefits	☐	☐	☐	☐	☐
It is recognized that changes should be managed and controlled	☐	☐	☐	☐	☐

There is a documentation of change, and the configuration documentation complete and reliable, albeit the quality is largely dependent on the people involved	☐	☐	☐	☐	☐
The accuracy of configuration documentation is improving as a result of the defined process albeit that extent of planning and impact assessment prior to a change is still limited	☐	☐	☐	☐	☐
There is a defined formal change management process in place, including categorization, prioritization, emergency procedures, change authorization and release management, and compliance is growing	☐	☐	☐	☐	☐
The analysis of the impact of IT changes on business operations formalised and done to support the planned rollout of new applications and technologies	☐	☐	☐	☐	☐
ENSURE SYSTEM SECURITY Tick the most appropriate box	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The organisations recognize the need for IT security	☐	☐	☐	☐	☐
The responsibilities and accountabilities assigned for ensuring security	☐	☐	☐	☐	☐

The measures to support the management of IT security implemented	☐	☐	☐	☐	☐
There is a recognizable system security administration process	☐	☐	☐	☐	☐
The organisations recognizes the need for IT security but the level of awareness of this need for information security depends primarily on the individuals concerned	☐	☐	☐	☐	☐
The responsibilities and accountabilities for IT security assigned to an IT security coordinator, although the management authority of this coordinator is limited	☐	☐	☐	☐	☐
Services from third parties address the specific security needs of the organisations	☐	☐	☐	☐	☐
The IT security reporting complete, informative and pertinent	☐	☐	☐	☐	☐
Security training available but mostly undertaken at the initiative of the individual	☐	☐	☐	☐	☐

Security awareness exist, and is it promoted by management	☐	☐	☐	☐	☐
Security awareness exist, and is it promoted by					

management	☐	☐	☐	☐	☐
IT security procedures are defined and aligned with the IT security policy	☐	☐	☐	☐	☐
MANAGE DATA Tick the most appropriate box	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Awareness of the need for accurate data management exist throughout the organisations	☐	☐	☐	☐	☐
Monitoring within IT performed on key data management activities (backup, restoration, disposal)	☐	☐	☐	☐	☐
Responsibilities for data management assigned to key IT staff	☐	☐	☐	☐	☐
Data management procedures formalised within IT and are tools for backup/restoration and disposal of equipment being used	☐	☐	☐	☐	☐
Training for staff with data management responsibilities is available	☐	☐	☐	☐	☐
MONITOR AND EVALUATE PEFORMANCE Tick the most appropriate box	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The organisations has implemented a process to monitor the performance of IT processes	☐	☐	☐	☐	☐
Management recognize the need to collect and assess information about monitoring processes	☐	☐	☐	☐	☐

Tool specifications for monitoring IT processes and service levels have been defined	☐	☐	☐	☐	☐
IT -specific performance measurements, non-financial measurements, strategic measurements, customer satisfaction measurements and service levels defined	☐	☐	☐	☐	☐

End of questionnaire Thank you for your participation

APPENDIX C: EASTERN CAPE PROVINCIAL ETHICAL CLEARANCE



Province of the
EASTERN CAPE
OFFICE OF THE PREMIER

PROVINCIAL ICT

Office of the Premier Building | Independence Avenue | Bhisho | Eastern Cape
Private Bag X0047 | Bhisho | 5605 | REPUBLIC OF SOUTH AFRICA | Website: www.ecprov.gov.za
Tel: +27 (0)40 609 3020 | Fax: +27 (0)86 295 3820 | email: ayanda.madyibi@otp.ecprov.gov.za

TO : DIRECTOR-GENERAL

FROM : PROVINCIAL CHIEF INFORMATION OFFICER

SUBJECT: REQUEST FOR DATA COLLECTION FOR PhD STUDIES

Purpose

To request the approval of the Director-General for a collection of data regarding an IT Governance Process Maturity study by a student studying towards a PhD Degree.

Background

Miss Memory Ranga (ID No. 8409201672180) is currently studying towards a PhD IT degree with the North West University Vaal Campus. Her topic is an ***Assessment of IT Governance Process Maturity for Eastern Cape Government Departments***

As part of her studies, she's looking at the IT Governance Process Maturity and plans to develop a customized model that will enable the Eastern Cape Government Departments to move from one maturity level to the next. Hence, she is kindly requesting for permission to collect data in 13 Provincial Government departments within the Eastern Cape through the Government Information Technology Officer's Council (GITO).

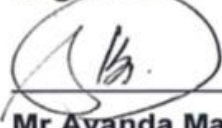


REQUEST FOR DATA COLLECTION FOR PhD STUDIES

The results from the study will remain confidential information and the full research document will be made available to your office

I, therefore, seek your approval for her to conduct this research for the benefit the Provincial Departments

Regards

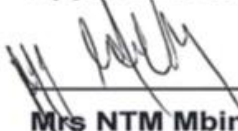


Mr Ayanda Madyibi
Provincial Chief Information Officer

25 / 08 / 2017

Date

Approved / ~~Not Approved~~



Mrs NTM Mbina-Mthembu
Deputy Director-General: IDOS

29/08/2017

Date



16 August 2017

To: Mrs. NTM Mbina-Mthembu

RE: REQUEST TO CONDUCT DATA COLLECTION FOR MY PhD IT STUDIES AT THE EASTERN CAPE GOVERNMENT DEPARTMENTS

My name is Miss Memory Ranga (ID No. 8409201672180) I am currently studying towards my Ph.D. IT with the North West University Vaal Campus. My topic is **Assessment of IT Governance Process Maturity for Eastern Cape Government Departments**.

As part of my studies I am looking at the IT Governance Process Maturity and I plan to develop a customized model that will enable the Eastern Cape Government Departments to move from one maturity level to the next. Hence, I am kindly requesting for permission to collect data in 13 Government departments within the Eastern Cape. Below is the list of the departments I plan to include as part of my study:

Office of the Premier
Department of Health
Department of Transport
Department of Road and Public Works
Department of Education
Department of Economic Development, Environmental Affairs and Tourism
Department of Human Settlements
Department of Rural development
Department of sport and recreation
Provincial Treasury
Department of Cooperative Governance and Traditional Affairs
Department of Safety and Liaison

The results from the study will remain confidential information and the full research document will be made available to your office.

I am kindly asking for the approval from your office.



Miss Memory Ranga

PhD IT Student


Approved

Mrs. NTM Mbina-Mthembu

Director General

29/08/2017

APPENDIX D: NORTHWEST UNIVERSITY ETHICAL CLEARANCE

ETHICS APPROVAL LETTER OF STUDY

Based on approval by the **Faculty of Natural and Agricultural Sciences Ethics Committee (FNAS-REC)**, the Faculty of Natural and Agricultural Sciences Ethics Committee hereby **approves** your study as indicated below. This implies that the North-West University Senate Committee for Research Ethics (NWU-SCRE) grants its permission that, provided the special conditions specified below are met and pending any other authorisation that may be necessary, the study may be initiated, using the ethics number below.

Study title: Assessment of IT Governance process maturity in Eastern Cape Government Departments																																								
Study Leader/Supervisor: Prof P Pretorius																																								
Student: MM Ranga																																								
Ethics number:	<table border="1"> <tr> <td>N</td><td>W</td><td>U</td><td>-</td><td>0</td><td>1</td><td>2</td><td>9</td><td>3</td><td>-</td><td>2</td><td>1</td><td>-</td><td>A</td><td>9</td><td></td><td></td><td></td><td></td> </tr> <tr> <td colspan="4">Institution</td> <td colspan="8">Study Number</td> <td colspan="4">Year</td> <td colspan="2">Status</td> </tr> </table>			N	W	U	-	0	1	2	9	3	-	2	1	-	A	9					Institution				Study Number								Year				Status	
N	W	U	-	0	1	2	9	3	-	2	1	-	A	9																										
Institution				Study Number								Year				Status																								
Status: S = Submission; R = Re-Submission; P = Provisional Authorisation; A = Authorisation																																								
Application type: Single	Risk Category:	Minimal																																						
Commencement date: 28/08/2021																																								
Expiry date: 31/01/2023																																								
Approval of the study is initially provided for a year, after which continuation of the study is dependent on receipt and review of the annual (or as otherwise stipulated) monitoring report and the concomitant issuing of a letter of continuation.																																								

Special in process conditions of the research for approval (if applicable):

The following documentation are archived by FNASREC and should be complete and kept up to date:

Research proposal

Signed approval from the scientific committee indicating the proposed risk category

All researchers involved in the study should submit signed NWU code of conduct statements annually.

All researchers of low risk studies should submit proof of relevant ethics training every two years.

All researchers that take part in activities that pose a safety and security threat to the researchers or the environment should submit a risk assessment form annually.

All research involving human interaction should follow best ethical practise and keep documents as proof. This includes informed consent, questionnaires, incorporation of risk-benefit, and responsible data management.

Any research at governmental or private institutions, permission must still be obtained from relevant authorities and provided to the FNASREC. Ethics approval is required BEFORE approval can be obtained from these authorities.

Special conditions:

This study was previously approved and will now be monitored by FNASREC.

General conditions:

While this ethics approval is subject to all declarations, undertakings and agreements incorporated and signed in the application form, the following general terms and conditions will apply:

The study leader/supervisor (principle investigator)/researcher must report in the prescribed format to the FNASREC:

annually (or as otherwise requested) on the monitoring of the study, whereby a letter of continuation will be provided, and upon completion of the study; and without any delay in case of any adverse event or incident (or any matter that interrupts sound ethical principles) during the course of the study.

The approval applies strictly to the proposal as stipulated in the application form. Should any amendments to the proposal be deemed necessary during the course of the study, the study leader/researcher must apply for approval of these amendments at the FNASREC, prior to implementation. Should there be any deviations from the study proposal without the necessary approval of such amendments, the ethics approval is immediately and automatically forfeited.

Annually a number of studies may be randomly selected for an external audit.

The date of approval indicates the first date that the study may be started.

In the interest of ethical responsibility, the NWU-SCRE and FNASREC reserves the right to:

request access to any information or data at any time during the course or after completion of the study;
to ask further questions, seek additional information, require further modification or monitor the conduct of your research or the informed consent process;
withdraw or postpone approval if:

any unethical principles or practices of the study are revealed or suspected;
it becomes apparent that any relevant information was withheld from the FNASREC or that information has been false or misrepresented;
submission of the annual (or otherwise stipulated) monitoring report, the required amendments, or reporting of adverse events or incidents was not done in a timely manner and accurately; and / or
new institutional rules, national legislation or international conventions deem it.

FNAS-REC can be contacted for further information or any report templates via
Roelof.Burger@nwu.ac.za 018 299 4269

The FNASREC would like to remain at your service as scientist and researcher, and wishes you well with your study. Please do not hesitate to contact the FNASREC or the NWU-SCRE for any further enquiries or requests for assistance.

Yours sincerely,



Prof Roelof Burger
Chairperson Faculty of Natural and Agricultural Sciences Ethics Committee (FNASREC)

REPORT OF THE PLAGIARISM CHECK

THIS REPORT CERTIFIES THAT THE ATTACHED WORK

MEMORY RANGA THESIS

WAS CHECKED WITH THE PLAGIARISM PREVENTION SERVICE
MY.PLAGRAMME.COM

AND HAS:

SIMILARITY

9%

RISK OF THE PLAGIARISM

3%

PARAPHRASE

1%

IMPROPER CITATIONS

0%

File name: Memory_PhDFinal_Draft_28Jun_2022_.docx

File checked: 2022-28-06

Report generated: 2022-28-06

The measurement of maturity level of information technology Governance based on COBIT 5 framework for Eastern Cape Government Departments

Abstract

Departments are currently progressing on Information Technology (IT) development and maximization as a way of ensuring good Information Technology Governance (ITG). Lack of detailed requirements analysis of IT utilization may limit IT development from achieving effective outcomes. This quantitative study uses Control Objective for Information & Related Technology 5 (COBIT 5) business framework to assess and identify the maturity level of ITG, primarily within the domain of Monitor, Evaluate and Assess (MEA). Data were obtained through questionnaire, observation, and documentation. The result reveals that the maturity level of ITG is in level 1 (Performed); by which the study recommends for enhancements and upgrades and implementation of policies in IT within the scope of compliance and ITG and Risk support.

1. Introduction

IT governance is defined as a key component of enterprise governance. It aims at supporting top management, organizational structures and processes to ensure that the enterprise's IT sustains and extends the enterprise's strategies and objectives (da Silva et al., 2019). Being an integral part of enterprise governance, it then becomes the part of the system by which departments are directed and controlled (Ngoma & Erasmus, 2016). Research has shown that there is at least a 60% better return on IT investments when good ITG is in place and well implemented (da Silva et al., 2019). Effective ITG has also been shown to enable alignment between ICT and departmental goals which is one of the drivers of ITG (Neto et al., 2018). ITG has become one of the most important topics of the fourth industrial revolution era (De Haes et al., 2017).

Process maturity is the level to which a process is plainly defined, managed, measured, controlled and effective. The Capability Maturity Model (CMM) model together with the COBIT Framework will be used as tools for measuring ITG maturity processes and to provide specific metrics to improve the process (Johl et al., 2013).

2. Purpose of Paper

The assessment of maturity level is intended for a department to identify the maturity level of IT to be used as a benchmark to enhance the quality of ITG and to ensure the availability of ITG in addressing to current and further business needs. Moreover, the assessment is essential in order for the organization to be capable of analysing strength and weakness and to formulate strategies in addressing the gap, maintaining decent organizational governance, and minimizing potential risks (Wirawan, 2018). By that, the organization is expected to be capable in interpreting business target and goals, by which the organization can prioritize certain business operational activities, in determining effective IT service to support the optimal outcomes of ITG.

3. Methodology

Research methodology is the plan and procedure for conducting out researches, involves research strategy, a method of data collection, and detailed analysis (Creswell & Creswell, 2017). Referring to the research methodology, the research strategy applied is a quantitative method, which was comprised of literature study, use of Cobit tool and questionnaire as a technique of collecting data. Furthermore, a literature study was conducted to give a detailed insight of IT governance, management, organization, and COBIT 5 framework. The case study took place in Eastern Cape Government Departments (ECGDs) by identifying business environment within the Departments. Nine cases were ultimately considered for this study.

From the methodology this paper extracted the requirements, target, and strategic objects in accordance with processes within Monitor, Evaluate and Assess (MEA) domain. The result were further treated as a reference in formulating questions within questionnaire form, by also referring to best practice standard of MEA domain of COBIT 5 framework within Information Systems Audit and Control Association (ISACA).

3.1 Population and sample

Saturated sampling technique allows the whole population to be treated as a sample . Saturated sampling is defined as a technique for selecting sample if the whole population is treated as a sample (Creswell & Creswell, 2017). Samples were obtained by non-probability sampling for the

Departments and within the departments we used saturated sampling technique. In addition, the technique generated result capable of being generalized with minimum errors (Stratton, 2021). The saturated samples were selected from the population of 60 people consisting of Directors, IT Manager and IT staffs that qualified the requirements to participate in this research. ICT Managers and some technicians were selected based on the group under which the department belonged. Furthermore, individuals were selected based on pre-specified criteria, namely responsibility for organizational IT or portions thereof which required their input into decisions relating to the establishment and management of IT governance within their department. The departments were further grouped according to their organisational structure.

3.2 Instrument formulation and procedures

The formulation of research instruments for MEA domain was based on Capability Maturity Model Integration (CMMI) model in COBIT 5 framework (Neto et al., 2018). The MEA domain of COBIT 5 deals with assessment of the effectiveness and performance of the IT in its ability to meet the business objectives and the control processes required by the internal and external auditors (Amorim et al., 2018). The assessment scale of every question involved scoring as shown in Table 1.

Table 1. Levels to assess the maturity in Cobit 5

Capability Level	Achieve
Level 0: Incomplete	The process is not implemented or fails to achieve its process purpose
Level 1: Performed (Informed)	The implemented process achieves its process purpose;
Level 2: Managed (Planned and monitored).	The process is managed, and results are specified, controlled, and maintained;
Level 3: Established (Well defined)	A standard process is defined and used throughout the organization;
Level 4: Predictable (Quantitatively managed)	The process is executed consistently within defined limits
Level 5: Optimizing (Continuous improvement)	The process is continuously improved to meet relevant current and projected business goals.

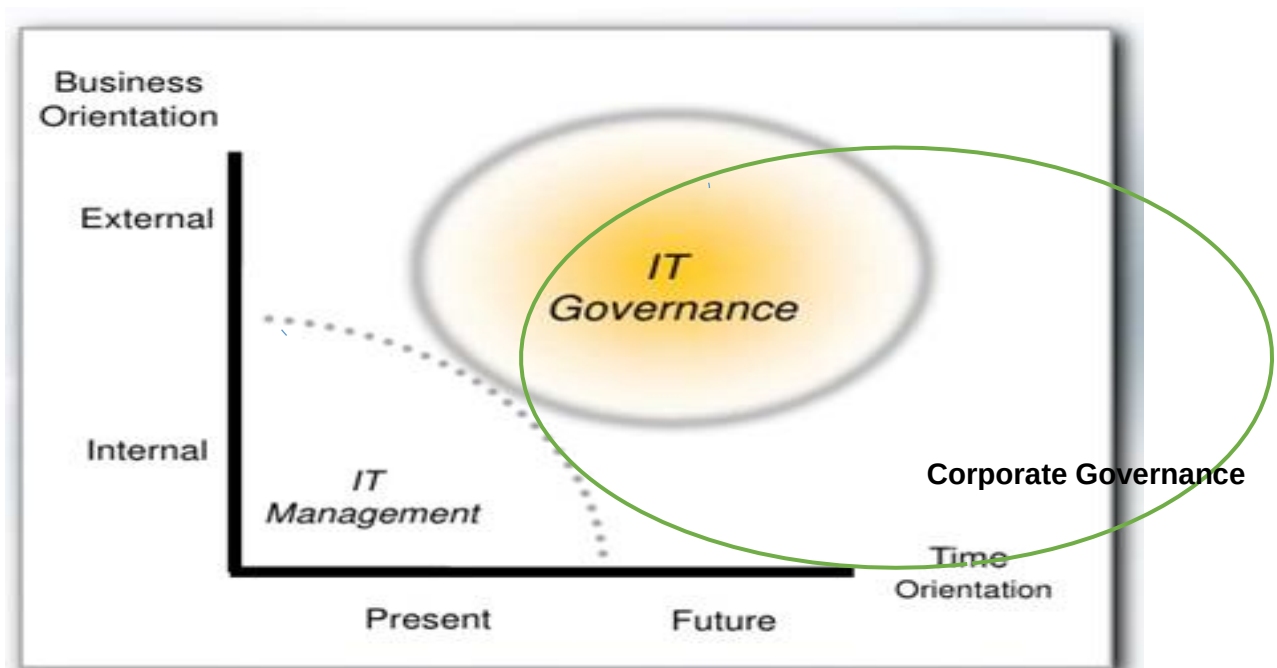
3.3. Assessment

This step involved elaboration of the research findings, such as for as the current situation of ITG management within the organization in every process of MEA domain. The analysis was employed on

every process within MEA domain of IT, from which the research formulates recommendations for further management upgrades of ITG. These recommendations are further treated as guidelines in formulating upgrades on governance processes within the Departments capable of fulfilling and exceeding current and further organizational business needs.

4. Literature Review

The unprecedented growth of IT has considerably impacted the global economy in both public and private institutions. The effect of IT is evident on the improvement of personal and organizational productivity (Venkatesh et al., 2013). The influence that IT has had on the departments is exhibited by how technology has improved business processes, enabling departments to accomplish their goals (Wahab & Arief, 2015).



Source: (Alkhalidi et al., 2017)

Figure 1 Corporate governance vs IT management vs IT governance

As shown in Figure 1.1, IT and business are inherently inter-related. The business environment depends on IT systems for control and provision of the information, including the computerization of transactions. These and other IT innovations influence the business environment by introducing new potential risks and capabilities requiring adjustments to existing organizational structures and updates to information and IT requirements (Alkhalidi et al., 2017).

By properly aligning ICT and business strategy, an department benefits in the long run through identifying improved firm performance as an outstanding benefit derived from ICT-business alignment (MAKOVHOLLO et al., 2021). The positive relationship between ICT and business strategy alignment is attributed to an increased competitive advantage and better financial performance. Another benefit found by Lindros (2017), is increased ICT credibility within the institution due to increased IT effectiveness that is realised. Alignment of ICT and business strategy promotes firm growth and paves way for better ICT planning and better strategy execution.

On the other hand Sibanda and von Solms (2019), argues that ICT-business strategy alignment is just used as a mechanism for the ICT staff to get resources from the department. ICT projects tend to have strategic importance when they are simply just operational. Furthermore Gillwald et al. (2018), points out that ICT-business alignment is difficult to achieve because getting all parties within an department to unanimously agree on what is needed to achieve alignment is not easy. Considering this, alignment should therefore be an effort from both IT function and top-level management for it to yield positive results for the department.

5. Findings on ECGD MEA process maturity

Data was gathered to evaluate the maturity of business processes at the ECGDs that were considered in this study. COBIT is one of the tools recommended to the public sector departments by DPSA. Hence, data was gathered to evaluate business process in the selected ECGDs according to processes in COBIT 5. The maturity model in COBIT 5 was used. Accordingly, findings on these processes are reported within these four categories in COBIT 5. Furthermore, this section presents consolidated findings from all the departments that were considered in this study (Ranga, 2022).

To assess the maturity of processes that fall under MEA. Exactly 4 processes were evaluated. The departments were grouped into two depending on their size and adopted organogram. As shown in Table 2 only 1 business process (MEA4) was given a rating of at least 2 in Group A indicating that it had attained at least the defined stage of maturity. The remaining 3 (MEA1- 3) processes for Group A were found to be either ad hoc or undocumented or non-existent. While in Group B, 2 processes (MEA1&2) had a maturity level of 0 meaning these two processes are not implemented or fails to achieve its process purpose and processes MEA 3&4 have a maturity level of 1 meaning they are achieving their intended process.

Table 2: Maturity level of MEA business processes

Process	Process description	Maturity Level Group A	Maturity Level Group B	Expected Level
MEA1	Monitor and evaluate IT performance	1	0	5
MEA2	Monitor and evaluate internal control	1	0	5
MEA3	Ensure regulatory compliance	1	1	5
MEA4	Provide IT Governance	2	1	5

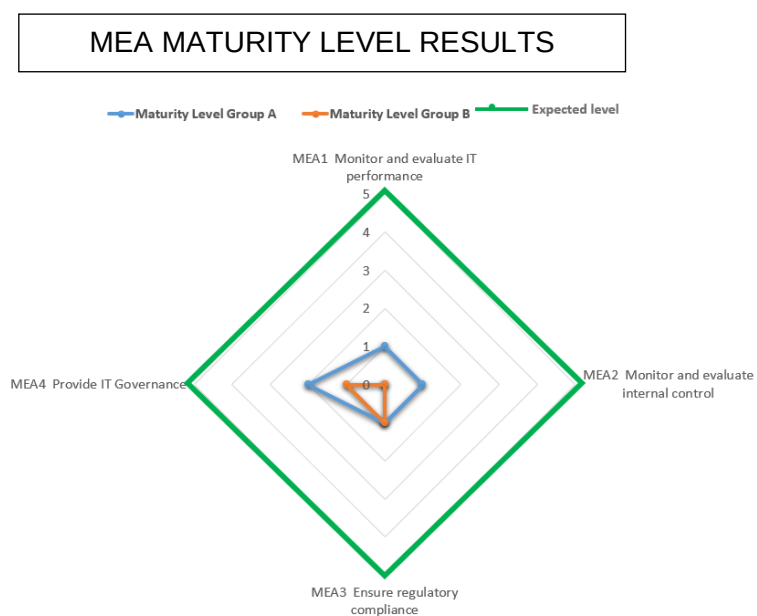


Figure 2: Graph of MEA business process results

6. Recommendations

This paper recommends that:

- The organization requires to formulate and ratify policy of Standard Operating Procedure (SOP) of IT Governance and Performance monitoring, due to the deficiency of comprehensive SOP within each IT unit. The SOP is critical to formulating as a guideline of process and implementation of IT governance within the organization. By that, it allows the organization to

implement comprehensive and detailed documentation of every process, job desk, and role of individuals or groups within the department.

- It is crucial for the department to engage in the clear and well-structured standardization of governance and management to minimize potential gaps in data and information flows needed when formulating policy.
- Enhancement in ITG is essential within every work unit of the organization in accordance with the characteristics of ITG requirements of each department.
- The organization is required to implement integration with pre-existing applications to validate data, from which it provides ease for the users to experience service of the accurate and effective information accessing.
- Upgrade and optimization in ICT service system are vital for the organization to conduct to achieve good governance.

7. Conclusion

The overall score of the current maturity level of IT service is in scale 1(performed) out of level 5 scale (optimizing). The overall result reveals that ITG processes are not fully implemented and documented referring to the performed standard process, in which it allows the organization to achieve positive outcomes. Despite that, the departments are obliged to enhance the MEA process, due to the current maturity level is quite distant from the desired level, i.e., level 5 (optimised). The expected level of 5 the highest level of the maturity levels using the COBIT framework. The significant gap exists the four processes for the two groups. This illustrates the importance of the personnel's' knowledge upgrade in handling IT governance issues by engaging in training, apprenticeship, and certification and raising awareness. On top of that, it needs full commitment from all academicians to ensure the information availability and ease of access within each department. By that, it is essential for the Department to implement well-prepared planning and to execute the planning consistently to comply with organizational strategy and goals.

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Developing a framework for Information Technology Governance Maturity Assessment for Eastern Cape Government Departments

Abstract

The goal of this paper is to develop a framework to develop an Information Technology Governance (ITG) maturity framework to guide the planning, design, and implementation of ITG in Government Departments. The objectives of the proposed model are to define qualitatively and measure quantitatively the maturity levels within the Information Technology (IT) dimensions (IT governance, IT services, data management and infrastructure), within the Government Department and to develop an implementation model that is practical and contextualized to the needs of the Eastern Cape Government Departments (ECGDs). The proposed framework consists of three components: a conceptual model of ECGDs, IT dimensions and indicators, and IT maturity levels. The framework was validated by experts in the IT field and the Office of the Premier in Eastern Cape which is responsible for the Provincial Governance.

Keywords: information technology models of maturity; framework,

Introduction

Over the years, IT has moved from providing transaction support to enabling competitive advantage to organizations in a strategic way. IT has become critical to organizations in providing the agility needed to sense and respond to market and competitive forces. Growth in the use of IT within and across organizations has driven the need for various governance structures and processes as a result ITG has evolved considerably over a period of time (Damayanti & Manuputty, 2019).

The ECGDs requires a comprehensive framework covering all aspects of ITG due to various reasons such as the need to align IT strategy with business strategy, deploy IT resources effectively, create appropriate internal controls, and prevent issues related to software errors. Frameworks provide standard practices that can help departments in implementing various processes and procedures (Sibanda & von Solms, 2019). Control Objectives for Information and Related Technology (COBIT), is one of the comprehensive frameworks for governance of IT. Various surveys have indicated wide use of COBIT in industry (Nxosi & Flowerday, 2021).

This paper aims to design a framework to develop a model of maturity of ITG that can be applied in ECGDs, which will allow the determination of the level of technological development in the

following IT dimensions: IT government, IT services, data management, and technological infrastructure. The intention with the proposed model is so that it is practical and contextualized governance systems can be implemented in ECGDs that wants to transform their ITG practices or for those that already are implemented but want to improve their level of IT maturity. The proposed IT maturity framework will improve the identification of the current level of maturity and assist with activities that Departments can do to move to the next level. Adopting maturity levels will align IT investments in local development plans.

Literature Review

A maturity framework model is a tool that has proven valuable in measuring different aspects of a process or organization. It represents a path to an organized and systematic way of doing business in organizations. A maturity model consists of several “maturity levels”. The number of levels may vary, depending on the domain and concerns that motivate the model (Rizal et al., 2020).

A maturity model consists of a sequence of maturity levels for a class of objects. It represents an anticipated, desired, or typical evolution path of these objects shaped as discrete stages. Typically, these objects are organizations or processes (Gajdos et al., 2018). The bottom stage stands for an initial state that can be, for instance, characterized by an organization having little capabilities in the domain under consideration. In contrast, the highest stage represents a conception of total maturity. Advancing on the evolution path between the two extremes involves a continuous progression regarding the organization’s capabilities or process performance (Gajdos et al., 2018). The maturity model serves as the scale for the appraisal of the position on the evolution path. It provides criteria and characteristics that need to be fulfilled to reach a particular maturity level. During a maturity appraisal, a snapshot of the organization regarding the given criteria is made. The characteristics found are evaluated to identify the appropriate organization-individual maturity level. The application of maturity models can be supported by predetermined procedures, e. g. by questionnaires. Based on the results of the as-is measures can be derived and prioritized in order to reach higher maturity levels (Neto et al., 2018).

The maturity model represents the level of effectiveness and efficiency of the organization. Measuring maturity is a concept used to make measurements in your organization toward an organization process or activity. Among the recognized models, we have: COBIT, Capability Maturity Model Integration (CMMI) and Gartner (Garsoux, 2013). The goal of CMMI is to provide guidance to improve the organization’s processes to manage the development, acquisition, and

maintenance of products or services. There are six capacity levels, designated by numbers 0 through 5 from lowest to highest (Garsoux, 2013).

Using a maturity model can help a government or organization achieve its goals successfully, efficiently, and systematically during efforts, such as strategy and operations (Ncamphalala, 2019). Maturity models are used to help assess the level of maturity of the smart cities and determine the critical capabilities that should be developed for consolidating the goods and services digitally (Ncamphalala, 2019).

IT support of business processes has become a strategic enabler for a lot of companies (Ribeiro et al., 2021). Moreover, innovative IT systems generally offer great opportunities to improve a company's competitiveness. The responsibility for effective and efficient design and use of IT lies with the company's IT management. The main goal here is to continually improve IT performance with regard to its economic efficiency (Ribeiro et al., 2021).

Continual improvement requires the company's alignment regarding its IT capabilities and the quality of its goods and services. As a rule, this positioning involves a comparison with the company's goals, external requirements (e. g. customer demands, laws, guidelines or benchmarks). To achieve an objective assessment of a company's position, however, often proves to be a difficult task. For each aspect of the company's IT under investigation, the questions arise what needs to be measured and how, and what to compare it with, to assess the as-is situation of a company and to assign it a specific quality or degree of maturity. IT management therefore requires supportive tools to assess the as-is situation of a company, derive and prioritize improvement measures and subsequently control the progress of their implementation. Maturity models are helpful tools for addressing these issues (Santos et al., 2020).

Studies have shown that more than a hundred different maturity models have been proposed (Amali et al., 2020). The authors only rarely reveal their motivation and the development of the model, or their procedural method and the results of their evaluation. The aim of this paper is therefore to propose a procedural model for the design of maturity models hoping to remedy these widespread shortcomings.

Methodology

Initially as a key step to the development of the framework, various maturity assessment frameworks were considered as reference points through literature-based surveys. Based on these frameworks, few

well-documented development processes of maturity models were compared, and the results from the comparison provided the groundwork for the construction of a procedure model for the development of maturity framework.

To formulate and design the proposed Information Communication Technology Governance Maturity Assessment Framework (ICTGMAF), a series of steps were considered, specifically those derived from some tried and tested theories, strategies, and techniques for ICT Governance frameworks. The main phases that were adapted are outlined by (Jabareen, 2009). Not all of the phases were considered; only the main ones were adapted and refined as specified hereunder:

- Detailed reading and classification of related data;
- Key concepts naming and identification;
- Integration of the key concepts;
- Classification and categorisation and making sense of the key concepts;
- Validation of the framework

These phases enabled the researcher to consider all the relevant ICT Governance information available. It was important to unpack the different frameworks and policies available on ICT Governance. This information was obtained through the research methods clarified earlier in this study. Both secondary and primary data were necessary to enable the development of the framework. It is worth mentioning that the framework was designed specifically for the needs of the ECGDs. However, the framework could also be adopted by other Departments within South Africa. Furthermore, the framework should assist with the assessment of the ICTG process in the future as the province only has two Departments that have implemented Enterprise Architectures (EAs) fully.

Additionally, ICTG processes are vicariously affected by technological, social, economic, political, and societal dynamics, which makes it difficult to generate a comprehensive framework that applies to the diverse contexts. Such challenges were considered, and the researcher opted to integrate certain aspects rather than attempt an ambitious framework that would be generalisable. Selected phases (listed above) in Jabareen (2009) proposed eight phases were preferred for this study depending on their suitability. The current ICT governance frameworks and tools such as the Information Technology Organization.

Modelling and Assessment Tool (ITOMAT), Governance Wide Enterprise Architecture (GWEA), Control Objectives for Information and Related Technologies (COBIT) 2019, and the Department of Public Service and Administration (DPSA) framework supported by numerous ICT governance strategies within the Eastern Cape were considered. These selected phases also aligned to existing models and helped the researcher in formulating a series of steps that were important in the

development of the ICTGPAF. Table 1 shows the phases adopted and adapted from Jabareen (2009), research as they directly mapped onto the design envisaged in this specific study.

3.1 ICTGMAF design process

Having interrogated the eight steps mentioned and the key phases recommended, the researcher also considered the Design Science Research (DSR) for Information Systems. In this case, the design science was applied to satisfy the gaps and inconsistencies clarified in my thesis (Ranga, 2022).

Table 1: Jabareen phases matched to ICTGMAF Design steps

Jabareen (2009) Phases Selected	Research matching Step
-Phase 2: Detailed reading and classification of related data	Step 2: Identifying ICTG frameworks and components Step 6: Strategies implementation evaluation and monitoring plan
Phase 3: Key concepts naming and identification;	Step 1a: Identify key stakeholders or participants Step 1b: Assess if participants have received training on any ICTG key areas Step 4: Formulate the critical skills essential in implementing ICT Governance process
Phase 5: Integration of the concepts;	Step 3: Assess the level of implementation of ICTG Frameworks within the Province
Phase 4: Classification and categorisation and making sense of the concepts;	Step 5: Draw up assessment criteria Step 6: Strategies implementation evaluation and monitoring plan Step 7: Categorisation of related theories and strategies
Phase 7: Validation of the conceptual framework	Step 8: The provision of an explanation of the ICTGAPF leading to the evaluation process

The researcher privileged the Jabareen (2009) Mezmir (2020) conceptual framework phases in the formulation of the ICTGMAF steps. Essentially, these steps facilitated a robust understanding of the

framework processes and what needed to be included. DSR helped to understand the Eastern Cape environment where the study was conducted. There was a need to understand the views of the people, the organisational systems, and the cultural background and views on governance. Also of significance was the identification of the problems and opportunities that would be generated by the ICTGMAF.

The DSR assisted in building the knowledge base. The researcher consulted a few appropriate theories and models to help in understanding and getting the required knowledge. The researcher's own experience in the field and engagement of experts also assisted in considering the DSR. Finally, all these enabled the building of the framework that followed a sequential process. It was important to combine the conceptual framework design and the DSR in the formulation of the framework process and components (Jabareen, 2009).

The researcher considered design science as it satisfies the research approach and the process that this research followed. The proposed ICTGMAF adds value and knowledge as a generic guide to ICT experts in the field of ICTG. The proposed ICTGMAF is based on the input from data collection, Director, and ICT researchers' ideas. These ideas were generated to solve a particular problem which is the lack of a governance process assessment framework that could be used by public sector organisations as they implement ICTG.

As advised by Peffers et al. (2007), the following guidelines for design science research were appropriate for the research.

Design as an artefact: the research must produce a construct, a model, a framework, a method, or an instantiation.

Problem relevance: The developed solution must address the problems at hand and enable business growth.

Design evaluation: Design must be evaluated by engaging key users and experts using appropriate evaluation methods.

Research contributions: The design must show the contribution that it brings to a specific field.

Research rigor: Design-science research requires a thorough application of related research.

The researcher concedes that the processes of Design Science were necessary to formulate the ICTGMAF discussed below. The proposed framework components were derived from the current lessons learned from ICTG, the findings from engaged participants, and the researcher's own experience. The researcher works as an ICT Lecturer and a part-time ICT Auditor and has experience

with the status of ICTG in the EC public sectors. As such, thorough and detailed engagements facilitated the development of the proposed framework that envisions a sustainable solution that could be adopted within South Africa, African Governments, or other underdeveloped areas in terms of ICTG.

Discussion of developed framework

The proposed framework was designed following the outlined phases, guided by the findings as explained in the previous chapter, application of related theories, and the researcher's interpretation of findings. The framework could be termed a 3-in-1 generic framework as it accommodates the views of three research fields. For example, the framework accommodates the views of experts from ICT governance fields, administration, and change-innovation design science.

The main components of the framework are crucial steps that one could follow. The researcher understands the significance of keeping to the basics and simplicity, even when the research itself is complicated by the multidisciplinary of its orientation.

Setting the basics, priorities, stakeholders, and governance engagement mean that for any researcher in the field, there is a need to engage all key stakeholders. It is critical to get input and research on the current state of the ICTG process. Understanding the environment and available information is an asset in designing such a framework and this enabled the researcher to understand the problem at hand and current initiatives available within the EC.

Identifying key participants – once the ICTG process is available, the next step is to engage all key stakeholders to draw up the intended framework. As indicated from the findings and summarised in the framework, the services needed were outlined. These services are also standard in Government Departments according to the literature on ICTG. At this stage, the stakeholders must be aware and alerted of the need to ensure all the intended services are secured. For this research, ICTG maturity and implementation are considered critical aspects. The researcher supports the fact that the maturity of ICTG must be prioritised.

Defining key performance indicators, standards, and monitoring - the next step after the engagement of stakeholders is to outline the KPIs. This defines the supporting policies on managing, maintaining, and measuring success. This is important as it shows areas to improve, and changes required. This is one of the missing links in most ICT initiatives and governance -related research. Typically, once services are rolled out, almost everyone celebrates and enjoys them, and no one thinks about maintaining, updating, and monitoring. From this study, a separate team of experts is proposed for monitoring and updating the ICTG status to maintain a compliant environment.

The framework exposes the different elements that were considered and could be critical in enabling the adoption of ICTGPA. The main components that the framework should address are outlined in the ICTGPAF.

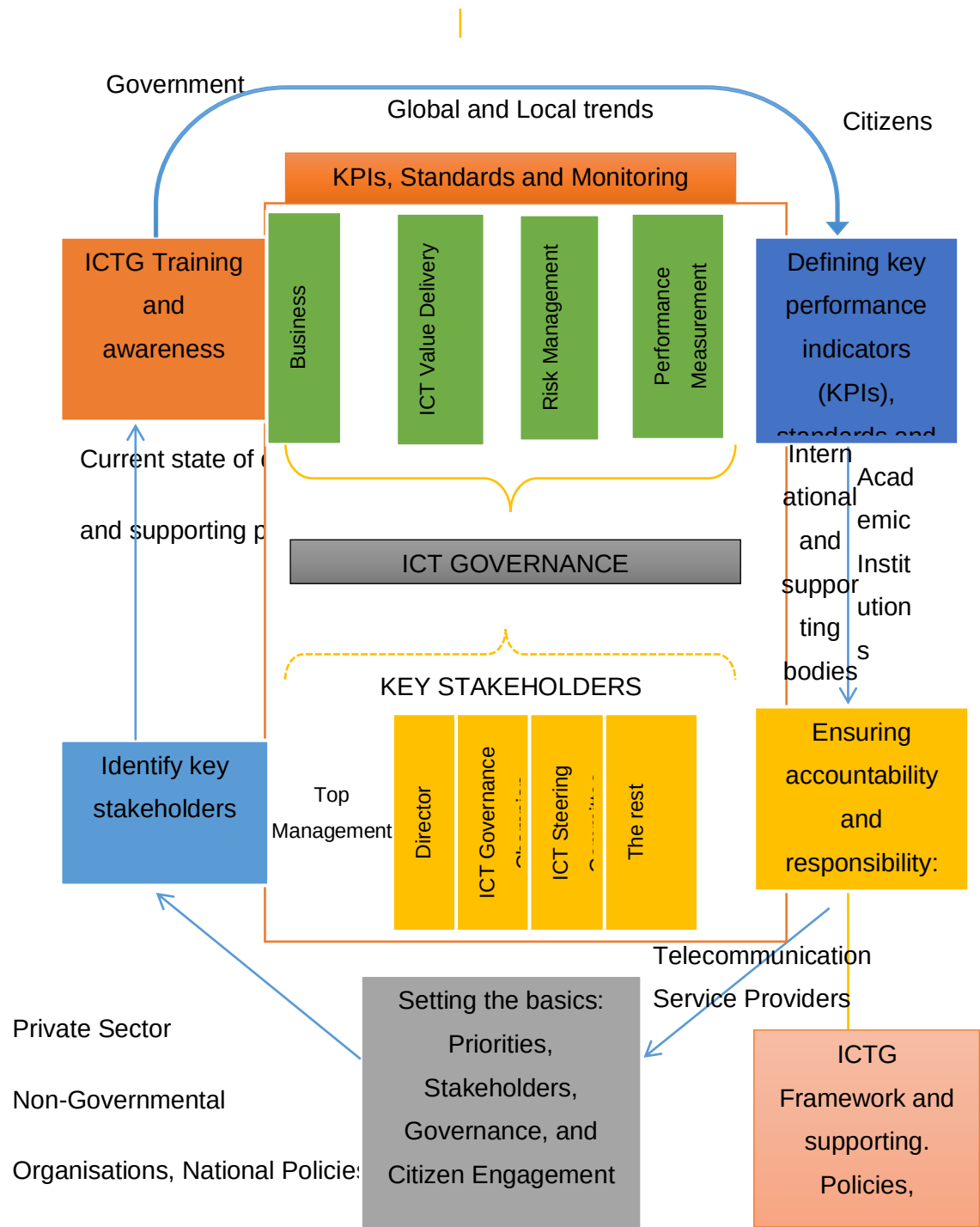
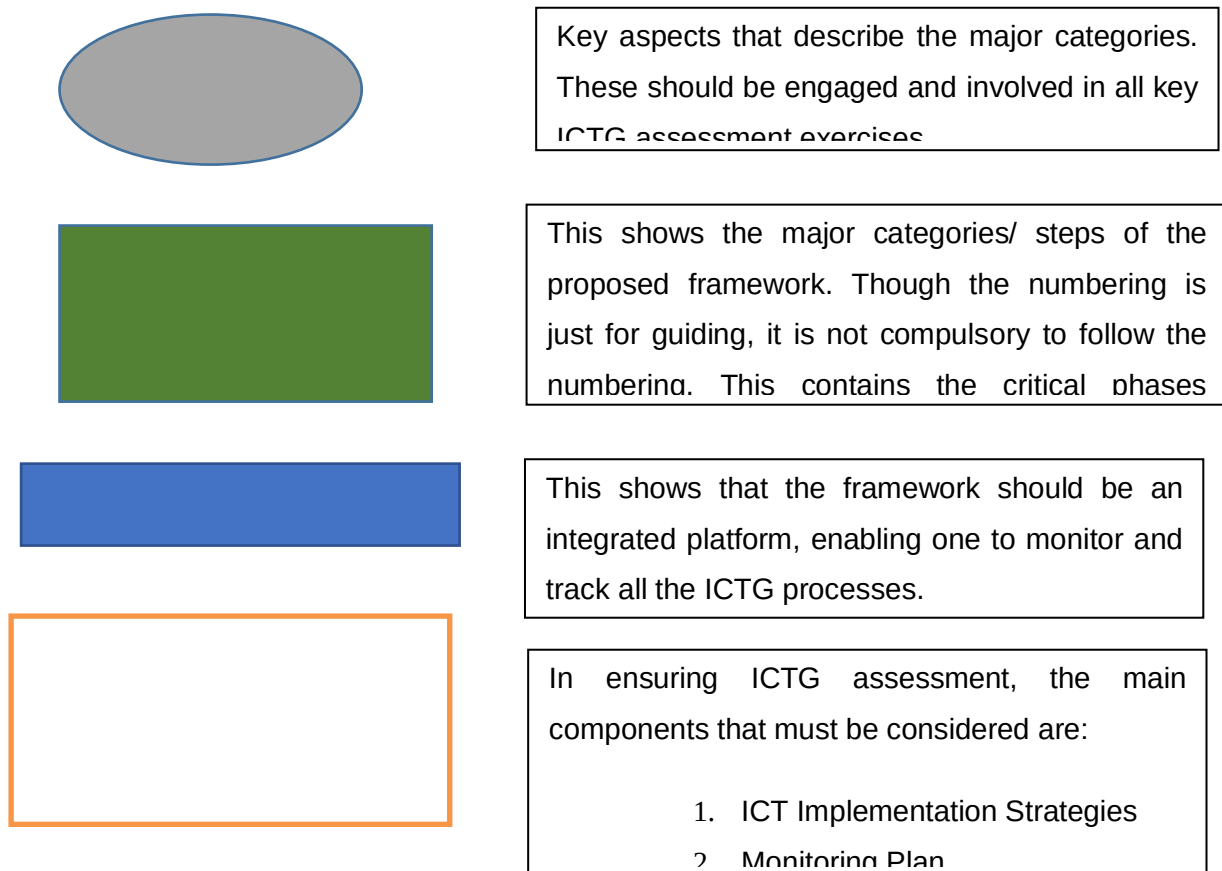


Figure 1: Framework ICTG

This framework must be evaluated to satisfy the theories that were adapted in its development and the design science approach. The researcher understands that this evaluation could take many years and may not be possible during the study, as it may require this framework to be implemented and monitored. For academic requirements, the evaluation of the framework was done using related literature and other ICTG models. In addition to this, evaluation was also done by engaging experts, especially the critical readers and promoters of this study.

Proposed ICTGMAF after initial review

The researcher considered the comments from the experts and revised the ICTGMAF framework as shown in Figure 2. The explanation of the components is as follows:



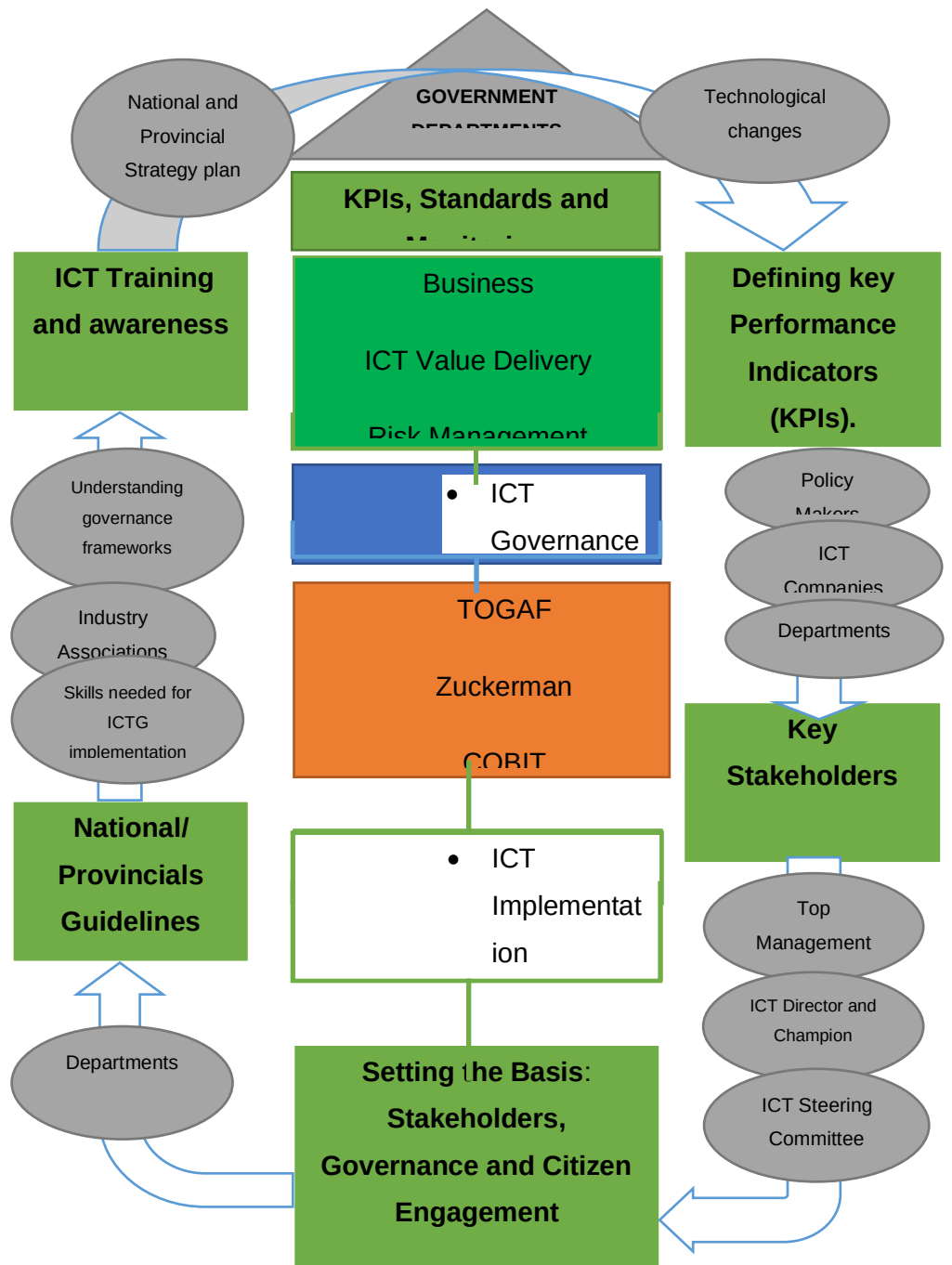


Figure 2: ICTGMAF Final Framework

The final framework includes the key steps and the sequence. It then shows the key areas for the ICTGAP required in ECGDs. Then the framework outlines the key areas that should be addressed.

Evaluation of the Framework

The evaluation of the framework was based on the available ITG frameworks and the observations on how the ITG process is implemented. The researcher is an ICT Auditor with experience in ITG within the South African context, mainly in the Eastern Cape.

Understandably, proper evaluation of such a framework would require significant time to engage in full implementation. The COBIT 2019 framework, DPSA implementation lesson learned, and the Eastern Cape Provisional ICT plan were considered for this study. The aim was to align the approach to the suggested components of the framework. It was important to note that for successful maturity assessment and effective ICT governance within a government department, the following features must be adequately addressed:

- f) Identifying the key resources**
- g) Defining key processes and activities**
- h) Key stakeholders' consideration**
- i) Training and awareness**
- j) Monitoring and evaluation**

The key features are mentioned in successful ICTG framework implementation and applications. The features were aligned to other related components and internal and external requirements.

7. Conclusions

A framework was designed to develop an information technology maturity (IT) model, which allows the determination of the level of technological development in the following four IT dimensions: government and IT management, IT services, data management, technological infrastructure. The proposed model is practical and contextualized and can be implemented in government institution that wants to transform or for those that already are implemented but want to improve their level of IT maturity. Furthermore, the proposed IT maturity model is flexible and recommended to be adjusted with different levels of granularity, not only by intelligent services, by service areas, but you can also determine the overall pillars of growth within each department. The proposed IT maturity model is also scalable and is recommended to fit the particularities of each department to define IT dimensions, indicators, and service areas.

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