

TOWARDS THE DEVELOPMENT OF A COBIT 5-DRIVEN IT AUDIT FRAMEWORK



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PREFACE

I confirm that I have been granted permission by the University of Cape Town's Doctoral Degrees Board to include the following publication(s) in my PhD thesis, and where co-authorships are involved, my co-authors have agreed that I may include the publication(s):

Asmah, A.E., Kyobe M. (2018) **Towards A Theoretical Model to Examine IT Governance Audits**– *Proceedings of the 11th International Conference on Theory and Practice of Electronic Governance*, April 3 -8, Galway, Ireland.

Asmah, A.E., Kyobe M. (2018) **A Practice-Based Study on the Challenges of IT Governance Auditing in Ghana** – *Proceedings of the Twenty-fourth Americas Conference on Information Systems*, New Orleans, 2018.

The acceptance by the scholarly community has provided guidance and encouragement to the production of this thesis. Based on comments received from reviewers at the conferences, the publications were revised and updated into this thesis.

ABSTRACT

In recent years, given the increased investments in Information Technology (IT), and its pervasive usage in business environment, the need to ensure that IT decisions are in the interest of shareholders led practitioners and researchers to focus on Enterprise Governance of IT (EGIT). EGIT involves implementing mechanisms that ensure that IT risks are duly mitigated, and that the IT investments are yielding the expected returns for enterprise owners. For the mechanisms to work as intended, there is the need for regular auditing; however, past literature and practitioner reports have confirmed that auditors do not audit governance mechanisms to the expectation of shareholders. Within the Ghanaian Financial services sector, failures in EGIT resulted in the collapse of several organisations which made stakeholders question the role played by auditors. The purpose of this study was to examine EGIT from the perspective of the auditor, develop an audit framework based on COBIT 5 and understand how auditors can be ‘critical partners’ to ensure EGIT effectiveness.

To provide a better understanding of the EGIT phenomenon, a theoretical framework based on the integration of six theoretical perspectives was presented to provide a holistic view of EGIT and how auditors can add value. The theoretical framework argued in line with organisational theorists that to achieve positive outcomes, governance mechanisms must be implemented in a coherent whole and analysed as a configuration. As such the study adopted the configurational theory to analyse the coherence of the governance mechanisms. Based on the theoretical framework and the configurational theory, a conceptual framework was developed to guide the research. The thesis proposed that the greater the level of coherence among the governance mechanisms, the higher the level of EGIT effectiveness, and that the audit of EGIT will improve the maturity of the governance mechanisms and its coherence.

The pragmatic philosophic stance was adopted, utilising qualitative and quantitative methods to answer the research question. The Peffers, Tuunanen, Rothenberger, & Chatterjee, (2008) design science research methodology guided the identification of the problem and the development of an artefact that can aid IT auditors by providing them with an adequate scope for EGIT audits and reduce the audit detection risks. An Exploratory Focus Group (EFG) and a Confirmatory Focus Group (CFG) were employed in the development of the artefact. In addition, a survey instrument was utilised to gather data about the governance maturity of the case organisations prior to and after the usage of the artefact. Cluster analysis based on the concept of ‘coherence as a gestalt’ produced cluster solutions revealing the nature of the

configuration that resulted in positive outcomes. Post-Hoc analysis was used in the summative evaluation of the artefact to measure the statistically significant changes that occurred in the governance maturity after the use of the artefact.

The findings revealed that regular auditing of EGIT mechanisms can lead to significant improvement in several governance mechanisms as postulated. It also revealed that to attain positive outcomes, there is the need for a coherent implementation of governance mechanisms with emphasis on technology which can be the driving force in a fast-changing environment. This result was contrary to existing literature about EGIT that suggested the overarching importance of leadership to drive change in the attainment of EGIT objectives. The findings show that with the right systems and technologies, IT can provide decision makers with timely information that would increase the utility of the decisions.

The study makes significant contributions to knowledge by providing insights into EGIT and IT auditing which is an under-researched area. One key theoretical contribution was the integrative theoretical framework that provides theoretical underpinnings to EGIT, which has previously been studied descriptively and provides a holistic view of the complex phenomenon. The study also confirms the configurational theory and advances knowledge by proving that in the context of EGIT, the combination of the various mechanisms does influence the whole and the outcomes.

Concerning the contribution to practice, the study resulted in the development of an IT auditing artefact that is based on COBIT 5, a widely accepted industry framework for EGIT, and contextualised with the regulatory needs of the Ghanaian Financial Services sector. With this tool, IT auditors can develop an audit plan that provides assurance of key governance areas and so reduce the audit risk of not detecting a non-existence or weak control in an organisation's EGIT practices. The tool can be used by regulatory auditors who were complicit in the EGIT failures that occurred in the sector to provide adequate supervision. Further discussion on the theoretical, practical and methodological contributions are set out in this thesis along with the limitations of the study and recommendations for future research.

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CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Enterprises mostly survive and thrive with the support of IT. The greater reliance on IT for business and society has exposed many enterprises to a series of significant IT risks which require effective governance and constant monitoring for the management of these risks. Management and those charged with governance in previous periods minimised their participation in IT leaving most decisions to functional IT managers (Zororo, 2014). With the broad spectrum of external and internal threats arising from the adoption, deployment and use of IT such as fraud, risk of loss of investment, cybercrimes and abuse, strategic attention for IT has been the major focus of most sectors and industries not only because of the risks but also because of the potential to support existing businesses and create new lines of business. Given the huge IT investments in the past three decades, the need for risk management and value creation has also directed practitioners and researchers to focus on Enterprise Governance of IT (EGIT) (De Haes, Van Grembergen, & Debreceeny, 2013). As an integral aspect of enterprise-wide governance, EGIT involves the implementation of governing structures, processes and relational mechanisms to ensure that IT risks are duly mitigated, if not eliminated, and the IT investments are yielding the expected returns for enterprise owners (Ko & Fink, 2010). To improve the overall EGIT, practitioners have developed several frameworks such as the Control Objectives for Information Technology (COBIT), to provide guidance for the governance, management and control of IT.

Auditing on the other hand involves the systematic, independent and documented process for obtaining audit evidence and evaluating it objectively to determine the extent to which the audit criteria are fulfilled. Auditing disciplines include financial auditing, operational auditing, quality auditing and IT auditing, which became necessary when enterprises began to use information and related technologies in finance-related transactions (Gantz, 2014a). Although all the various auditing disciplines share common auditing principles and standards, IT audit significantly differs from and exhibits greater breadth and variety than the financial, operational and quality audits because it comprises many different approaches and perspectives corresponding to the organisation's IT environment, governance and audit objective (Gantz, 2014a). IT audits exist as an important mechanism to assist stakeholders, board and

management in ensuring that governance mechanisms are in place to achieve an enterprise's IT objectives. In fact, the IT auditor is at the core of EGIT to provide assurance of the effectiveness of IT and its management (D'Onza, Lamboglia, & Verona, 2015). Gantz (2014b) posits that an effective EGIT audit allows organisations to validate that the structures, processes and mechanisms are working as intended, resources are optimised, and IT risks are being managed effectively to create value for stakeholders. Together with the board and management, IT auditors play a crucial role in assisting organisations to enhance EGIT by ensuring regular feedback on the adequacy of the governance mechanisms of the enterprise.

The role of IT auditors has changed from being technology resource support staff to strategic management advisors, mainly because of the increasing EGIT requirements and exposure to IT risk (Senft, Gallegos, & Davis, 2013). This has been emphasised by several practitioners and researchers. For instance, Senft et al. (2013) theorise that IT audit is a crucial mechanism for ensuring the integrity of Information Systems (IS). The Institute of Internal Auditors (IIA) (2018) report on Auditing IT Governance also highlights that, in the wake of global financial crisis and high profile information security breaches, IT audits in EGIT have become necessary. Similarly, the survey result published by Ramamoorti and Siegfried (2016) in the IIA's CBOOK® report (Promoting and Supporting Effective Organisational Governance), posits that IT audit is well positioned to promote and support EGIT to help achieve a balance between value creation and value preservation. They conclude that the role of IT audit can be crucially important both in averting governance failure as well as the effective implementation of growth-oriented strategies resulting in superior performance and value creation. The definition of IT audit further encapsulates IT audit's role in enhancing EGIT. IT audit is defined as the "process of collecting and evaluating evidence to determine whether information systems and related resources adequately safeguard assets, maintain data and system integrity and availability, provide relevant and reliable information, achieve organisational goals effectively, consume resources efficiently, and have, in effect, internal controls that provide reasonable assurances that business, operational and control objectives will be met and that undesired results will be prevented, or detected and corrected, in a timely manner" (ISACA, 2011).

Making it a necessary requirement for auditors, *The International Standards for The Professional Practice of Internal Auditing* (Standard 2110-A2) requires that the internal audit must assess and make appropriate recommendations to improve the organisation's governance processes for:

- Making strategic and operational decisions
- Overseeing risk management and control
- Promoting appropriate ethics and values within the organisation
- Ensuring effective organisational performance management and accountability
- Communicating risk and control information to appropriate areas of the organisation
- Coordinating the activities of, and communicating information among the board, external and internal auditors, other assurance providers, and management.

(IIA, 2017)

Although the role has changed significantly and stakeholders expect more, both academic literature and reports from the professional community suggest that IT auditors are more focused on the audit of IT infrastructure than the audit of IT governance and management. D’Onza et al. (2015) found that IT auditors are often fully immersed in technical problems, reducing their ability to have a holistic view of IT and the value IT investments generate for the enterprise. IT auditors improve EGIT by being more management, and less technically oriented to have a “big picture” perspective of the enterprise and how processes interact with one another to create value (Merhout & Havelka, 2008). Leung et al. (2011) also found the tasks performed by IT auditors do not match the important audit objectives especially in the area of governance. They highlighted that auditors have been providing consulting and advisory roles in matters concerning IT systems and infrastructure, but do not contribute proactively to good governance. Within the practitioner community, the survey organised by IIA indicates that only 27% of auditors perform extensive governance reviews although the percentage varies by region with Europe, Latin America and Caribbean, and Middle East and North Africa having smaller percentages (Ramamoorti & Siegfried, 2016). These findings, although worrying, heighten the need to conduct investigations into the EGIT activities of IT auditors with the aim to establish the need and importance of auditing for effective governance of IT.

1.2 IT Governance in Ghana

The legal and regulatory framework for corporate governance refers to those laws and regulations outside an organisation that stipulate the governance principles, procedures, practices and rules. In Ghana, the regulatory framework for an effective governance practice are contained in the Companies Code 1963 (Act 179), Securities Industry Law 1993 (PNDCL 333) as revised by the Securities Industry (Amendment) Act, 2000 (Act 590) the listing

regulations, 1990 (L.I. 1509) of the Ghana Stock Exchange and other directives by regulatory bodies. There are no clear regulations and laws for IT governance in Ghana, and thus organisations seeking to ensure good IT governance practices have referred to international practices such as ISO, ITIL and COBIT.

Despite the legal and regulatory framework for enterprise governance, the Ghanaian business landscape has received severe criticisms over the years, and especially in recent times. Several organisations (both public and private) have failed one way or the other to implement and maintain effective governance mechanisms. These have had dire consequences on the organisations and their major stakeholders. For instance, the Social Security and National Insurance Trust (SSNIT), the public enterprise entrusted with the management of all pension funds in Ghana was under intense scrutiny in recent months after it emerged that an amount of USD 72 million was used to procure enterprise software while pensioners receive meagre amount as pension salary (Myjoyonline, 2017a). Further review of the case by the state attorney general revealed that the Chief Information Officer (CIO) was recruited fake Master's and Doctoral degrees. The Managing Director (MD) was also cited as having disregarded cautions of the legal experts not to sign the agreement. This scandal raised issues about the governance mechanisms that have been implemented to ensure sound IT decisions and whether those mechanisms are working as intended. Both the CIO and the MD along with 13 other personnel are being prosecuted for their roles in the failures of the governance mechanisms (CITIFM, 2018).

In the banking industry, IT governance failures were cited by the Central Bank for the collapse of nine banks in 2018. Failed governance practices that led to the collapse of these banks as cited by the Central Bank include ineffective boards, overriding Board chairs and CEOs, incompetent and unqualified board members, passive board committees, poor risk management practices, weak IT infrastructure and monitoring systems, high non-performing loans and capital deficiency. Due to the collapse of these banks, the central government issued a bond to pay off the liabilities amounting to over GHs 12billion (USD 2.67billion) (Banahene, 2018). The bond is expected to be paid by the ordinary tax payer. Besides this, several thousands of individuals lost their livelihoods due to the collapse of these banks.

To prevent future recurrence the Central Bank issued strong directives on the need to implement enterprise governance including IT governance mechanisms. Based on the directives, banks are now required to employ a CIO. Most banks had not filled that role prior

to the directive. The directive also requires that banks appoint individuals to the board who have information technology expertise to check the activities of executive management. The need for risk management was reinforced in the directive with particular emphasis on a sufficiently robust information technology infrastructure and a strong management information system for controlling, monitoring and reporting risks (BOG, 2018).

Several of these issues have been raised for the Savings and Loans sector which has prompted the Central Bank and other regulatory agencies about the pervasiveness of Corporate and IT governance failures within the whole Financial Services sector and the need to sanitise the industry. In all these scandals, issues have been raised about the role played by auditors regarding their actions and inactions to provide the needed assurances that resulted in these failures. The Institute of Chartered Accountants Ghana has commenced disciplinary measures against the auditors of the affected entities (B&FTOnline, 2018). The Local Accra Chapter of Information Systems Audit and Control Association (ISACA) also saw the need to organise IT Governance Summits for IT auditors and managers in the wake of these scandals to improve the skills of IT auditors in EGIT audits (Wemakor, 2018).

1.3 Problem Statement

IT auditing activities can be broadly classified based on the controls that auditors review which are IT governance, IT management and IT infrastructure (D'Onza, Lamboglia, et al., 2015). Although past studies followed similar classifications, literature has focused mainly on auditing IT management which includes the review of change management, business continuity, IT outsourcing (Bachlechner, Thalmann, & Manhart, 2014), disaster recovery (Labadie, 2010) and IT infrastructure such as cloud-based systems, robotic process (Moffitt, Rozario, & Vasarhelyi, 2018), artificial intelligence (Issa, Sun, & Vasarhelyi, 2017) big data (Gepp, Linnenluecke, O'Neill, & Smith, 2018) and Enterprise Resource Planning (ERP) systems (Haynes & Li, 2016). Arguably little or no attention has been directed at auditing of the governance mechanisms.

Considering the significance of IT governance to enterprise governance in general, there is the need to support it with regular and continuous audits (Gantz, 2014b). The effectiveness of the IT governance audits has, however, become an issue of concern for practitioners leading to the development of frameworks which have been shown to be broad, difficult to manage (Cruz-Hinojosa & Gutiérrez-De-Mesa, 2016; Omari, Barnes, & Pitman, 2012) and not, easy to use

especially for small-size enterprises. Calls have thus been made for future research to focus on the development of IT audit frameworks that will improve IT governance audits and IT governance in general (Darmawan & Wella, 2018; Lovaas & Wagner, 2012).

1.4 Research Questions and Objectives

Research Question

- How can an IT audit tool, driven by COBIT 5 lead to effective audits of IT governance and effective EGIT in the Financial Services industry in Ghana?

Sub-Questions

- RQ 1: What challenges do IT auditors face in the audit of enterprise governance of IT?
- RQ 2: What configuration of governance mechanisms will achieve an effective EGIT?
- RQ 3: How can a COBIT 5-driven IT Audit framework be designed?
- RQ 4: To what extent can regular audit of enterprise governance of IT based on a COBIT 5-driven IT audit Framework improve governance mechanisms?

Research Objectives

- RO1: To identify the challenges IT auditors face in auditing enterprise governance of IT.
- RO2: To understand the configuration of governance mechanisms that will improve EGIT effectiveness.
- RO3: To develop a COBIT 5-driven IT audit framework.
- RO4: To understand the extent to which auditing with a COBIT 5-driven IT audit framework will improve governance mechanisms.

1.5 Contribution

EGIT is a broad subject that has become relevant in the past three decades. Despite the growth in EGIT research, there has been little research into the contribution of IT audits which is central to the entire governance activities. Also, the existing studies on the phenomenon are descriptive in nature and offer little theoretical understanding of the concepts involved. Addressing the literature gaps, the study makes contribution to both practice and theory.

Under the concept on IT auditing, the gaps identified in extant literature is the lack of empirical work on auditing EGIT and the need for a simple IT auditing tool to guide governance audits and improve EGIT activities. When completed, the study will contribute to practice with the development of a tool that has been recognised in literature as a hindrance to governance audits. The study will also provide more insight into the challenges in auditing EGIT. This will guide practitioners to find ways to minimise or eliminate the challenges with the aim to improve EGIT auditing.

Theoretically, the study contributes to extant EGIT research by providing an extended model to understand governance mechanisms. The extended model is based on the analyses of EGIT from different theoretical perspectives making significant improvement to the body of knowledge on the phenomenon, which have been characterised by descriptive studies. Based on the extended model the study developed a conceptual model which can guide our understanding of the complex phenomenon. The study further advanced the configuration theory and its applicability to EGIT. This provided a novel way to assess EGIT holistically to understand the nature of configurations that must be implemented to derive value.

Methodologically, the study proved the effectiveness of cluster analysis in measuring coherence of IT governance mechanisms which require significant interactions to attain organisational IT objectives. With the analysis, the study portrayed the heightened need for IT auditors to holistically review governance mechanisms instead of adopting a limited review of IT infrastructure and management. Holistically, the study critically examined EGIT from the perspective of the IT auditor, to understand the extent to which regular audits of governance activities would impact EGIT.

1.6 Intended Thesis Layout

The first chapter of the thesis covers the introductory part of the study. A discussion of the nature of the research problem is presented to establish the research questions. Chapter Two will present a review of extant literature in IT auditing and EGIT. The aim of the review is to evaluate the current body of literature with respect to EGIT auditing and discuss these works from different theoretical perspectives to provide better understanding of the concepts. The chapter ends with a summary of gaps in past literature that needs to be addressed to answer the research questions. Chapter Three focuses on the theoretical foundation of the study and the development of a conceptual framework which serves as a theoretical guide for the remainder

to the study. Based on the theoretical foundation and the relationships established, propositions will be presented. Chapter Four presents the research methodology and research design of the study.

In Chapter Five, the results and discussions for the first research question are presented. The chapter provides insights into the challenges that impede the audits of EGIT and provides clear identification of the problem. In Chapter Six, a configurational analysis of the EGIT maturity of the case organisations prior to the use of the developed artefact is presented. Chapter Seven aims to develop the proposed C5DITAF based on review of COBIT 5. The chapter presents the principles and structure of COBIT 5 and presents an approach to simplify it, based on the theoretical foundations presented in the literature review. This is followed by Chapter Eight, which presents a comparative analysis of the EGIT maturity after the usage of the artefact. Chapter Nine, the final chapter, summarises the work and provides a holistic conclusion and answer to the overall research question. The limitation and contributions of the study are presented in that chapter.

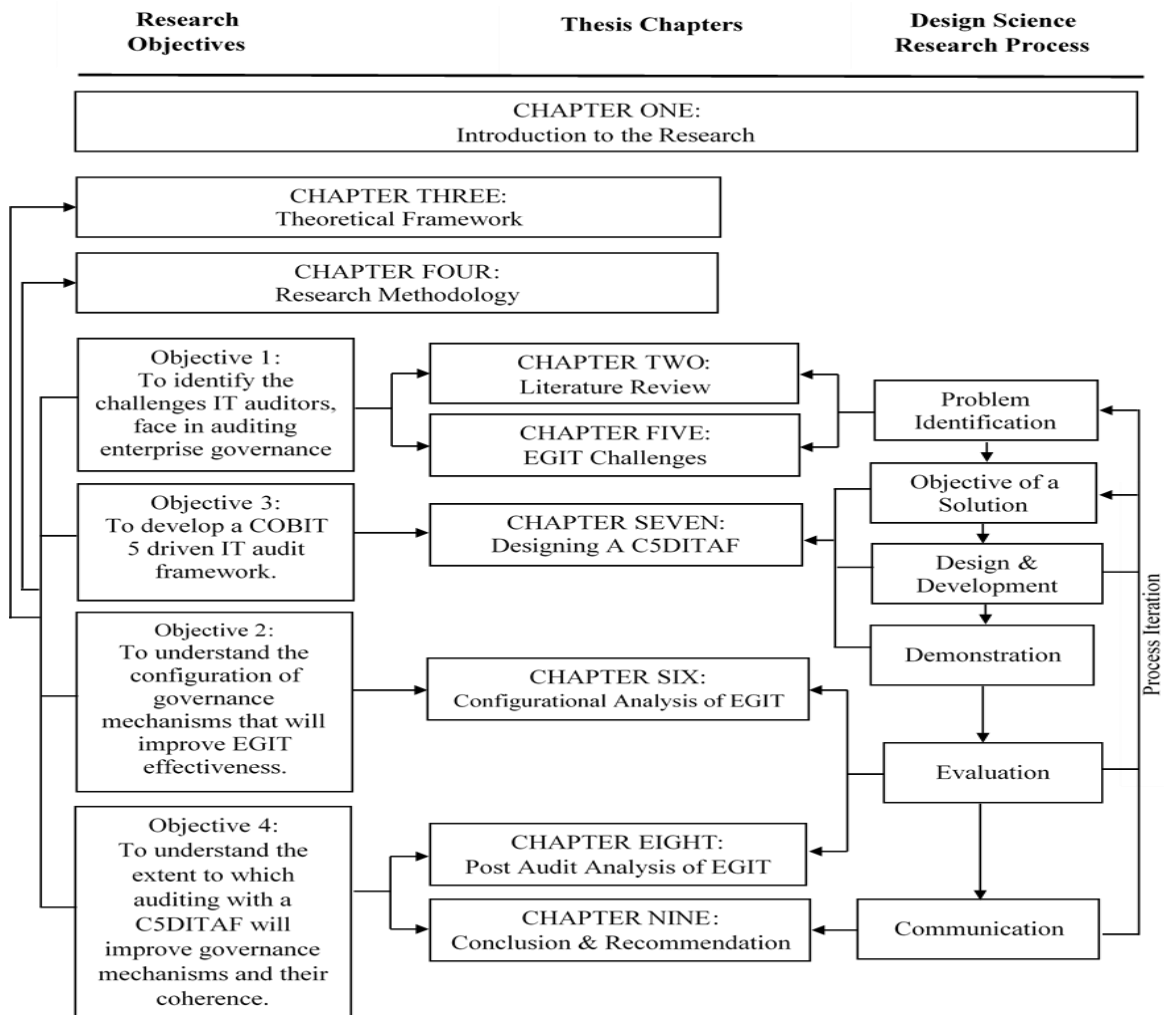


Figure 1: Thesis Structure

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

An extensive literature review is essential to any research activity because it enables the researchers to position and determine the scope of the research by assimilating extant literature to build knowledge. In this chapter, the study presents a discussion of the literature relevant to the phenomenon, including in this case, EGIT, IT auditing, governance and auditing frameworks and their theoretical foundations. The first section of this chapter provides background information and theoretical foundations for enterprise governance. This is followed by a discussion of EGIT and its relationship with the broad enterprise governance and its focus areas. The next section covers IT governance and auditing frameworks used in existing literature. Following that, the concept of IT auditing is discussed along with its theoretical foundations. The evolving role of the IT auditor is presented, after which the gaps identified in the entire review are summarised and presented in the last section.

2.2 Enterprise Governance

There is no one generally accepted definition of corporate governance as researchers define the concept from different perspectives. Khan (2011) defined it as “the broad term used to describe the processes, customs, policies, laws and institutions that direct the organisations and corporations in the way they act, administer and control their operations”. Samaduzzaman, Zaman, and Quazi (2015) also defined it as “the set of rules and regulations that are framed to protect corporate values and shareholders’ interests”. Claessens and Yurtoglu (2013) defined governance of an enterprise as the system by which the enterprise is directed and controlled. The two main perspectives gained from the existing definitions are, first, the rules under which enterprises operate to satisfy their stakeholders (Normative framework), and second, the behaviour of enterprises or corporations measured by performance, efficiency, growth, financial structure, and treatment of shareholders and other stakeholders (Claessens & Yurtoglu, 2012). Both perspectives are as a result of the separation of ownership and control, shareholders need for transparency and their requirements for the appreciation of the long-term value of the enterprise (Gupta & Sharma, 2014). Failure of the governance mechanisms leads to a series of unexpected corporate scandals (Rubino & Vitolla, 2014). Agency theory, which is the main underpinning theory for enterprise governance, asserts that the separation of

ownership and control often lead to a divergence of interest between the owners and the managers of enterprises (Rashid, 2015). The conflicting interest often leads to agency loss, which is the extent to which residual interest to the owners falls short of what they would have been if there were no separation of ownership and control (Azevedo & Akdere, 2008). To reduce these agency losses, the owner establishes governance mechanisms to reduce the problems of incomplete information and uncertainty. Mechanisms under the agency theory recognised the role of auditors to ensure that directors act in the interest of owners instead of their own. Other structures put in place include the appointment of independent directors to check the executive directors as well as the establishment of the audit committee to ensure the integrity of the financial system of controls (Eisenhardt, 1989). Auditors review the financial, operational and other systems to provide assurance to owners that their investments will provide the expected value.

Another viewpoint on the need for governance is the stewardship theory, which assumes that there is no divergent interest between the agent and the principal, and that governance mechanisms help to facilitate effective collaboration and coordination between the principal and the steward (Donaldson & Davis, 1991). The steward acts in the interest of the principal because the benefits gained from interest alignment with the principal exceeds the benefits gained from self-serving interests. Unlike agents, stewards prefer collective goals rather than individual goals, thus the steward considers the success of the enterprise as his own achievement (Fox & Hamilton, 1994). The motivation to act is the main difference between the two theories, whereas a steward focuses on the intrinsic benefits such as growth, achievements and duty which are not easily measured, the agent focuses on the extrinsic benefits (Cuevas-Rodriguez, Gomez-Mejia, & Wiseman, 2012). Donaldson and Davis (1991) provide empirical support for the stewardship theory rather than the agency theory stating that empowering managers to take decisions leads to better performance than establishing mechanisms to control their decisions. Similarly, Rashid (2015) found that providing independent directors as controlling mechanisms does not necessarily reduce the agency cost associated with the enterprise. Auditors are required to ensure effective collaboration and cooperation between the principal and stewards to improve corporate performance.

Providing a new perspective on governance, Freeman and Reed (1983) recommend the stakeholder theory which seeks to replace the term shareholder in governance with stakeholder. According to the theory, the shareholder is not the only party affected by corporate decisions,

as such there is the need to consider the interest of other wider and narrow stakeholders in governance decisions, such as employees, public interest groups, key suppliers in governance decisions (Freeman & Evan, 1990).

Just as enterprise governance has been driven by the need to ensure that operations are managed effectively to meet stakeholders' expectations for financial prudence, transparency, competitive advantage, risk management and also to foster cooperation between owners and management, so have enterprises focused on IT governance to achieve similar objectives in respect of IT investments (Wilkin & Chenhall, 2010). This is important, given its pervasiveness in modern businesses in streamlining production and administrative activities as well as creation of new businesses.

2.3 Enterprise Governance of IT

Mohamed and Kaur (2012) posit that IT governance “encapsulates governing structure, leadership, processes, and relational mechanisms to address performance while providing assurances that information is protected from IT-related risks”. Governing structures as used in the definition, are those formal structural mechanisms for enabling collaboration and cooperation between business and IT management decision-making functions such as IT Steering Committee (De Haes & Van Grembergen, 2009; Mohamed & Kaur, 2012). Processes comprise the strategic IT decision-making and monitoring procedures that have been formalised and institutionalised such as Strategic Information System Planning (SISP) and Strategic IT alignment (Peterson, 2004). Leadership refers to the supervision and the oversight responsibilities of the Board in IT governance (Coertze & Von Solms, 2014). Relational mechanisms, also considered to be the soft side of IT governance (Mohamed & Kaur, 2012) are referred to “the active participation of, and collaborative relationship among, corporate executives, IT management, and business management” such as stakeholder involvement and training (Peterson, 2004). The definition by Mohamed and Kaur (2012), although detailed, agrees with earlier definition by De Haes and Van Grembergen (2009) and Ko and Fink (2010), but does not effectively capture all of the four interdependent elements of an organisation as depicted by Leavitt (1965). The definition fails to recognise the technology used in IT governance. Leavitt's Diamond is based on the principle that enterprises have four interrelated components (Structure, Process, Task, and Technology) which must be evaluated if any major change must be made. Interaction between the components determines the fate of the organisation in that a change in any one of the components may have a resultant effect on one

or all the other three components which must be evaluated to implement change successfully. Technologies represents necessary technologies needed to support governance workflows (Voudouris, Owusu, Dorne, & Lesaint, 2008) such as IT audit tools.

Webb, Pollard, and Ridley (2006) provide a different view on the definition of IT governance stating that structures, processes and relational mechanisms are important concepts and tools for the application, implementation and development of IT governance, but they do not define it. To accurately define IT governance, they suggested the need to consider the five elements of governance as described by Barrett (2001), which include Strategic business/IT Alignment (SA), Performance Management (PM), Risk management (RK), Control and Accountability (CA), and Value Delivery (VD). They, therefore, defined IT governance as “the strategic business/IT alignment of IT with the business such that maximum business value is achieved through the development and maintenance of effective IT control and accountability, performance management and risk management”. SA is considered by Kyobe (2008) as “the process of ensuring that the choices made about acquiring; developing; and deploying IT are consistent with business goals, organisational factors, the external environment and vice versa”. PM involves the process of reviewing and monitoring enterprise performance (Barrett, 2001). CA refers to the policies and procedures put in place to safeguard assets and make individuals answerable for their actions or inactions (Webb et al., 2006). RK refers to the process of planning to mitigate and prevent problems arising in the adoption, development and deployment of information and related technologies (Bradley et al., 2012). VD represents the benefits derived from the usage of IT. Although the two definitions have some convergence concepts, it is clear that, whereas the definition by Mohamed and Kaur (2012) focused on the mechanisms that need to be implemented to ensure EGIT, Webb et al. (2006) focused on the purposes of implementing the mechanisms. It is not uncommon that researchers approach IT governance in ways that support their own research interests (Webb et al., 2006) and as such, stand the risk of losing some important concepts.

IT governance research in recent years has highlighted that the existence of the five elements (SA, RK, RM, PM and VD) ensures overall IT governance effectiveness (Lunardi, Maçada, Becker, & Van Grembergen, 2017). These studies have opted for a much broader term in Resource Management (RM) instead of CA, as presented in the definition of Webb et al. (2006). RM concerns the formulation and implementation of processes and budgets for applying IT strategies to support overall business strategies (Wilkin & Chenhall, 2010). Wilkin

and Chenhall (2010) conducted a survey of IT governance literature to establish a taxonomy of IT governance and posited that the significant enablers of IT governance are SA, PM, VD RK and RM. Similarly, Lunardi, Maçada, and Becker (2014) proposed an integrated framework and concluded that all five elements are significant to IT governance effectiveness. Other studies have also shown that the implementation of governance mechanisms (Structure, People, Technology and Relational Mechanisms) does not necessarily impact on the effectiveness of IT governance. Lunardi et al. (2014) indicated that the governance mechanisms improve the way enterprises govern IT in the areas of SA, RM and PM, but do not have significant relationships with RK and VD. This is because implementing and integrating the mechanisms is a complex task (Ko & Fink, 2010) and usually not motivated by the need to deliver value but the need to meet regulatory requirements (Lunardi et al., 2014). IT auditors are therefore expected to expand their activities, become more proactive and take on effective roles to ensure IT governance effectiveness (D'Onza et al., 2015).

Besides the existence of the five elements, other factors have been noted to serve as determinants of IT governance effectiveness. Mohamed and Kaur (2012) found that for governance to be very effective in private businesses five factors must be considered by practitioners. These are organisational demographics, information intensity, organisational culture, external environment characteristics, and IT function characteristics. Demographics represent the size and age of the organisation (Mohamed & Kaur, 2012). Whereas the size represents the number of employees and sale revenue, the age represents the duration of the enterprise's existence. Boamah-Abu and Kyobe (2015) argued that larger Small and Medium Enterprises (SMEs) have more effective IT governance practices, but also found that the age of the enterprise does not have much influence on the effectiveness of enterprise governance. The frequency of information usage in the production and the delivery of service is referred to as information intensity (Kearns & Lederer, 2004). Industries such as the telecommunication and banking which use IT to support their core activities are inclined to implement IT governance mechanisms to ensure effective governance (Spremić, Žmirak, & Kraljević, 2008). "Set of norms and values that are widely shared and strongly held throughout the organisation" represents the organisational culture (Guiso, Sapienza, & Zingales, 2015). The structures and processes implemented set the tone for the organisation and thereby define the organisational culture; similarly the existing organisational culture impacts on the governance structure (Fink & Ploder, 2008; Ko & Fink, 2010). Ko and Fink (2010) found that for a successful IT governance structure, the existing organisational culture should be measured and evaluated

with the aim of getting the benefits of governance. The environment within which an enterprise operates, exerts pressure with regards to IT adoption and governance. For instance, pressures exerted by regulatory bodies force enterprises to implement governance mechanisms (Lunardi et al., 2014) without the clear objective of value creation but to satisfy regulatory requirements. IT function characteristics represent factors such as the size of IT budget, size of IT department, and IT function maturity (Mohamed & Kaur, 2012). Size of IT investment influences the implementation of governance mechanisms to deliver value from the investments, whereas the maturity of the IT function facilitates the implementation process (Spremić et al., 2008).

The name Enterprise Governance of IT (EGIT) is a renaming of the IT governance concept to show its relative importance to enterprises in recent times and the need to provide a holistic view of IT value as well as the risks involved (De Haes et al., 2013). To provide a simple understanding and to capture all the necessary concepts, this study defines EGIT as the mechanisms or systems by which Information and Related technologies are directed and controlled to ensure value creation for stakeholders, and risk management. Mechanisms or systems include the structures, technology, processes, leadership and relational mechanisms which encapsulate RM, SA, and PM used to deliver value and ensure risk management.

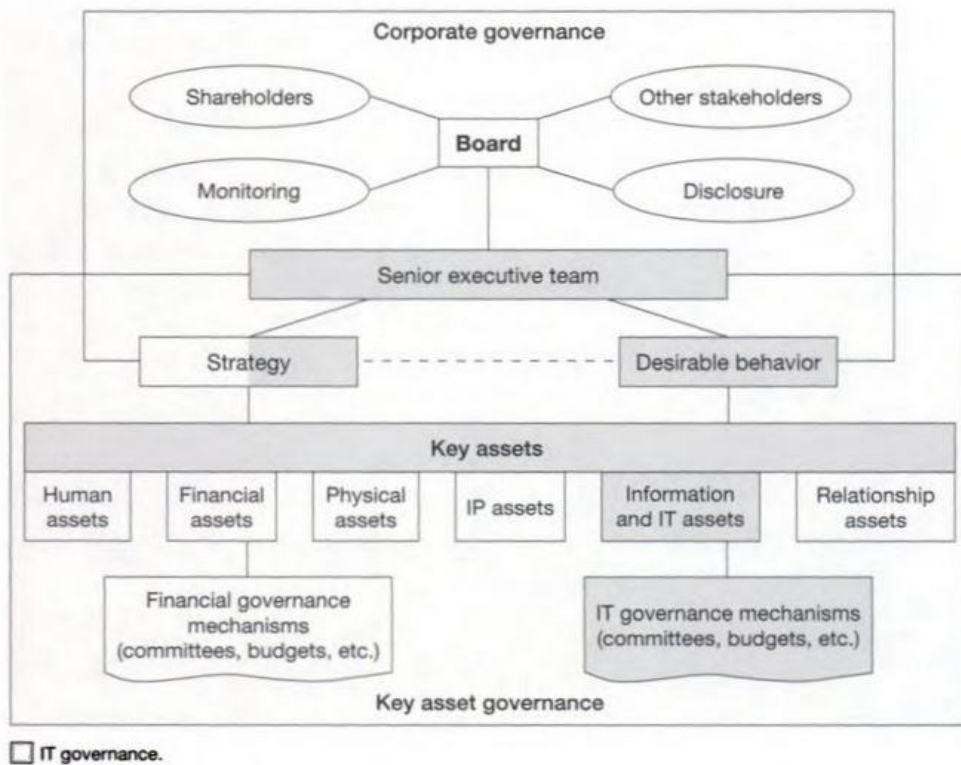


Figure 2: Link between corporate governance and IT governance (Weil & Ross, 2004, p. 5)

2.4 Governance Focus Areas

Past IS literature (Lunardi et al., 2017; Van Grembergen & De Haes, 2009) has shown that EGIT is designed to ensure the effective use of IT by focusing on five main domains; strategic Business/IT alignment (SA), IT value delivery (VD), IT risk management (RK), IT resource management (RM), and IT performance management (PM). These five domains are driven by the need to enhance stakeholder value which is the thrust of the agency theory. Therefore, the higher the level by which an organisation achieve the purpose of the focus areas the more value is created to stakeholders. In this study, an effective EGIT is measured by the level by which the five governance domains are achieved.

2.4.1 Strategic Business/IT Harmony

With the constant changes and adaptation of IT in business, the need to strategically align IT strategies with overall business strategies became inherent (Belalcázar, Díaz, & Molinari, 2016). Chan and Reich (2007) referred to strategic Business/IT harmony “as the degree to which the business strategy and plans, and the IT strategy and plans, complement each other”. Kyobe (2008) also defined it as “the process of ensuring that the choices made about acquiring, developing, and deploying IT are consistent with business goals, organisational factors, the external environment and vice versa”. Other researchers have attempted to define the concept; however, the congruence of the definitions is the integration of IT strategies with business strategies.

IS researchers have reinforced the need for strategic Business/IT alignment as a key component and performance outcome of EGIT (Webb et al., 2006; Wilkin & Chenhall, 2010; Zororo, 2014). The IT Governance Institute in a report on IT alignment indicated that disconnect between IT and business strategies leads to host of business issues which impact negatively on the business performance regardless of the investment in IT (Williams, 2005). The effects include poor cost minimisation strategies, reductions in the long-term value of shareholders and inefficient identification of the business opportunities that could be supported by IT.

De Haes, Haest, and Van Grembergen, (2010) also identified a direct relationship between IT alignment and the effectiveness of IT governance. The study found that organisations, regardless of the size, with low IT alignment score also have low IT governance implementation score and vice versa. Hosseinbeig, Karimzadgan-Moghadam, Vahdat, and Moghadam (2011) also arrived at the same conclusions, but further highlighted that several

organisational characteristics may influence the relationship between IT governance and strategic alignment functions. Some researchers (Cragg, Tagliavini, & Mills, 2007; Gutierrez, Orozco, & Serrano, 2009) have argued that especially for SME's business/IT harmony should be decentralised at the operational level to ensure efficiency in achieving governance effectiveness.

2.4.2 Risk Management

From the point of view of the decision theory, risk is usually perceived as the differences in the distribution of expected results, the likelihoods, and the subjective values (Wallace, Keil, & Rai, 2004). Although difference in expected results could be either positive or negative March and Shapira, (1987) highlight that managers do not consider the uncertainties associated with positive results as risk, but rather only focus on the threat of negative results. In decision making risk is one of the attributes used in evaluating possible alternatives and the greater the differences in the expected outcome of a given situation, the greater the risk (March & Shapira, 1987). Decision makers, according to the theories of choice, prefer larger expected outcomes and less risk considering all other factors are constant (Bradley et al., 2012). This means that expected returns or outcomes have a positive relationship, whereas risk has a negative relationship with the choice of alternatives. For this study, risk is therefore considered to be the situations that pose serious threats to the successful attainment of enterprise IT objectives.

With the huge IT investment in recent decades, decision makers, in line with the decision theories, prefer to maximise returns while at the same time minimising the potential risk. EGIT has been identified as a viable means to manage the host of risk that IT presents. The rapid growth in the IT industry increases the uncertainties associated with investments making it necessary to effectively manage the risk to achieve the expected outcome. Enterprises with EGIT have been studied to reduce their risk profile (Calder, 2005) because the implementation of governance mechanisms provides a proactive approach to manage IT risk (Bradley et al., 2012).

Bradley et al. (2012) classifies risk associated with EGIT into social subsystem risk (also referred to as social risk) and technical subsystem risk (also referred to as technical risk). Social risk involves the enterprise internal and external environmental uncertainties that pose a serious threat to the achievement of IT objective (Wallace et al., 2004). Technical risk, on the other hand, refers to the complexities in modern technologies that impede enterprise abilities to

achieve IT objectives (Bradley et al., 2012). Management of both risks involves the anticipation, prevention and the mitigation of the problems that arise in the adoption and usage of IT to achieve business strategies (Mohtashami, Marlowe, Kirova, & Deek, 2006). Frameworks such as COBIT, COSO and ITIL have been developed to assist to assess and manage the risk associated with IT investments.

2.4.3 Resource Management

From the perspective of the resource-based view, enterprises possess resources that can enable them to achieve competitive advantage and ensure long-term performance. The value of IT resources put it in a unique position to ensure sustained competitive advantage and require increased efforts to ensure protection from imitation or substitution or both. IT resources include hardware, software and network infrastructure as well as the skill set of individuals and functions to ensure the management of the resources to convert the investment in these resources into long-term performance (Lunardi et al., 2017). Resource management is concerned with the direction of the acquisition, deployment and use of IT resources to ensure that they contribute to enterprise long-term objectives and create competitive advantage (Bradley et al., 2012). This is done at the executive level to provide a holistic management of valuable IT resources to gain maximum returns. As a critical element of governance, EGIT facilitates a holistic supervision and direction of the sourcing, deployment and use of the most suitable IT capabilities considered to be rare and valuable to support current and future business requirements (Hardy, 2003). Enhancing EGIT effectiveness, resource management facilitates the design, implementation, adherence and monitoring of policies, processes and plans for applying broad IT and business strategies that help the enterprise to use effectively the internal and external IT resources and capabilities (De Haes & Van Grembergen, 2015). Several governance mechanisms are usually put in place to aid adequate resource management such as the IT steering committee, strategic information systems planning, and budgetary control (Ko & Fink, 2010).

2.4.4 Performance Management

The viable systems model developed by Beer (1981) provides a framework for the understanding of how performance is measured and managed within a complex system which is applicable to EGIT. Following the model, performance management systems are composed

of five interacting sub-systems which may be mapped onto aspects of enterprise structure and further categorised into three basic elements:

1. Elements which do things (routine IT operations)
2. Elements which control the doer (management/meta-system)
3. Surroundings in which they function (the environment)

System 1 represents the unit which conducts the day-to-day IT operations of the enterprise or the productive function of the enterprise (Bititci, Carrie, & McDevitt, 1997). Under EGIT, it therefore consists of activities such as routine execution of IT projects, IT operations, and service delivery. System 2, which is the local management, system co-ordinates the activities represented in System 1 (Beer, 1981). Here performance measures are put in place to monitor and objectively assess the performance of the individual IT activities. System 3 represents management systems put in place to manage the activities under Systems 1 and 2 by setting short-term targets and priorities. This system is responsible for the deployment of strategic decisions and policies by the board and top management to the operational system, as well as the monitoring of their activities.

System 4 represents top management function focused on continuous improvement in IT activities, by reviewing external factoring, and inhibiting IT operations to make the necessary changes to the lower level systems. By focusing externally, the system identifies the improvement gaps and sets strategies to fulfil IT objectives. System 5 represents the activities of the board to set the overall directions, corporate policies and objectives for the long term. The system sets the enterprise's overall priorities and targets. Together systems 3, 4, and 5 represent the meta systems responsible for ensuring that IT activities are conducted effectively to achieve enterprise objective (De Haes & Van Grembergen, 2015).

2.4.5 Value Delivery

IT delivers value by facilitating the achievement of strategic business goals to the expectation of top management and other stakeholders. Fishbein's expectancy-value theory postulates that, enterprise action is a function of expectations and the value of the goal driving the action. The theory provides an approach that predicts that when more than one course of action exists, the action chosen will be the one which provides the greatest contribution to the expected success and value (Palmgreen, 1984). IT adoption, deployment and use by enterprises is based on a pre-defined expectation of its contribution to enterprise performance and the value of such

contributions. EGIT seeks to ensure that business value and stakeholder expectations guide the choice and implementation of IT investments. Value delivery under EGIT requires the strategic evaluation and comparison of opportunities, their inherent risks, effects of the intended IT activity on business objectives, clarification of the roles and responsibilities for delivery IT capabilities, as well as continuous monitoring of IT activities to ensure that the expected value is achieved. Governance mechanisms such as the IT steering committee and IT chargeback systems are thus implemented to ensure that IT delivers its expected benefits by optimising the returns on investments (Huang, Zmud, & Price, 2010). According to the IIA Standards, IT audit activity adds value to the organisation (and its stakeholders) when it provides objective and relevant assurance, and contributes to the effectiveness and efficiency of governance, risk management, and control processes (IIA, 2017).

2.5 IT Governance Frameworks

Shareholders' quest to derive value from their IT investment led to the development of frameworks such as the Information Technology Library (ITIL), ISO 27001/2 and COBIT for the governance and management of IT. The frameworks presented here are the dominant frameworks, although other frameworks for IT exist such as Value from IT investments (Val IT), Risk IT and Capability Maturity Model.

ITIL was first developed in the 1980s by the British Central Computer and Telecommunications Agency (CCTA). After a collection of observed best practices in the industry, the second version was published in 2002 as the standard for IT service management. The fast-moving IT industry drove the development of the third version in 2007 and the later version in 2011 (Alimam, Bertin, & Crespi, 2017). ITIL provides a methodology for managing IT as a service to meet business needs and focuses on the end user rather than the technology (Bin-Abbas & Bakry, 2014). The framework has received world-wide acceptance because of its availability for public use and collection of best practice (Ozdemir, Basligil, Alcan, & Kandemirli, 2014). The adoption and implementation of ITIL is expected to improve customer satisfaction, support business change and regular improvement, provide a cost saving, and streamline IT operations. Researchers have however, criticised the framework. Cruz-Hinojosa and Gutiérrez-De-Mesa (2016) described the framework as not well defined in documentation and being a general guide, not providing specifics on its implementation.

ISO 27001/2 is the international standard and best practice for an information security management system. Its implementation shows an enterprise's capacity to protect sensitive data and helps in compliance with several regulations on telecommunications, data protection, computer misuse and freedom of Information for the public sector. Because the standard is specific to information security, it provides detailed guidelines on its implementation, unlike ITIL and COBIT (Von Solms, 2005).

2.6 COBIT 5 as an IT Governance Framework

COBIT was first created by the ISACA and IT Governance Institute (ITGI) and published in 1996. It was improved, and a second edition was published after consultation with practitioners in 1998. The third edition was published in 2000, although the online edition became available in 2003. In 2005, COBIT 4 was published, with the latest edition (COBIT 5) published in 2012. Earlier COBITs were methodologies for managing and controlling information and IT risks and vulnerabilities (Abu-Musa, 2009). COBIT 5 however, shifted the framework towards the achievement of business goals instead of focusing on processes by establishing one integrated model that combined different models such as COBIT, Val IT, Risk IT, and aligned with other known frameworks such as COSO, Capability Maturity Model, ISO/IEC 27002, and ITIL (Omari et al., 2012; Sahibudin, Sharifi, & Ayat, 2008).

COBIT 5 is generic and useful for enterprises of all sizes, whether commercial, not-for-profit or in the public sector. Its development is based on 15 years of practical usage experience and application of COBIT by enterprises of different types and sizes. The need to develop COBIT 5 was driven mainly by the need to provide stakeholders with much say with regards to their expectation from Information and related technologies. Further needs required them to deal with the increasing level of available information, and with the integral nature of advanced technologies in modern businesses, provide further guidance in the area of innovation and emerging technologies, achieve enterprise value creation through effective and innovative use of IT, and integrate all major IT governance frameworks (ISACA, 2012). This study adopts COBIT 5 because it focuses on governance and separates the governance of IT from the its management (Sunthonwutinun & Chooprayoon, 2016). It also derives its support from auditors (Ozdemir et al., 2014). Unlike COBIT, ISO2007 is specific to information security and does not provide a holistic view of enterprise IT, whereas ITIL focuses more on information technology services management. In January 2019 ISACA, published an improved COBIT 2019, to replace COBIT 5. Major changes in COBIT 2019 comprised introducing a conceptual

model to facilitate automated solutions development for Governance of Enterprise I&T, replacing the Process Assessment framework with the Capability Maturity Model for the assessment (CMM), removing the generic enabler model from COBIT 5, and increasing the governance objective to 40 with the addition of three new objectives (ISACA, 2019). Although the idea behind COBIT 2019 is to improve COBIT 5, this study adopted COBIT 5 because of its wide adoption and use by major industry players. The CMM introduced by COBIT 2019 was, however, adopted in the assessment of the EGIT mechanisms.

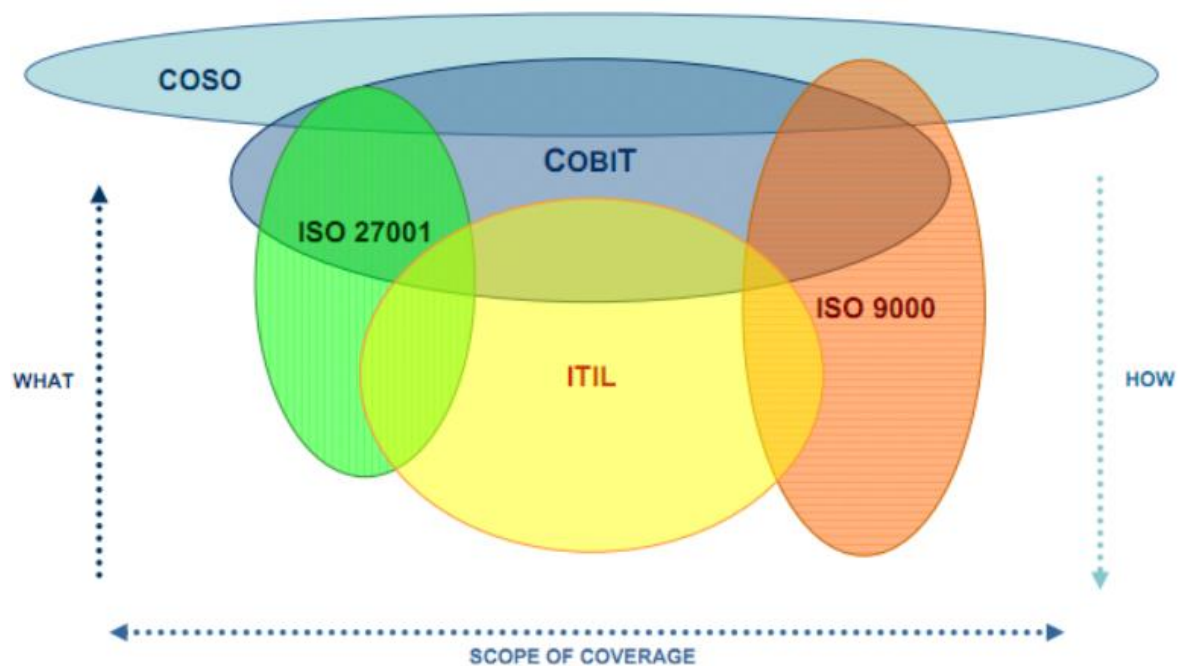


Figure 3: Interplay between COBIT and other Known frameworks (Erkmen, 2016)

Prior literature has examined COBIT through different perspectives such as the overall framework effectiveness and implementation (Abu-Musa, 2009; Hardy, 2006; Ndlovu & Kyobe, 2014; Youssfi, Boutahar, & Elghazi, 2014; Zhang & Le Fever, 2013), or some area of interest within COBIT, such as enterprise risk management, security, and internal control (Kerr & Murthy, 2013; Rubino & Vitolla, 2014; Rubino, Vitolla, & Garzoni, 2017; Tuttle & Vandervelde, 2007). Compared with other governance frameworks such as the COSO and ITIL, COBIT 5 is considered as an integrated model that combines different IT governance models and aligns other major frameworks to reduce their levels of abstractions for IT (Omari et al., 2012; Sahibudin et al., 2008).

Abu-Musa (2009) found that the processes in COBIT are perceived to be important although implementation is low for Saudi enterprises. Ndlovu and Kyobe (2014) attributed the low

implementation to challenges such as lack of top management support, inadequate training and awareness, poor cooperation and collaboration among different areas of the enterprise and non-availability of financial support. However, Lovaas and Wagner (2012) attributed the low implementation to the fact that the framework is too large to manage, which makes it implementation costly. Despite these different perspectives, COBIT has not been thoroughly applied in academic research and has not received the priority it deserves in academic literature, considering its wide adoption in practice (Mangalaraj, Singh, & Taneja, 2014). De Haes et al. (2013) therefore recommended academic literature to leverage COBIT as an instrument to conduct academic research.

2.7 Concept of IT Auditing

ISO 19011 (2011) guidelines defined auditing as a “systematic, independent and documented process for obtaining audit evidence and evaluating it objectively to determine the extent to which the audit criteria are fulfilled”. Audit evidence represents all the information derived from statements of facts, and records used by the auditor in arriving at conclusions on which audit opinions are based (Zuca, 2015), audit criteria also represents set of applicable standards, guidelines, policies and procedures (Karapetrovic & Willborn, 2000). Similarly, the Information Technology Infrastructure Library (ITIL v3) defined audit as the “formal inspection and verification to check whether a standard or set of guidelines is being followed, that records are accurate, or that efficiency and effectiveness targets are being met”. Both definitions focus on the procedures for evaluating available evidence against predefined criteria. By referring to the importance of criteria, the definitions differentiate audit from evaluation and other review assignments (Gantz, 2014).

The agency theory is the most widely used theory to understand the demand for audit. Due to the divergence interests resulting from the separation of ownership and control, the auditor is appointed in the interest of both management and wider stakeholders. Auditing serves as a mechanism to monitor management’s use of IT resources to ensure that the agency losses are reduced to an acceptable level. The theory suggests that the principal-agent relationship may be associated with information asymmetry (Azevedo & Akdere, 2008). Information asymmetry is the situation where one party in a contractual relationship has more information than the other. Since management have control over the company, their greater involvement in the enterprise gives them access to more information than the principals about the IT investments and can utilise the information to serve their individual interests (Rashid, 2015). Regulations

are usually used to reduce the level of asymmetry in information; however, IT audit provides the principal with the needed information. The theory of inspired confidence further explains the demand for audits to reduce the information asymmetry (Ittonen, 2010). The theory suggests that the information provided by management should be audited to ensure its accuracy (Hayes, Gortemaker, & Wallage, 2005). The role of the IT auditor is vital for validating the correctness and completeness of the information provided by enterprise management. The auditor acts as an intermediary between the management and the users of this information, to reduce the information asymmetry.

Different types of audit exist with the major ones being financial audits, operational audits, quality audits and IT audits (Gantz, 2014). Financial audits involve the systematic review of an organisation's financial systems to assess the truth and fairness of the assertions in the financial statement. Operational audits are commonly performed in an enterprise in order to ensure the effectiveness and efficiency of the enterprise's operations assessing the company's internal control and ensuring smooth running of operations (Greenawalt, 1995). Quality audits represent an organisation's checks to ensure that the structures and activities are matched to its purpose (Woodhouse, 2003). Weber (1999) defined IT audit as "the process of collecting and evaluating evidence to determine whether a computer system safeguards asset, maintains data integrity, allows organisational goals to be achieved effectively and uses resources efficiently". Similarly, the CISA review manual defined IT audit as the "process of collecting and evaluating evidence to determine whether information systems and related resources adequately safeguard assets, maintain data and system integrity and availability, provide relevant and reliable information, achieve organisational goals effectively, consume resource efficiently, and have, in effect, internal controls that provide reasonable assurances that business, operational and control objectives will be met and that undesired results will be prevented or, detected and corrected, in a timely manner" (ISACA, 2011). The latter definition provides a clearer picture and recognises the role of IT audit in EGIT; however, both definitions fail to indicate the need for audit criteria which differentiate audit from other review engagements. For this study, IT audit is defined as the process of inspecting and evaluating evidence against pre-defined criteria to ensure that the management and governance of information and related technologies achieve organisational goals. Although all the various auditing disciplines share common auditing principles and standards, IT audit significantly differs from and exhibits greater breadth and variety than the financial, operational and quality audits because it comprises many different approaches and perspective corresponding to the organisation's IT environment, governance

and audit objective. It is, however, a major component of the other types of audit to the extent that all these other types of audit use IT in the review activities (Gantz, 2014a).

2.8 Evolving Role of IT Auditor

IT auditors became necessary since the beginning of the computer age when enterprises began using information-related technologies in finance-related transactions (Brisebois, Boyd, & Shadid, 2007). In the early days, IT auditors augmented the role of financial auditors (auditors without IT background). Their work was mainly to test the effectiveness of the control environment for the reporting year. This required the IT auditor to review the systems and processes in place to identify weaknesses in controls and deficiencies in processes. The financial auditors relied on this report to determine the audit strategies to use in the financial statement audits. An effective IT control environment usually did not require a detailed substantive test and vice versa. The inclusion of IT auditor on financial audits reduced the labour hours and enhanced the quality of the audit (Singleton, 2011).

As enterprises continued with huge investments in IT infrastructure, the need to regularly assess the reliability and the integrity of the IT environment became inherent. The role of the IT auditor moved away from only supporting the financial auditors to the regular provision of an independent and objective assessment of the control, reliability and integrity of the IT environment (Goldberg, 2011). This required the IT auditor to regularly review the application controls as well as the general controls.

With further advancement in technology and the associated risks, the need to review IT holistically and its value creation as well as management of the risks, led to the need for governance. Shareholders' expectations as well as legal and regulatory requirements have increased tremendously with the emergence of advanced technologies such as internet of things, cloud computing, artificial intelligence, big data, etc. (Zororo, 2014). With the increased recognition of IT as a strategic revenue enabler, the role of the IT auditor changed to a strategic advisory role from the traditional roles of application control reviews and general control review (Senft et al., 2013). The traditional IT audit activities continue to be important in providing an objective assessment of the effectiveness of controls. Brisebois et al. (2007) highlight that to ensure the effectiveness of enterprise IT governance, IT auditors should promote IT governance strategies, ensure that IT governance is on the agenda and contribute to the performance metric.

Value propositions of IT auditing for key stakeholders have three dimensions. Those charged with governance and senior management rely on IT auditors for the purpose of: 1) providing assurance that IT is operating as intended, 2) providing professional insights for improving controls, processes, procedures, performance management and risk management, and 3) providing an objective assessment of effectiveness and efficiency of IT operations, management and governance.

2.9 Previous IT Auditing Literature

Existing IT auditing literature can be broadly classified into three categories (Brandas, Stirbu, & Didraga, 2013; D’Onza, et al., 2015)

- 1) The adoption of Computer-Assisted Auditing Techniques and Tools (CAATs).
- 2) The development of frameworks to facilitate the auditor’s assurance work.
- 3) Specific IT auditing activities and their value contribution to the enterprise.

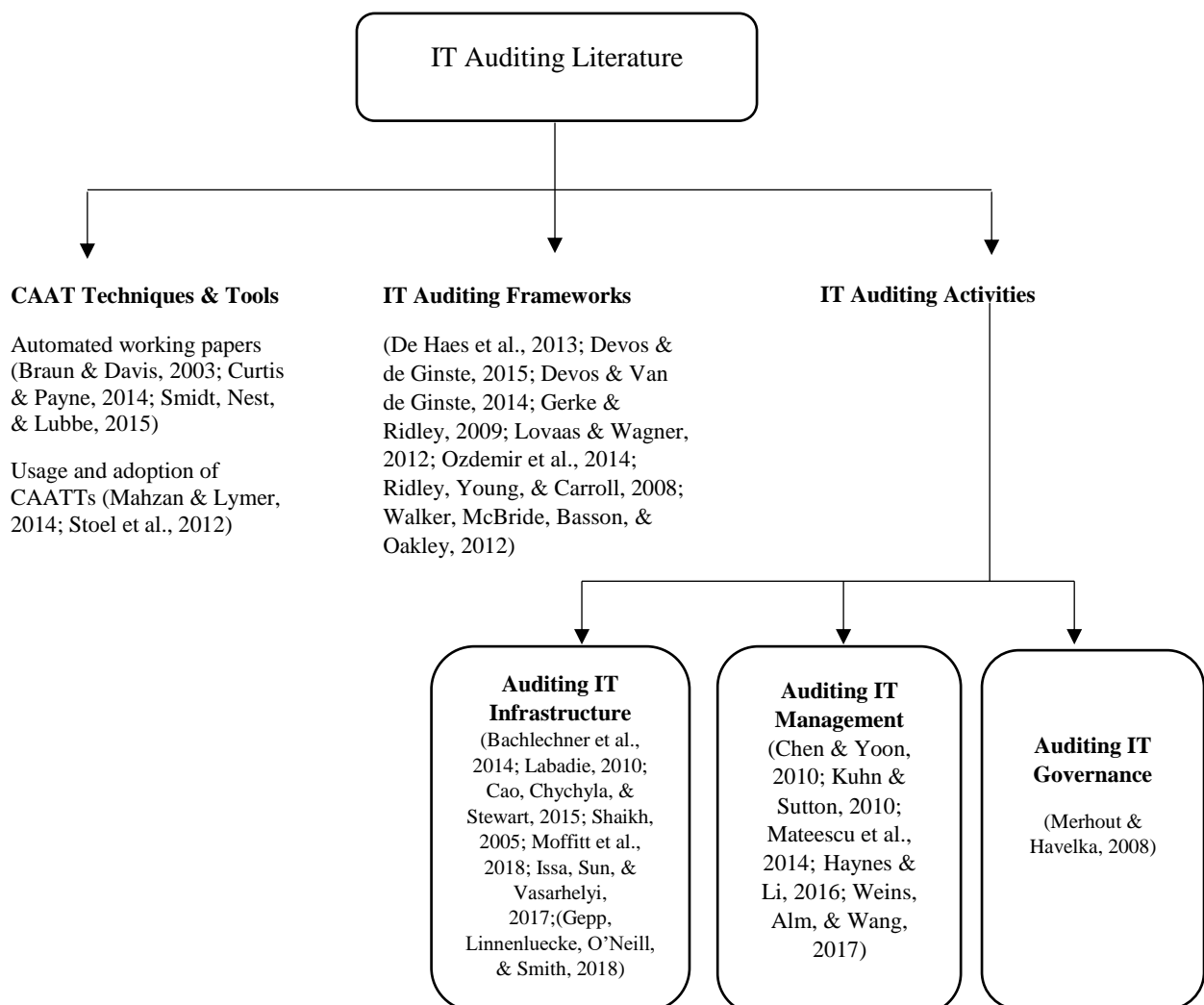


Figure 4: Review of IT Auditing Literature

CAATTs involve the use of information and related technologies in the conduct of audit assignments (Mahzan & Lymer, 2014). This includes the use of automated working papers, word processing applications as CAATTs and data processing and analysing systems such as generalised audit software. CAATTs may be used as part of their audit procedures to process data of audit significance contained in an entity's information systems (Braun & Davis, 2003). It may also be used to examine directly the internal logic of an application or draw indirect inferences upon an application's logic by examining the data processed by the application. CAATTs have been noted to improve the overall IT auditing processes by enhancing efficiency and providing timely assurance of the integrity of enterprise systems (Braun & Davis, 2003). Existing IT auditing literature in relation to CAATTs have delved into its development and application by both internal and external IT and financial auditors (Braun & Davis, 2003). Other studies have also examined the factors that influence its adoption (Mahzan & Lymer, 2014) and how its adoption and implementation influence audit quality (Stoel, Havelka, & Merhout, 2012).

Increased sophistication comes with increased risk. For the IT auditor, the complexities in advanced technologies increases the audit risk. Audit risk, which is the product of the inherent, control and detection risks, is the risk that the auditor expresses an inappropriate opinion (ISACA, 2011). To decrease the level of audit risk, the detection risk is reduced with the development of frameworks which guide the audit of EGIT (Ridley, Young, & Carroll, 2008). Different categories of frameworks exist in this regard including the COSO, Information Technology Assurance Framework (ITAF), ISO 27001, ITIL and COBIT. Among these frameworks, COBIT has received high acceptance rate in the IT industry because it is noted to be comprehensive and considered as the de-facto standard because it comprises all activities, processes and services which can help companies manage the level of operation (Ridley et al., 2008). Although COBIT 5 is not a typical framework for auditing, its wide acceptance and continuous use has made it a yard stick to be used for the audit of any IT governance activity and is considered best suited for audit (Omari et al., 2012). Nonetheless, the framework has received some amount of criticisms from the academic community. For instance, Ridley et al. (2008) found that, although COBIT use in practice has increased over time, its theoretical usage and bases have been lacking, thus calling for future academic studies to focus on the 'de-facto' standard and provide more theoretical underpinning. Devos and Van de Ginste (2014) also recognised COBIT's wide acceptance in the broad range of IS communities and further highlighted that it holds only a minor amount of theoretical supported claims because it is

created by practitioners. They recommended the need for the development of an alternative and more theoretical framework using the most relevant IS theories that could become a new IT artefact and reconcile with COBIT 5. De Haes et al. (2013) highlighted the need for the academic community to investigate the intellectual foundations, design, applicability and internal consistency of the framework which integrates three significant but related frameworks covering governance, management, value generations and risk management. Lovaas and Wagner (2012) studied the applicability of COBIT, ISO 27001 and ITIL to small financial institutions and found that their comprehensive nature makes them too large to manage and that they do not conform to the true risk-based audit framework required by regulators. They also found that use requires hiring a couple of specialised information systems auditors, which is extremely expensive and not an option for relatively smaller enterprises.

IT auditing activities are classified into the auditing of IT governance, IT management and IT infrastructure (D'Onza et al., 2015). Auditing IT governance involves the review of the governance mechanisms to ensure the improvement in the SA, RK, RM, PM and VD. Auditing IT management involves the review of specific IT processes and operations such as IT acquisition and development, change management, disaster recovery, business continuity, IT outsourcing and IT security. Auditing IT infrastructure involves the technical review of the hardware and software to ensure that they are properly functioning. D'Onza et al. (2015) found that IT auditors are more focused on the audit of IT infrastructure and provide little attention to the audit IT management than on IT governance, thus making them more technical and less management-oriented. In line with practice, existing literature has mostly focused on the study of IT auditing activities in the areas of management and infrastructure (Chen & Yoon, 2010; Moffitt et al., 2018) with little attention on auditing IT governance. Auditing IT infrastructure such as the robotic process (Moffitt et al., 2018), artificial intelligence (Issa et al., 2017), cloud systems and big data (Gepp et al., 2018) help the enterprise to ensure that their systems are available, working efficiently and effectively, and that confidential data are secured. Auditing IT management process helps the enterprise to ensure that operations are streamlined, controls are working effectively, IT assets are effectively safeguarded, and all inefficiencies are removed to improve cost management (Haynes & Li, 2016; Weins, Alm, & Wang, 2017). However, auditing IT governance provides an overall review of enterprise IT activities which ensure that stakeholders obtain value for their IT investment. The IT auditor can see the "big picture" of how the systems and process affects the overall shareholder value through the audit

of governance. Knowing the big picture, the IT auditor can inform stakeholders on which IT services are meeting business objectives.

2.10 Gaps in Literature

Although the importance of effective EGIT to the success of enterprises has been determined, the majority of prior studies have mostly studied and analysed the mechanisms and practices (Bianchi & Sousa, 2016; De Haes & van Grembergen, 2009). Mechanisms studied in these extant research (Ko & Fink, 2010) have most focused on structures, processes and relational mechanisms. Theoretical foundations from the Management System Model indicates that to successfully stimulate enterprise change toward the achievement of pre-determined objectives requires, in addition to the studied mechanisms, technological and leadership mechanisms (Cavaleri & Oblój, 1993). Prior studies have not provided reasons behind the neglect of these two important mechanisms in EGIT. In addition, prior studies have directed enormous attention on the practices in enterprises and the challenges faced with little quantitative assessment of the effectiveness of the identified mechanisms and the extent to which these mechanisms impact on the EGIT focus areas and overall EGIT effectiveness. Analysing the extent of impact of mechanisms and their coherence will provide much insight into which of the mechanisms need much attention to achieve overall EGIT effectiveness.

IT auditing literature, on the other hand, has been categorised into three classes, namely: the use of computer assisted auditing tools to enhance continuous auditing, development of frameworks to facilitate the auditor's assurance work, and IT auditing activities (D'Onza, et al., 2015). In the first category, several studies have identified CAATTs tools used in the auditing process and how these tools enhance the auditing process. With regard to the development of frameworks, review of prior literature indicates that EGIT auditing frameworks is an important aspect of ensuring EGIT effectiveness as such well-defined standards and frameworks for IT auditing in general have been developed; however, these frameworks have been studied and found to be very broad and difficult to manage, making their application to IT governance auditing problematic (Lovaas & Wagner, 2012; Omari, Barnes, & Pitman, 2013). Use of these frameworks has been found to be expensive especially for small enterprises, and thus only large multi-nationals have the required resources to adopt and implement. Studies in this category have called for the development of a simple and easy EGIT auditing framework to assist the review activities of IT auditors. In relation to the last category of IT auditing literature, IT auditing activities have been classified into auditing IT

infrastructure, IT management and IT governance (D'Onza et al., 2015). Literature in this area has focused mostly on the auditing of IT infrastructure and IT management, with little or no attention paid to auditing IT governance. This can be attributed to the fact that the majority of IT auditors have been classified as technologically inclined, focusing on only the audit of the technical aspects of IT with less attention on the strategic and management aspects (D'Onza et al., 2015). This is despite increased expectations from shareholders and senior management for more involvement from IT auditors in the strategic direction of enterprise IT. Several other challenges have been noted to be the cause of the limited focus of IT auditors, with the need for an auditing framework being one of them (Omari et al., 2013).

In its earlier version, COBIT was a framework for managing and controlling information and IT risks and vulnerabilities; however, constant improvement and upgrades have developed it into a governance framework (Mangalaraj et al., 2014). As a governance framework, COBIT 5 is considered to be broad, and overarching because it embraces a large body of knowledge designed to implement and evaluate EGIT within enterprises of all types and sizes. Although highly acknowledged in the IT environment, theoretical usage of the framework has been low because it is created by practitioners for the profession. Several past studies have criticised the inability of the academic community to conduct empirical analyses of the framework or to use it as an artefact for conducting empirical studies (De Haes et al., 2013; Devos & Van de Ginste, 2014; Ridley, Young, & Carroll, 2008).

This study endeavours to address these gaps by conducting research that seeks to enhance EGIT effectiveness by leveraging COBIT 5 as an artefact to develop an IT auditing tool to stimulate more EGIT auditing. The study further assesses the extent to which auditing with the tool can improve the extended governance mechanisms and the extent to which these mechanisms can influence overall EGIT effectiveness.

2.11 Summary of Chapter

This chapter has discussed the aspects relating to the research focus. An overview of Enterprise Governance in general and its theoretical underpinning was presented, followed by a discussion of EGIT and the various views presented in literature. Subsequently, the focus areas or the domains of EGIT were highlighted. Then followed a review of IT Governance frameworks highlighting the need to focus on COBIT 5. Subsequently, the concept of IT auditing and the evolving role of the IT auditor as a strategic partner was presented. This was followed by a

review of extant IT auditing literature which showed the gaps in the available literature. The following chapter discusses the theoretical/conceptual model and approach that will guide the present study in filling the gaps, as well as answering the research questions to meet the research objectives.

CHAPTER THREE

THEORETICAL FOUNDATIONS AND DEVELOPMENT OF CONCEPTUAL FRAMEWORK

3.1 Introduction

This section provides the theoretical foundations to support the development of an integrated framework to holistically examine EGIT audits. A conceptual framework with hypotheses is also developed, based on the integrative framework. Several theoretical perspectives are discussed to cover various concepts in EGIT and IT auditing, such as management system model, strategic choice theory, structuration theory MIT90s frameworks, and assurance theory. The viewpoints of these theories are presented and their relationship to EGIT is discussed, with an integrated model to help develop the conceptual framework and make propositions.

3.2 Existing EGIT Model

Despite the different definitions of IT governance, there is a consensus in EGIT literature on the mechanisms deployed under IT governance which are structural, processes and relational mechanisms (De Haes & Van Grembergen, 2004; Ko & Fink, 2010; Lunardi et al., 2017; Mohamed & Kaur, 2012). Based on this a Three-tiered (Fig 2) IT governance model has been used in existing literature (De Haes & Van Grembergen, 2005; Ko & Fink, 2010; Lunardi et al., 2017) to provide understanding of EGIT and its implementation to bridge the gap between theory and practice. In this model, EGIT implementation to derive the expected value is required to have a balance between structural, procedural and relational mechanisms (depicted in Figure 2) (De Haes & Van Grembergen, 2004). The required balance is, however, dependent on the enterprise and its external influences (Grant, Brown, Uruthirapathy, & McKnight, 2007). This model has been criticised for its lack of depth, and existing studies based on the model have also being criticised for their descriptive nature (Jewer & Mckay, 2012).

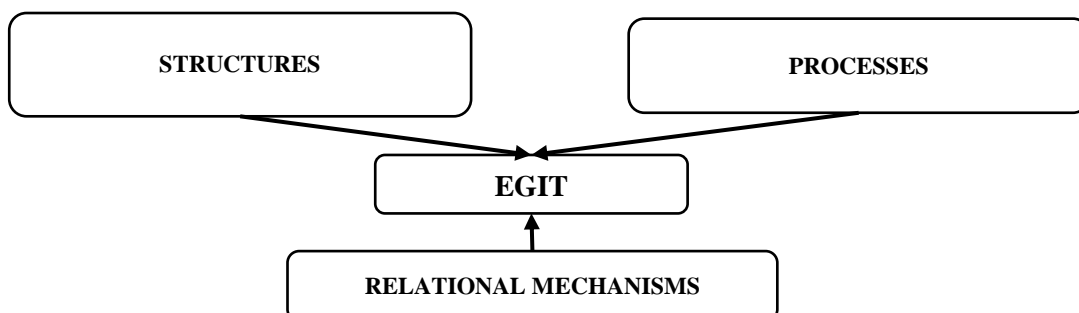


Figure 5: Three-Tiered IT Governance Framework (De Haes & Van Grembergen, 2005)

3.3 Management Systems Model

The extant EGIT research often provides a description of how enterprises implement EGIT with little focus on providing a theoretical understanding of how EGIT can be used to change the enterprise towards achieving IT objectives. The Management Systems Model (MSM) provides a tool for systems manipulation which can be used to understand how EGIT can be used to change the organisation towards achieving IT objectives (Cavaleri & Obłój, 1993). The model provides five systemic factors or tools available for use by enterprises to steer affairs into desired results, namely: strategy, structure, procedures (processes and technology), culture and leadership (Cavaleri & Obłój, 1993). The model postulates that to obtain the best possible results, each tool should be applied in a harmonised approach (Cavaleri & Obłój, 1993). Leadership and strategies are tools for inflicting change in the enterprise, whereas culture, process, technology and structure are systemic tools used to ensure regulations and accountability.

Strategy which represents the first layer of the model, provides an interface with the environment. An interaction between technology, process and structure to conduct enterprise activities exists in the next layer (α). Tools in this layer are more sensitive to activities of both internal and external environment and less difficult to change compared to the last layer (Cavaleri & Obłój, 1993). To make any significant change in this layer requires efforts and commitment to achieve alignment with the environment. This process is described in the model as adaptation. The core of the model is the culture which exists in the innermost layer (β). It is very influential for the survival and performance of the enterprise; however, it is very difficult to change and requires much more effort and energy to change or conform to the environment. At this level, a complete transformation is required to have any effect on culture (Svyantek & Brown, 2000). To complete the change efforts, leadership serves as a factor to influence the other tools and variables. Leadership provides the linkage between all the layers and the environment is an essential factor in influencing change in other variables or factors (Svyantek & Brown, 2000).

The model provides a clear understanding into the constructs of EGIT and its effectiveness. Since EGIT is a process of change towards achieving enterprise IT objectives, the constructs indicated in the model depict that change efforts towards the achievement of objectives require significant interactions among structures, processes, technology and relationships. The existing three-tiered model for EGIT studies presented in the literature review considers only three

mechanisms, i.e. the structures, processes and relational mechanisms. This does not provide a complete understanding of the phenomenon, because the relevance of technological mechanisms has not been discussed. The underpinning theoretical assumptions of the agency theory, and the theory of inspired confidence which explains the need for EGIT is focused on improving decisions made by managers to ensure that they are in the interest of the owners and also ensure the symmetry of information flow. Technological mechanisms support the decision-making process and facilitate the flow of information from managers to owners. Its neglect in extant studies is a gap that hinders the complete understanding of the phenomenon. In addition, the model recognises the influence of leadership to interact with the environment and drive the entire process of change by the development of strategies.

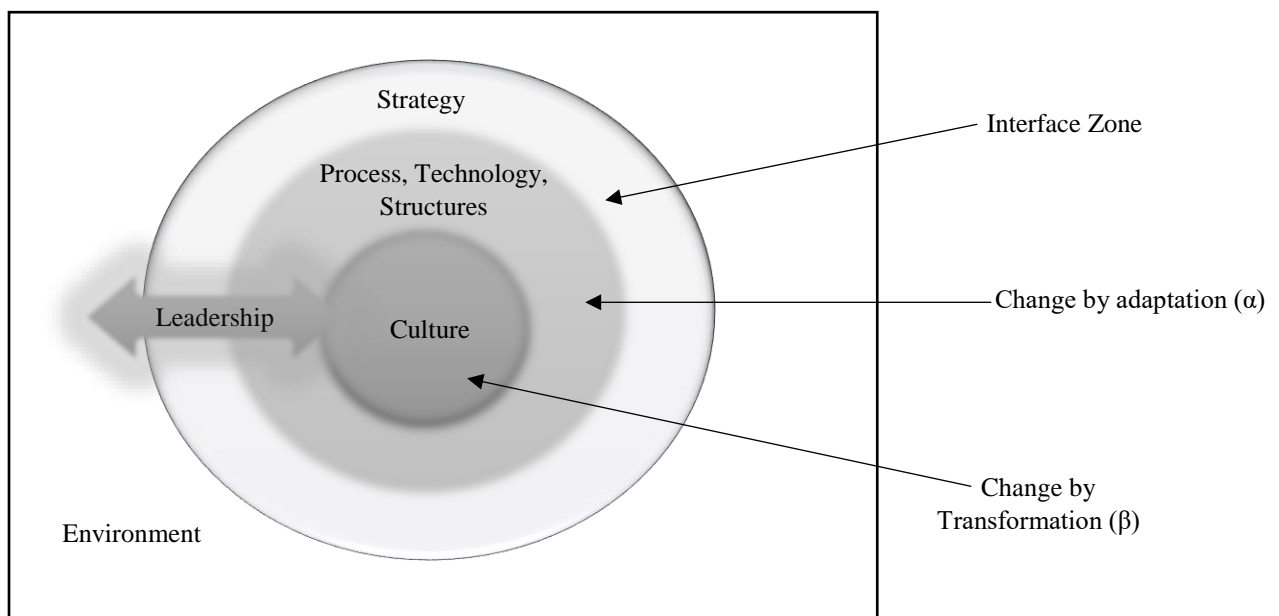


Figure 6: System interface and hierarchy of efforts required for change

3.4 Strategic Choice Theory

The rapid changes in industrial relations led to the development of the Strategic Choice Theory to explain the behaviour of leaders in decision making. At the time, most of the existing conventional theories for industrial relations were developed in the period of relative stability in US industry and as such could not provide an adequate explanation of the phenomenon of a changing environment. The conventional industrial relations theories postulate that management decisions are mostly a reaction toward environmental pressures and as such decisions are constrained by the degree of changes in the environment. This perspective does not explain the ways in which decision makers exert influence on enterprises to suit their

predilections. The strategic choice theory provides a more dynamic approach to industrial relations and demonstrates that industrial relational practices are usually moulded by the interactions of the environmental factors. It draws attention to the active role of decision makers with control and power to influence the structures of their enterprises. The major difference between the two broad theoretical views is the deterministic and voluntarist (nondeterministic) orientation of organisational change. Strategic choice theory with a nondeterministic view argues that leaders within enterprises can make proactive decisions to influence the achievement of objectives.

The development of the strategic choice theory led to the significant change in the focus or direction of organisational analysis and sparked academic and professional debate on three major issues:

1. the role of agency and choice,
2. the nature of organisational environment; and
3. the nature of relationship between organisational agents and the environment.

With regard to the issue of the role of agency and choice, the debate is centred on the ability of decision makers to make proactive choices for the enterprise based on its characteristics. Whittington (1988) argues that the focus of conventional industrial relation theories on external constraint obscures the influence of the decision maker. He, therefore, suggests that both environmental and action determinisms restrict a decision maker's ability to choose from among different course of actions. Environmental determinism refers to constraint imposed by the environment to limit the number of available alternatives to only one which leads to survival, with the other alternatives leading to extinction (Whittington, 1988). Whittington (1988) highlighted that the concept of choice in such a case becomes meaningless because the decision maker can peruse only one course of action to succeed. Contrary to conventional theories, he indicated that environmental constraints alone were insufficient for explaining decision maker's ability to choose, but the characteristic of the decision maker (action determinism) also affects the ability to choose. Action determinism refers to the idea that "actions are selected according to in-built preference and information processing systems of the actor" (Whittington, 1988). He further postulates that the external constraint only provides a secondary influence on choice because actors can exercise choice once the external constraints are removed. Action determinism asserts that, with certain motivation or drivers such as the intention to maximise enterprise profit, the decision maker's choice is limited to

one course of action (Child, 1997). In other words “the simple single-mindedness of the actor’s internal mechanisms denies any genuine choice between alternatives” (Whittington, 1988). The action determinism re-focuses the attention on the characteristics of the decision-makers.

On the issue of the nature of the organisational environment, Child (1997) explains that it is not possible to abstract the environment when determining the strategic choices available to decision makers. This, he explains is because of the threat and opportunities presented by the environment which influences decision making. One perspective to the environment is that decision makers ‘enact’ their environment, which is to say decision makers choose the environment in which to do business (Child, 1997). Enactment in the context of strategic choice analysis refers “mainly to actions which bring certain environments into relevance” (Child, 1997). Environment, in this context, does not indicate the physical boundaries of the organisation but interactions with people outside the organisation. A contemporary perspective to the strategic choice theory maintains that the environment has properties which cannot simply be enacted by decision makers, but the properties of the environment may be negotiated through social interactions between internal decision makers and external contacts (Child, 1997).

The third debate, which is on the nature of the relationship between decision makers and the environment stems from the argument raised by Whittington (1988), that the simplification of the limitations to external factors does not provide a vivid understanding of the constraints but a consideration of the decision makers is necessary. Child (1997) highlights that one must consider the interactions between the decision makers and the environment when considering the ability to make a choice. He argues that external parties exert influence when they command the resources critical to the operations of the enterprise. However, they recognise that decision makers can take steps through interactions and negotiations with external parties to manage and reduce their level of dependence.

From the debates arising, three important issues are seen to have influence on the decision makers’ choice. These debates have expanded the original strategic choice theory, which postulated that the environment may constrain choice. The perspectives presented show that the characteristics of the decision makers and their relationship with the environment also present constraining factors to be considered.

3.5 Structuration Theory

Giddens's arguments in the structuration theory is focused on the relationships between individuals and society. The development of the theory represents efforts to reject the traditional dualist theories which argue that social phenomenon are determined by either objective social structures or by human agents (Jones & Karsten, 2008). The structuration theory argues that both structures and human agents influence social phenomenon and not that either of them exert influence independently. The theory postulates that human agents in their actions rely on social structures and also by their actions create and reinforces social structures (Orlikowski & Robey, 1991). Three major structures emerge in the structuration theory because of human actions, namely structures of significations, structure of domination and structures of legitimation. Structures of significance represents shared understanding among groups, for example organisational culture and mission that create awareness. Structures of domination represents the production and use of power by human agents which originates from the control of resources. Structures of legitimisation represents the rights, standards, obligations, norms, and rules that guide conduct of human agents.

Although Jones and Karsten (2008) provide interesting arguments that the complete neglect of technological artefacts and their abstracts makes the theory an unlikely source of insight for IS studies, the social implication of the theory towards understanding the impact of technology on social phenomenon has driven a wide use of the theory in IS studies. The use of IT in enterprises is based on the interaction between human actors and IT. By objectifying and reifying human actors' knowledge and assumptions overtime, IT serves as a medium for the construction of social reality (Orlikowski & Robey, 1991). Technology is regarded as a medium for human action because it is developed by human actors and institutionalised in the enterprise through its ongoing use. Constant use by human actors on the ongoing routines, technology develop the influential ability to mediate the actions of the human actors by enhancing or inhibiting human social practices.

Through the continuous use of technology within the enterprise, in this case through the governance activities, technology may impinge on the institutional properties reinforcing the existing structures and creating new structures. First, it reinforces structures of dominations by institutionalising the premises for enterprise decision making through the facilitation of differential access to information (Orlikowski & Robey, 1991). Second, rights, obligations, sanctions and norms are also formalised with the use of IT creating an institutionalised moral

order around the use of automated monitoring or controls embedded in computer systems thereby creating and reinforcing the structures of legitimation by directing actions and encouraging appropriate responses (Orlikowski & Robey, 1991). Lastly, structures of significance are created with the embodiment of shared meanings, values, goals in computer systems reinforcing the dominant ideologies and culture of the enterprise (Orlikowski & Robey, 1991).

3.6 Assurance Theory

An assurance engagement is an engagement in which a practitioner expresses a conclusion about the integrity and the reliability of a subject matter designed to enhance the degree of confidence of the intended users other than the responsible party about the outcome of the evaluation or measurement of a subject matter against criteria (IAASB, 2005). Arens, Hogan, Elder, and Beasley, (2013) define assurance service as “an independent professional service that improves the quality of information for decision makers”. Individuals responsible for making business decisions seek assurance services to help improve the reliability and relevance of the information used as the basis for their decisions.

The theory suggests that regular independent assessment of a system improves the quality of information for decision makers. Decision makers seek the services of an assurance provider to help improve the reliability of the information used as the basis of decision making. This helps to improve the system in the end

3.7 MIT90s Framework

The MIT90s framework developed by Morton, (1991) provides a much clearer picture of how the mechanisms interact to achieve overall IT effectiveness. The model assumes that an enterprise’s effectiveness in creating value with its IT resources is a function of six inter-related elements, namely; the external environment, strategy, structures, technology, processes and individuals. In the context of EGIT, relational mechanisms provide a much better reference to individuals because relational mechanisms refer to the informational and collaborative relationships that exist among individuals to stimulate active participation in EGIT. To stimulate change towards achieving enterprise IT objectives the model asserts that managing the interactions of the elements and their configurations provides better results rather than just managing element themselves. The model also recognises the mediating effects of cultural issues on the elements and their relationship with the technology. Despite its capacity to

provide insight into the interactions between the elements, the model has been criticised (Levy, Powell, & Yetton, 2003) as being static because it provides one perspective for the interactions, suggesting that the transformation of an enterprise towards achieving IT objectives involves the sequential consideration of the five mechanisms starting with strategy as the driver.

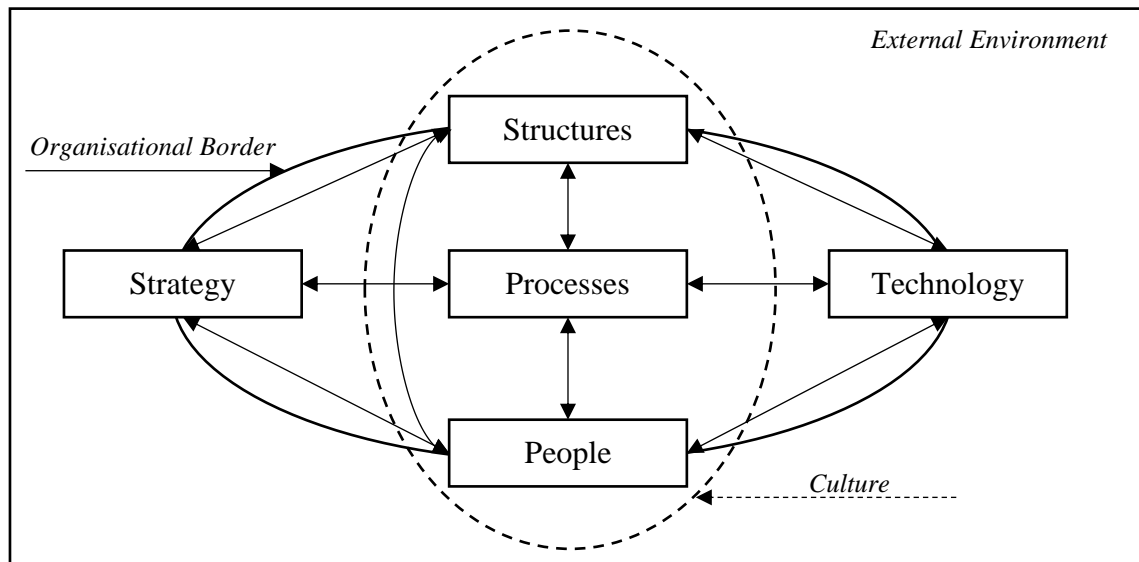


Figure 7: Scott-Morton's MIT90s Framework

Levy et al. (2003), using the MIT90s model, demonstrate four different perspectives to the interactions among the elements that stimulate the achievement of IT objectives. They categorised the four perspectives of the interactions among the elements into four quadrants. In the first quadrant, technology is used to drive change in the internal management processes towards efficiency with the view to maintaining low cost of operation. In the second quadrant, with an increase in customer base, technology is used to change organisational structures as well as the internal processes to co-ordinate activities towards satisfying the increasing customer base. Increased sophistication in the third quadrant, with further complexities, drives the shift from maintaining low cost of internal operations towards an enhanced need to obtain value from IT investment. In such a situation, the IT strategy drives the need to change processes, and the technology that supports them to foster collaboration among the various functional units and with customers. In the fourth quadrant, all elements of the framework need to be interrelated due to the pervasiveness of IT in the business. Here the element of critical importance to drive the required change and significantly influence all other elements and their interaction is the leadership. Although not initially recognised in the original MIT90s model, Levy et al. (2003) acknowledge that at this level, leadership develops and drives the business/IT

strategies which can be used to foster collaboration, enhance efficiency and improve co-ordinations.

Based on the demonstration by Levy et al. (2003) the model can be used to explain how governance mechanisms and their interactions can stimulate the achievement of enterprise IT objectives. In relation to EGIT, structures exist to facilitate governance activities, stimulate cooperation among the various functional units and enhance the IT decision making processes through mechanisms such as the IT Steering Committee. Process mechanisms facilitate the initiation and sustainability of the application of IT in the enterprise. Relational Mechanisms exist to ensure that human resources are adequately prepared to deploy and implement IT decisions. The presence of the technological mechanisms is to influence information asymmetry and streamline decision making. Leadership mechanisms also exist to provide overall oversight, develop and drive Business/IT strategy and ensure the management of the mechanisms and their interactions.

The different relationships between the mechanisms help to achieve efficiency, co-ordination, and collaboration, all geared towards achieving enterprise IT objectives (Levy et al., 2003). Efficiency represents the relationship between the technological mechanisms and the processes mechanisms. Technological mechanisms impact on process mechanisms by streamlining the activities and events. Streamlining governance processes, the adoption of technological mechanisms provides a time- and cost- effective approach to achieve IT objectives. De Haes and Van Grembergen (2009) asserts that process mechanisms need to be embedded in the routine of the enterprise to be able to enhance effective governance. Technology, by its nature, provides a unique avenue to embed governance processes into the enterprise routine. On the other hand, existing governance processes impact technological mechanisms by dictating the types of technologies needed to support decision making. For instance, the nature of the SISP process will determine the technological mechanisms needed.

The relationship between technological mechanisms and structural mechanisms is geared toward enhancing co-ordination of governance activities. As depicted in the structuration theory, technological mechanisms under EGIT have the potential to reinforce existing and creating new rules of conducts, roles and responsibilities for IT decisions (Orlikowski & Robey, 1991). These new roles and responsibilities under the reinforced or new structures is targeted at providing a co-ordinated approach to IT decisions making and the implementation of governance activities using the streamlined governance processes.

The interactions between the relational, structural and process mechanisms are geared towards achieving collaboration and active participation. Enhancing existing ties among the various actors within the enterprise, relational mechanisms, foster close collaboration between IT and business management and also ensure that processes move from one functional unit to the other with ease. The active participation of all actors is instrumental to the success of the entire governance activities. Just as relational mechanisms impact the structures, existing governance structures also impact the nature of relationship among actors. For instance, framing existing IT governance research, Brown et al. (2005) highlighted that a decentralised approach to decision making fosters closer ties among various functions than a centralised approach.

Finally, as demonstrated by Levy et al. (2003), leadership is critical to the success of the overall governance activities (Coertze & Von Solms, 2014). Existing studies (Buchwald, Urbach, & Ahlemann, 2014; Ndlovu & Kyobe, 2014) in IS and IT governance have shown that the lack of top management support is a hindrance to the implementation of majority of IT projects. Providing an oversight to the entire governance activities, leadership has enormous control to drive strategies, implement other mechanisms and manage the interactions among the various mechanisms (Coertze & Von Solms, 2013, 2014). This study, therefore, proposes an extended EGIT model (Figure 4) under which leadership drives the entire range of governance activities by developing and driving business/IT strategies and ensuring the implementation of a balance of each of the mechanisms to create the needed value.

3.8 Governance Mechanisms

Governance mechanisms represents a set of controls, practices, processes and structures implemented within an organisation to ensure decisions are in the interest of shareholders, monitor the progress and activities of the organisation and take corrective actions where necessary. In this study, governance mechanisms are broadly classified as Structures, Processes, Leadership, Relational Mechanisms and Technologies. Leadership is clearly separated from structures to emphasise the fiduciary duty of the board to implement these mechanisms and drive change.

3.8.1 Structures

Structures refer to the rules of conduct, roles and responsibilities for making IT decisions within an enterprise. Schlenker et al. (1994)'s triangle model of responsibilities can be used to depict how structural mechanisms can help to achieve enterprise objectives and ensure accountability.

The model postulates that to formulate effective structures require the presence of three elements: the prescription, the event and the identity. Prescriptions refer to the codes or rules of conduct that guide individuals' conduct. They include the information (explicit and implicit) about the goals, objectives or standards of performance and the appropriate ways to achieve the goals (Schlenker et al., 1994). Events represent the units of actions used in evaluation. Identity images refer to the actors' roles, qualities, commitments and presentations that provide a sense of authority to act in a particular manner (Schlenker et al., 1994). Structural mechanisms in this context thus consist of identities which include IT steering committees, CIOs, with clear reporting lines and specific roles for making and implementing IT decisions (De Haes & Van Grembergen, 2005), prescriptions which include laid-down policies, IT-specific strategies and goals, and the enabling environment necessary for the identities to undertake events to achieve the prescriptions.

Structural mechanisms can be used effectively to achieve IT objectives and ensure accountability only when the three elements are in place: a) clearly defined IT objectives or goals, b) clear depiction of the identities of the functions with the commensurate authority to achieve the prescriptions, c) the actual actions of the functions which serve as the events linked to the prescription to assess performance. For instance, the IT steering committee, by virtue of that identity is obligated to take decisions in a way to achieve enterprise-defined IT objectives and can be held accountable by stakeholders if their decision impacts negatively on the performance of the enterprise. This means that the mere creation of the IT steering committee cannot achieve intended purposes unless clearly defined IT goals exist, and the committee can operate freely. The combined strength of the three linkages among the elements determines the extent to which objectives can be achieved and the level of accountability to be charged. Prescription-identity linkage determines the extents to which laid down objectives are perceived as applicable to an individual or function (Schlenker et al., 1994). For example, a strong, clearly defined IT goal for business functions makes them equally responsible for IT and not to relegate it to IT functions. Identity-event linkage refers to the extent to which an individual or function has control over events. A strong linkage exists when individual or function has the ability and freedom to work within the prescription.

Prior studies on EGIT have delved into the various practical structures of IT governance to understand their nature, extent of implementations, implementation challenges and the factors influencing their implementations. Some studies also focused on the hierarchical placement of

the decision-making authority and the structuring of enterprise-wide IT activities (Ko & Fink, 2010). Two structural approaches were discussed, which are centralised and decentralised approaches. The centralised structure places all IT decision-making authorities at the apex of the enterprise hierarchy while the decentralised structure distributes the decision-making authorities to the various business functions or processes (Brown et al., 2005). Discussing the benefits of the two approaches, the majority of prior research have preferred the centralised structure due to its inherent benefits of allowing greater control of IT, providing a holistic view of IT investments value to stakeholders and the realisation of economies of scale to reduce IT cost. The decentralised structure improves the level of customisation of IT solutions to suit business functions which improves enterprise responsiveness to functional business units. De Haes and Van Grembergen (2004) highlight a contemporary hybrid approach that exists mostly in modern enterprises, known as the federal structure, which seeks to harness the benefits of the two main structures. The structure seeks to achieve efficiency and effectiveness by ensuring a holistic view of IT while encouraging flexibility to allow for responsiveness to the needs of business units.

Among the various examples of governance structures, having a IT steering committee has been noted to be the usually adopted practice to ensure the alignment of IT projects with business and provide oversight of enterprise IT investments and activities (Maidin & Arshad, 2010). It is focused on converging stakeholders from diverse backgrounds and organisational roles to provide directions by setting IT policies, streamlining the allocation of IT resources and monitoring IT projects. The ease of instituting an IT steering committee is because IT serves as the easier conduit for IT and other business managers to collaborate to manage IT projects. The design of the committee is, however, dependent on the enterprise information density, its focus of IT issues as well as its culture (Ko & Fink, 2010).

3.8.2 Processes

EGIT processes refer to the strategic IT decision-making and monitoring procedures that have been formalised in the enterprise to ensure that activities are in line with laid-down policies, regulations and other guidelines (De Haes & Van Grembergen, 2015). Processes, describe the set of practices and activities that yield output to support each other and have been organised to achieve pre-determined objectives with the overall aim to create value for the enterprise. Porter's (1985) value chain analysis provides a clear depiction of how processes can be used as governance mechanisms to support IT decision making. The idea of value chain provides a

process view for governance activities instead of a hierarchic approach. With the notion of creating enterprise value, a series of activities performed by different functions of the enterprise support each other to create an overall value from IT investment. Output from one functional unit becomes the input for the next unit along the chain in the process of making IT decisions. In the process, non-value adding activities are removed and the entire process facilitates strategic alignment in IT/business decisions (Porter, 1985). For instance, the strategic planning process in EGIT depicts a clear set of activities along divergent functions which converge at the apex to produce strategic decisions that support the enterprise value creation.

Several other processes exist and many of the governance structures cannot be effective without supporting processes (De Haes & Van Grembergen, 2009). These processes make use of performance monitoring frameworks and tools (Bhattacharjya & Chang, 2006) such as COBIT and ITIL to provide practical bases for the formulation of activities. Governance processes provide a key mechanism to achieve the overall objective of EGIT which include SA, RK, RM, PM and VD. Prior literature has mostly focused on the practices of governance processes in both public and private institutions. These studies have shown that enterprises place more emphasis on the processes that ensure strategic IT/Business alignment (Ko & Fink, 2010; Marshall & Mckay, 2004). For instance, Bhattacharjya and Chang (2006) conducted an analysis of two enterprises on their IT governance practices and noted that processes practised by these two enterprises were strategic IT decision-making, strategic IT monitoring and strategic IT planning. The other governance processes were not implemented in both enterprises and the adoption of frameworks was mostly done on a needs basis, focusing on the areas that provide much relevance at a time (Ko & Fink, 2010). In a governmental setting, Al Qassimi & Rusu (2015) found that, besides strategic information systems planning, no other process mechanism is employed and the use of frameworks is limited to ITIL which is mostly used for small IT projects.

3.8.3 Leadership

Leadership here refers to the actions of the Board to provide direction, guidance and supervision over an entity's IT resources and activities. It is the prime responsibility of the board to provide leadership towards the governance of enterprise IT (De Haes & Van Grembergen, 2015). Boards have fiduciary duty of care in EGIT to make accurate IT decisions; however, existing studies have indicated that the oversight duties of boards have not been formalised despite the increased attention to the potential benefits of boards' involvement in

EGIT and the potential costs of ineffective oversight (Trautman & Alternbaumer-Price, 2011). This has been mostly attributed to the general shortcoming of most board members with regard to their IT expertise and competences and the failure to constitute board level IT strategy committees (Coertze & Von Solms, 2013). These shortcomings inhibit their ability to inspire the vision towards EGIT, generate the needed enthusiasm and lead the way for management and employees to follow (Turel & Bart, 2014). The strategic choice theory, as discussed in section 3.4, shows the importance of leadership (decision makers) to make proactive choices for the enterprise based on its characteristics. The board's responsibility, according to the theory, is to respond to the environment and develop strategies that will steer the enterprise into achieving its objectives.

3.8.4 Relational Mechanisms

Relational mechanisms represent informational and collaborative relationships that exist between IT and business functions and their active participation in EGIT (Peterson, 2004). It covers the efforts by management to foster closer relationships between and among the various units with the objective to disseminate EGIT principles, policies and the decision-making processes to all areas of the enterprise. This includes training of staff, formal communication lines preferably from the office of the CIO or IT audits and one-on-one sections with key stakeholders (Al Qassimi & Rusu, 2015).

According to the social network theory, an enterprise exists as a network with nodes and ties. Nodes represent actors which can be individuals or functions within the enterprise. Ties also represent the relationships between actors (Haythornthwaite, 1996). The theory assumes that to foster collaborations, the attributes of actors are less important than their tiers within the network or enterprise (Haythornthwaite, 1996). To effectively disseminate information and enhance collaboration, there is the need to engage active participation by fostering ties among individuals from different functions and units.

Widely known relational practices, as stated above, help to gain an enterprise-wide shared understanding of business/IT objectives to foster active collaboration among functional units and commitment towards the overall governance processes. Winkler (2013) identifies two approaches for relational mechanisms, which are relational networks and creation-shared knowledge. He explains that relational networks involve those informal information structures of the enterprise which provide a powerful social alignment mechanism across the enterprise

hierarchy and help to foster a culture of collaboration and knowledge sharing. Creation-shared knowledge on the other hand, refers to as the formal relationships which are engaged in by the enterprise hierarchy to share complementary knowledge and IT procedural knowledge, such as sharing knowledge through training mechanisms be it online or face to face.

3.8.5 Technological Mechanisms

Technological mechanisms represent those information technologies and systems that are used in governance to support decision making and reduce information asymmetry. Using the economic theory, Bakos and Chris (1992) posit that the collection and dissemination of information through IT are driven by the notion that the information has economic value, which is a function of its ability to increase the expected utility of a decision maker. They highlighted the value-creating capability of technology in its ability to offer substantial economies of scale and scope, but with huge switching cost. With an underlining objective of creating value, EGIT is greatly enhanced when decision-making systems as well as information dissemination technologies are deployed to support the other mechanisms. The ability of technological mechanisms to create value is, however, dependent on the information that it produces, the usability of the information by decision making and the dissemination of the information to relevant users (Bakos & Chris, 1992).

Brandas (2011) classified technologies and systems that support governance into four groups; 1) systems for the dissemination of information for operational management such as Enterprise Resource Planning Systems (ERP), Supply Chain Management System (SCM); 2) systems for supporting communication and collaboration which include groupware systems which foster collaboration between business and IT functions; 3) systems and technologies for supporting decision-making processes such as Decision Support Systems (DSS), Business Intelligence Technologies (BI) and Hybrid Intelligence Technologies; and 4) support systems and technologies for external Stakeholders such as corporate website, and other information portals.

Recent studies (De Haes, Huygh, & Joshi, 2017; Joshi, Bollen, & Hassink, 2013) have shown low levels of disclosures of EGIT activities regardless of increasing activities across several sectors, which is indicative that external stakeholders are not deriving full value from EGIT activities. This is however, not surprising as most, if not all prior studies have failed to consider the use of technological mechanisms to support EGIT. Brandas (2011) highlighted the fact that, applied effectively, technological mechanisms can help to reduce the level of information

asymmetry between owners and managers and foster collaborations between business and IT functions.

3.9 Integration of the Theories

EGIT is a broad concept. To provide a detailed examination of the how audits can be used to improve it, requires a holistic view of the concepts and the various constructs involved. Several theories have, as discussed above helped to do just that. These theories operate under different, partially-overlapping theoretical assumptions and thus each independent theory provides a limited comprehension of the phenomenon. An integrative framework is thus needed to explain EGIT audits holistically.

To develop the holistic framework, the MSM model is used as a base theory which helps to understand the inherent limitations of the three-tiered model of EGIT. The model helps to understand the mechanisms that can be implemented to ensure effective EGIT. The model highlights the importance of technological mechanisms to streamline governance processes and coordination activities. Interestingly, existing studies based on the three-tiered model have failed to consider the technological mechanisms. The economic theory confirms the need for technological mechanisms to facilitate the collection and dissemination of information which only has economic value when provided on a timely manner. The MSM model further highlights the importance of leadership to develop IT/Business strategies necessary to foster effective IT decisions. The crucial importance of leadership to provide a linkage between the layers of change have not been emphasised and studied. The strategic theory confirms the importance of leadership considering that several studies discussing the failures of IT project have identified the lack of top management support as a major cause. The majority of prior EGIT studies have discussed leadership as part of structural mechanisms which do not provide a vivid understanding of the board and its role in EGIT. To extend existing knowledge, this study separates leadership mechanisms from structural mechanisms based on the theoretical foundations of the MSM model and the strategic choice theory and adds technological mechanisms. Furthermore, the assurance theory highlights the importance of auditing to improve leadership decision. Although not part of the MSM model, auditing of governance activities is necessary to ensure that the other mechanisms are working as intended and to facilitate leadership decision.

Besides the addition of the three mechanisms, the management system model postulate that there should be significant interactions among the mechanisms for adaptation. However, the limitation of the management system model is its inability to provide a vivid description of the nature of the interactions. The MIT 90s framework provides a clearer description of the nature of the interaction among the mechanisms. Extant studies have provided little theoretical underpinning and thus have not used any of these models for better understanding of the phenomenon. In analysing the interactions among the mechanisms, the structuration theory is also used to discuss the impact of technology on structures. The analysis provides a clear understanding of how technological mechanisms can be used to create new structures and reinforce existing structures.

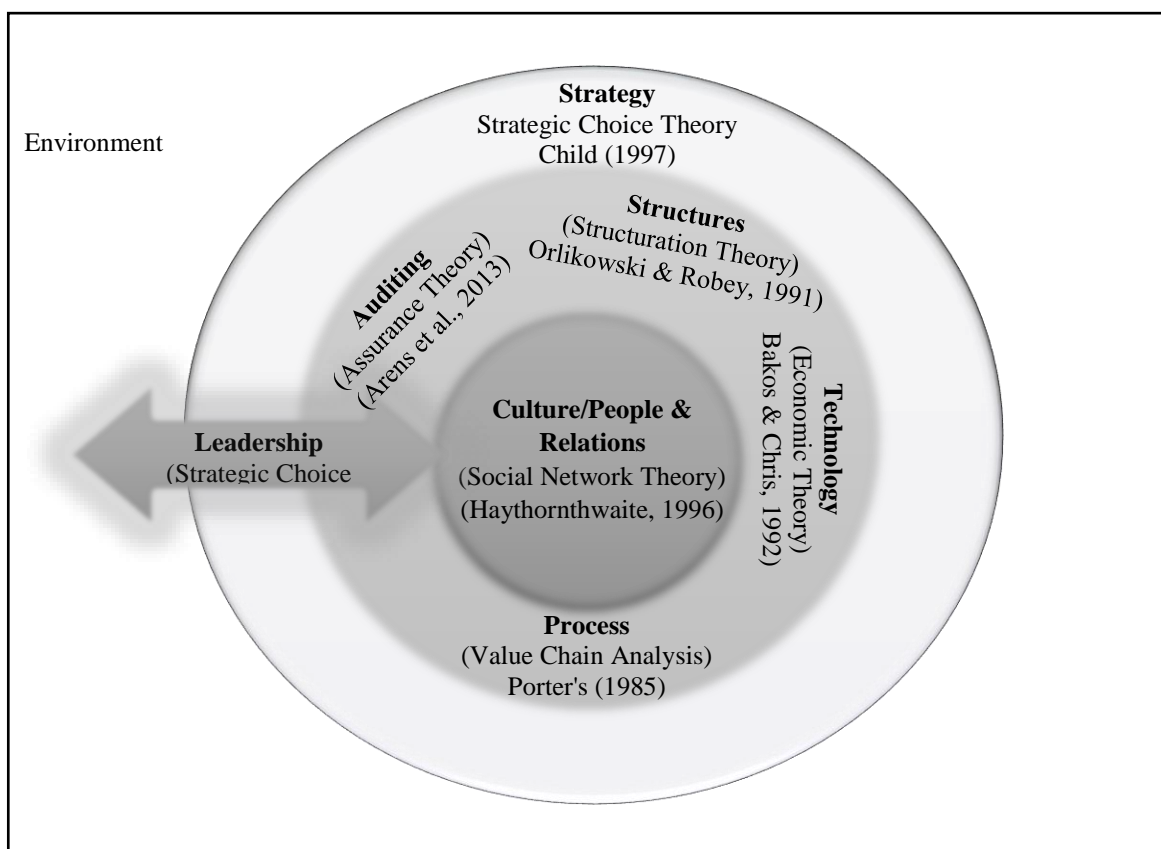


Figure 8: Integrative Theoretical Framework

In summary, in this research, management system model and the MIT 90s framework are used to examine the mechanisms needed to achieve effective EGIT. The MIT90s framework and the structuration theory are used to examine the nature of the interactions among the mechanisms. The strategies choice theory echoes the importance of leadership oversight of EGIT and examine the relationship between the attributes of the board and the effectiveness of the leadership mechanism. Furthermore, the management systems model and the strategic choice

theory are used to examine the relationship between organisational factors and the leadership mechanisms and how they affect the overall EGIT effectiveness. These theories and how they led to the development of the conceptual framework and propositions are discussed in more detail in the following sections.

3.10 Configurational Theory and the Concept of Coherence

The notion of configuration has over the years been one of the central ideas in research used predominantly in organisational studies to provide perspectives on organisational settings. It represents the idea that the whole is best understood from a complete view or as an assemblage of interconnected elements (Fiss, Marx, & Cambré, 2013). It shows the unique, tightly integrated set of elements within an organisation. Organisational Configurational theorists argue that an organisation's performance does not depend on elements in their singular attributes, but rather on the "fit" or coherence among the elements (Miles, Snow, Meyer, & Coleman, 1978; Miller, 1989; Venkatraman, 1989). For instance, in the configurational theoretical framework argued by Miles et al., (1978), the performance of an organisation is determined by the level of "fit" (coherence) the decision makers achieve between strategy, process, structure, and technology.

"Fit" (used interchangeably to refer to coherence and alignment) represents the situation where organisational elements, structures, technology, processes and people are unified and bonded to contribute to the overall performance of the organisation over time (Miller, 1989). In other words, it refers to the synergies achieved by applying consistent strategies, processes, structure, people and technology to improve organisational performance. The synergies are achieved after the consistent interactions among the organisational elements. Just as with many organisational concepts, several theoretical perspectives have been used to represent the holistic synthesis of relationships between these organisational elements and how they are conceptualised and measured (Venkatraman, 1989).

Venkatraman (1989) provides six perspectives of coherence, which are: coherence as mediation, moderation, matching, profile deviation, co-variation and gestalts. Coherence as mediation perspective indicates the existence of an intervening or mediating variable that harmonises the relationship between an antecedent variable and the consequent variable. The mediator variable explains significant proportion of the relationships between the two variables (Venkatraman, 1989). For the moderation perspective to coherence, a third variable

(moderating variable) determines the impact of the antecedent variable on the consequent variable. Here, the coherence between the antecedent variable and the moderating variable primarily determines the consequent variable (Venkatraman, 1989). This is mostly adopted when the theoretical claim specifies different levels of the moderating variables which influence the impact of the antecedent variable.

The Matching perspective is used when there is a theoretically defined match between variables. Here the measure of coherence between two variables is done independent of any other variable (Venkatraman, 1989). Coherence as a profile deviation measures coherence as the degree of adherence to a predefined profile. Any deviation from the pre-defined profile is expected to create incoherence which will hinder performance (Venkatraman, 1989). The covariance perspective of coherence explains the pattern to which theoretically related variables vary or change together (or co-vary). It confirms the internal consistency among the variables and is modelled as a factor analysis. Coherence as Gestalts is also measured in terms of the degrees of internal consistency among a set of organisational elements. Gestalts are defined as configurations or patterns of organisational variables that have attained an adequate level of internal consistency (coherence) with one another (Venkatraman, 1989). The difference between gestalts and co-variance is that, whereas covariance is modelled as a factor analysis, gestalts are modelled with cluster analysis. The gestalts are useful to predict the organisational performance in that they are composed of mutually supportive elements analysed holistically (Miller, 1986).

Miller (1989) argues that several forces also known as imperatives drive or organise other organisational elements within a configuration to facilitate transformation for positive performance. The imperatives represent the fundamental, central or driving force that stimulate vital relationships among the variables and provide stability among the variables. He describes four different imperatives. Namely: technology (environment), structure, leadership and strategy. Although each of these is likely to play a role in the overall configurations, it is expected that a dominant imperative will drive, unify and stimulate the other variables within the configuration to ensure coherence. For instance, in a stable environment with relatively high monopoly, much emphasis is placed on standardisation, rules and regulations and formal communication. With clearly operating structures, other elements within the configurations can be unified under the central theme of structures. However, the technological imperative will be dominant in a fast-changing environment with high competition. He further argues that

configurations are not static but evolve over time into new configurations due to the nature of the environments and the interactions among the elements. As such decision makers are required to constantly review the nature of the configuration and ensure the appropriateness of imperatives (Miller, 1990).

According to Meyer, Tsui, and Hinings, (1993) two important principles underline the classifications of configurations. The first is the need for coherence between the elements within the organisation in an understandable and stable way and the second is the need to undertake a holistic examination of the organisation as opposed to the narrow analysis of organisational properties. From the theoretical foundation above, significant coherence must exist among governance mechanisms. Measurement of the coherence in a linear approach is unrealistic due to the complex nature of the relationships. As such the gestalts theory provides the best approach to measure using the configurational approach. Using gestalts allows researchers to express complicated relationships among many variables or mechanisms instead of simplifying the relationships in a linear fashion. This provides a means of parsimony while explaining in rich details the complexities in organisations, and enables the identification of those gestalts that yield high performance of organisation components (Dess, Newport, & Rasheed, 1993). This study, therefore, argues in line with most configurational theories (Dess et al., 1993; Doty, Glick, & Huber, 1993; Miller, 1999) within the context of EGIT that effectiveness can be achieved if the coherence among the mechanisms is at its maximum.

To statistically identify configurations, Ketchen et al., (1997) suggest that one could adopt an inductive or deductive approach. The inductive approach does not require the prior determination of the number and characteristics of the elements to understand the relationship between configurations and performance while the deductive approach involves the use of *a priori* theory to indicate the nature of a configuration and the expected performance. The deductive approach is adopted for this study based on the theoretical framework. Ketchen et al., (1997) argue no significant difference in the ability of either approach to explain performance.

The integrative theoretical framework postulates that governance mechanisms must be implemented coherently to obtain the required performance. To measure and understand the coherence, a non-linear but holistic view was adopted using cluster analysis. Cluster analysis was considered appropriate due to its ability to derive patterns into a gestalt. It uses “all observed relationships among configuration-defining variables to assign cases to clusters”

(Ketchen et al., 1997, p. 227). As an exploratory statistical method, it rearranges data based on the mean score of responses for each variable and their relative distance to the centroid into different clusters, thereby revealing patterns. The major purpose of cluster analysis as used in this study is to determine the groups of objects that are mutually exclusive, thereby making the similarities and differences between these objects as distinct as possible. Cluster analysis is an interdependence technique that analyses all the variables simultaneously in an effort to find an underlying structure (pattern or gestalt) to the entire set of variables (Hair, Black, Babin, & Anderson, 2014). In section 6.9 the detail procedure used in the cluster analysis is presented.

3.11 Conceptual Framework and Hypotheses

Based on the integrative framework and the configurational theory presented above, the study proposes a conceptual model to understand how auditing with a C5DITAF can lead to effective IT governance. Leveraging on the new strategic role (Zororo, 2014) and huge expectations from management and shareholders (D'Onza, Lamboglia, et al. 2015), the study expects that, based on the C5DITAF, the IT auditor will audit the entire governance activities and make meaningful recommendations that will drive the change needed towards effective EGIT. These recommendations are expected to improve the governance mechanisms.

The conceptual model recognises the five governance mechanisms needed to ensure effective EGIT and their interactions and theorises that the continuous auditing of EGIT activities will improve the effectiveness of the mechanisms. The circle around the governance mechanisms in the conceptual framework indicate the coherence among the mechanisms which must be maximised to ensure effective EGIT. Governance effectiveness is determined by the extent of strategic alignment, value delivered, performance management, risk management and resource management.

Two main hypotheses have been formulated from the conceptual model and from the literature presented in this paper. The possible propositions from the model are not limited to these two hypotheses; however, for further research, these can serve as the baseline point of enquiry and can be tested empirically.

Hypothesis 1: The greater the level of coherence among the governance mechanisms, the higher the level of EGIT effectiveness

Hypothesis 2: The audit of enterprise governance with C5DITAF will improve the maturity of the governance mechanisms and its coherence.

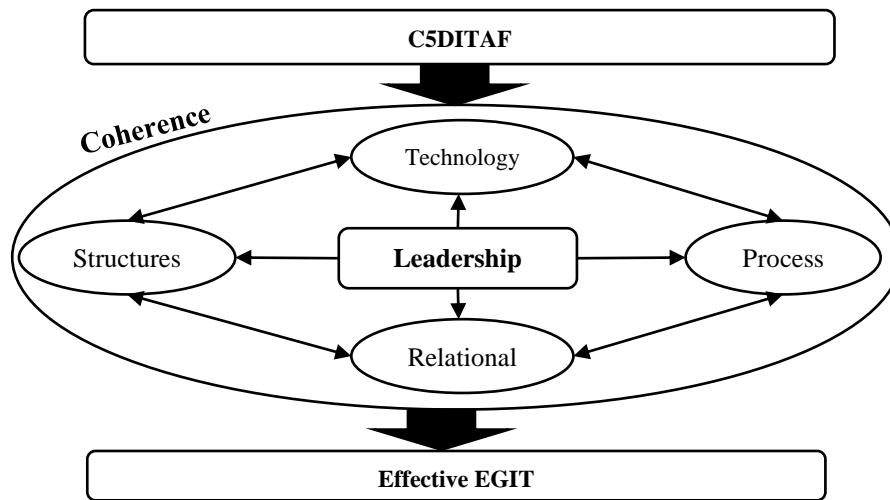


Figure 9: Conceptual Framework

3.12 Summary of Chapter

This chapter presented the theoretical foundations for the research. Extant studies on EGIT and IT auditing have been noted to be descriptive thus lacking strong theoretical foundations (Jewer & Mckay, 2012). Several theoretical perspectives have been presented to explain the complex concept of EGIT. An integrative framework based on the theoretical perspective is presented. After that, the conceptual framework is presented along with two major propositions. The next chapter presents the research methodology and design.

CHAPTER FOUR

RESEARCH METHODOLOGY

4.1 Introduction

This chapter presents the philosophical foundation that influenced the choice of the methodological approach for each stage of the thesis and design science research as a strategy for the development of the IT Audit framework. Instead of providing a detailed review of the methods or techniques involved in each of the stages applied by the research, the chapter presents an overall research approach except for the design science where a comprehensive design science process that led to the development of the artefact is elaborated. The chapter was presented in this way because the main thrust of the study is the design of the artefact. Detailed methodology for the other stages of the thesis is included in their respective chapters.

The chapter begins with a discussion of the research paradigm and makes a choice of a paradigm suitable for the study. Following that, the overall research approach for the thesis is presented. The next section presents the detailed design science process, followed by a summary of the contributions in the chapter.

4.2 Research Paradigm

The research paradigm is important for any research efforts as it establishes the philosophical foundations and defines the researcher's perspective on the assumptions about human knowledge and realities encountered in the world (Orlikowski & Baroudi, 1991). The research paradigm represents the researcher's beliefs about what is to be known and the nature of the knowledge. A chosen paradigm serves as a "set of lenses" which allows the researcher to view the study within the set of assumptions. This facilitates the integration of the intellectual utility of the paradigm with practical application of conducting empirically rigorous study (Orlikowski & Baroudi, 1991).

The philosophical assumptions regarding the nature of reality about the phenomenon under study helps to make a choice of a paradigm, which also guides the selection of the instruments and method to be used for the study (Saunders, Lewis, & Thornhill, 2009). Assumptions surrounding the ontological and epistemological as well as the methodological views assist to define a research paradigm.

Ontology is concerned with what is believed to constitute social reality. In a research study it shows the assumptions made by the researcher about the way the world operates, and the commitment held to particular views. The two major ontological stances, objectivism and subjectivism, present the two distinct views of social realities and in relation to social actors. Whereas objectivism holds the position of a single reality that exists apart from our understanding of it, subjectivism assumes multiple realities that are socially constructed based on our concept of it.

Epistemology is concerned with how reality is observed. In other words, it is concerned with how we know reality or what constitutes acceptable knowledge in a field of study. It represents the nature of knowledge and how it is demonstrated and justified (Orlikowski & Baroudi, 1991). In essence, it refers to the process of learning what reality is by examining the nature of association between the “knower” and the known. Positivists believe knowledge is measurable and can be represented in a value-free way while Interpretivists advocate that a phenomenon is not absolute, and it is necessary for the researcher to understand differences between humans in our role as social actors.

The methodological aspect of the theory of knowledge represents the techniques used by the researcher to study the reality or the mode of acquiring knowledge about the phenomenon (Saunders et al., 2009).

4.2.1 Researcher’s Philosophical Stances

The researcher adopted pragmatism as the ontological and epistemological stances. The philosophy of Pragmatism adopts a real-world practice orientation to research and refuses to join or continue the unending debate between the choice of positivist or interpretivist research philosophies. Pragmatism stands as a middle ground between the two extreme ontological stances and suggests that adopting either of the two extreme stances is unrealistic and that a more realistic approach is to modify philosophical assumptions overtime and move to a new position on the continuum (Morgan, 2014). Pragmatists argue that the assertions made by both extreme philosophical stances are equally important claims about the nature of human experience. On one hand, the nature of reality puts a limitation on experiences, on the other hand the interpretations of experiences are inherently limited by our understanding of reality.

Pragmatists, therefore, argue for context dependency, suggesting the need for a modification of the philosophical assumption based on the current actions and experiences because our

ability to use prior experience to explain and predict the outcome of current action is fallible and probabilistic (Morgan, 2014). This is because every set of experiences and circumstances that brings forth some potentially unknowable set of prior beliefs, so actions are always within some defined situation. The research question is the most important determinant of the ontology, epistemology and method. As such, both positivist and interpretivist epistemological stances are within scope, depending on the nature of the research question (Saunders et al., 2009).

The research question, “*How can an IT audit framework, driven by COBIT 5 lead to effective audits of IT Governance and effective EGIT?*” is neither objective nor subjective. Answering the sub-questions highlighted earlier would require both positivist and interpretivist assumptions. To answer the sub-question “How can a C5DITAF be designed?” would require that the researcher to be involved in the design process. Also, what the researcher knows about auditing EGIT should be negotiated, debated and interpreted throughout the iterative process. There is also the need to engage IT auditors whose opinions will be vital and continuously inform the development of the framework. In the assessment of the utility of the framework and the nature of the coherence among the governance mechanisms, an objective world-view can be adopted because in this assessment, constructs in the complex relationships can be measured and assessed with minimum involvement of the researcher. This aligns with the pragmatist argument that the researcher and the participants at some point might interact with one another while at other points the two may act separately of each other (Morgan, 2014).

4.3 Research Methods

Social science studies can generally be approached from two main perspectives, namely, inductive and deductive approaches. Inductive studies, which are mostly qualitative, use participant views to build broader themes and generate theories interconnecting the themes while deductive studies, which are mostly quantitative involve the development of hypotheses based on existing theory or conceptual framework, and research strategy is designed to test those hypotheses (Kaplan & Duchon, 1988).

Table 1: Summary of Research Methods and Activities

Research Activity	Research Activity 1	Research Activity 2	Research Activity 3	Research Activity 4
Research Question	What are the significant challenges inhibiting IT governance audits and why are they important?	What configuration of governance mechanisms will achieve an effective EGIT?	How can a COBIT 5-Driven IT audit framework be designed?	To what extent can regular audit of enterprise governance of IT based on a C5DITAF improve governance mechanisms?
Research Approach	Quantitative	Quantitative	Qualitative	Quantitative
Research Method	Delphi Technique	Survey	Design Science	Survey
Data Collection Technique	Questionnaire	Questionnaire	Focus Group	Questionnaire
Data Analysis Approach	Exploratory data analysis (EDA)	Cluster Analysis		Cluster Analysis, Tukey HSD for Unequal Sample Size

4.3.1 Research Activity One – What challenges do IT auditors face in the audit of Enterprise Governance of IT?

The first research activity seeks to explore the challenges IT auditors face in auditing EGIT. By assessing the challenges faced by auditors, the researcher would confirm the problem that necessitates the need for the development of the proposed auditing tool and identify other challenges that need to be addressed to ensure effective EGIT auditing. To identify the challenges, the study adopted the quantitative research approach using the Delphi technique. Using the Delphi research method, expert IT auditors, mostly from the Local Accra Chapter of ISACA, were contacted to provide their opinions on the challenges they face in EGIT auditing. The method is suitable for the study because of its ability to allow experts to provide clear definition to problems with or without any background literature through reflections and clarification made possible by its iterative nature (Davidson, 2013). Questionnaires were used to solicit opinions from experts iteratively to clearly establish the challenges.

4.3.2 Research Activity Two – What configuration of governance mechanisms will achieve an effective EGIT?

To answer the second research question, the study uses quantitative research approach to test the theory that the coherence of the governance mechanisms improve performance. The research was conducted prior to the use of the artefact. It seeks to understand the interactions among the governance mechanisms and the resultant effects on the governance focus areas. Here, the EGIT maturity of the selected organisations will be measured and analysed using cluster analysis to understand the pattern of configurations for the various organisations. Data will be gathered using questionnaires as the instrument. Conducting a survey is deemed appropriate because it is the most direct method of obtaining data regarding perceptions of governance mechanisms and their effectiveness. It is also appropriate because of its ability to capture large amounts of data from large respondents and is also the dominant method to capture data in most IS studies (Chen & Hirschheim, 2004).

4.3.3 Research Activity Three – How can a C5DITAF be designed?

The third research activity involves the development of the C5DITAF which will be used for the remainder of the study. To develop the framework, the researcher used the design science research methodology. The choice of Design Science Research (DSR) emanates from the researcher's philosophical stance of pragmatism. Several studies (Hevner, 2007; Hevner, March, & Park, 2004; March & Smith, 1995) have associated DSR with pragmatism philosophy, due to the nature and the emphasis on relevance with the need to make a clear contribution to the environment. Pragmatists philosophically argue against other ontological notions of truth, with the claim that truth is basically what works in practice (March & Smith, 1995). The DSR method combines knowledge from literature and experts from the industry to achieve both problem relevance and research rigour using the three-DSR cycle of Hevner, (2007)

In DSR, researchers have the aim to design the artefact, improve the design and evaluate its usefulness. This stage of the study will focus on the design and the improvement of the artefact; the evaluation of the artefact will be the focus of Research activity three. The Design Science Research (DSR) methodology developed by Peffers et al. (2008) recommends an iterative process involving the following steps: the identification of problem and its motivation, the clear definition of the objectives for a solution, design and development, demonstration, evaluation

and communication. The methodology offers the researcher an opportunity to clearly identify the contribution to knowledge and communicate the contributions to stakeholders. A focus group comprising IT auditors from the Local Accra chapter of ISACA will be used in the process of the design and improvements of the design.

4.3.4 Research Activity Four – To what extent can regular audit of enterprise governance of IT based on a C5DITAF improve governance mechanisms?

In the fourth research activity, the researcher undertakes a summative evaluation of the artefact to test the hypothesis that the auditing of governance practices with the C5DITAF will improve the maturity of the mechanisms identified in the literature. The quantitative research method will be employed utilising the questionnaire as the instrument to conduct a second survey. This survey was conducted after the use of the artefact for a period. The results was compared to the results from research activity two using both cluster analysis, and Post-Hoc (Tukey HSD for Unequal Sample Size). Cluster analysis at this stage is to understand the nature of the configurations after the use of the artefact while the Post-Hoc analysis is to understand the statistical significance of the changes that may occur.

4.4 Design Science Research

Design Science Research (DSR) in IS Research is a methodology used to develop an IT artefact and evaluate the utility of the IT artefacts with the intention to solve identified organisational problems (Peffer et al., 2008). DSR focuses on creating innovative or new artefacts by extending the boundaries of human and organisational capabilities to provide intellectual and computational tools that improve organisational capabilities (Hevner et al., 2004). The innovations created by DSR define the ideas, practices and technical capabilities which lead to the effective and efficient accomplishment of the design, implementation and the use of information systems.

The problem-solving process to design artefacts using DSR is rigorous and make a valued contribution to research through the building, application and evaluation of the artefact. Communication of the results to an appropriate academic and industry audience is central to the knowledge creation and the rigorous process to improve the artefact (Peffer et al., 2008). Artefacts developed with DSR provide tools to improve organisational capabilities such as IT audit. Design science is both a process and a product (March & Smith 1995). It involves two main processes and four main products. The two processes are the building process and the

evaluating process. In the building process, design scientists rigorously develop artefacts to solve identified, societal and organisational problems. The artefacts are then evaluated to confirm their utility to solve the identified problems in the evaluation process (March & Smith 1995). The four products of design, also known as artefacts identified by March and Smith (1995) are constructs, models, methods and instantiations. March and Smith (1995) explain that DSR contributes to the field of IS research by analysing problems faced by IS practitioners and providing them with relevant solutions.

Hevner (2007) analysed DSR as an embodiment of three closely related cycles of activities which are the relevance cycle, the rigour cycle and the design cycle. For a good DSR, the researcher is required to carefully incorporate significant levels of all the cycles. The relevance cycle sits between the DSR activities and the environment by understanding the environment (people, organisational and technical systems) to identify problems and opportunities (Hevner, 2007). The relevance cycle in essence initiates the DSR with the problem which defines acceptable criteria for the evaluation of the results. The rigour cycle links existing scientific theories, industry experiences and expertise with the design science activities to inform the direction of the study. The cycle provides existing knowledge to the project to confirm the innovativeness of the artefact. The researcher’s ability to thoroughly research and reference existing knowledge ensures that the design is not a routine design but a contribution to existing research (Hevner, 2007). The design cycle, which is at the heart of the DSR, is focused on the iteration process of developing the artefact, evaluating and using the feedback to refine the design. Hevner (2007) cautions that, though the design cycle depends on the relevance and rigour cycles, it is relatively independent during the research process.

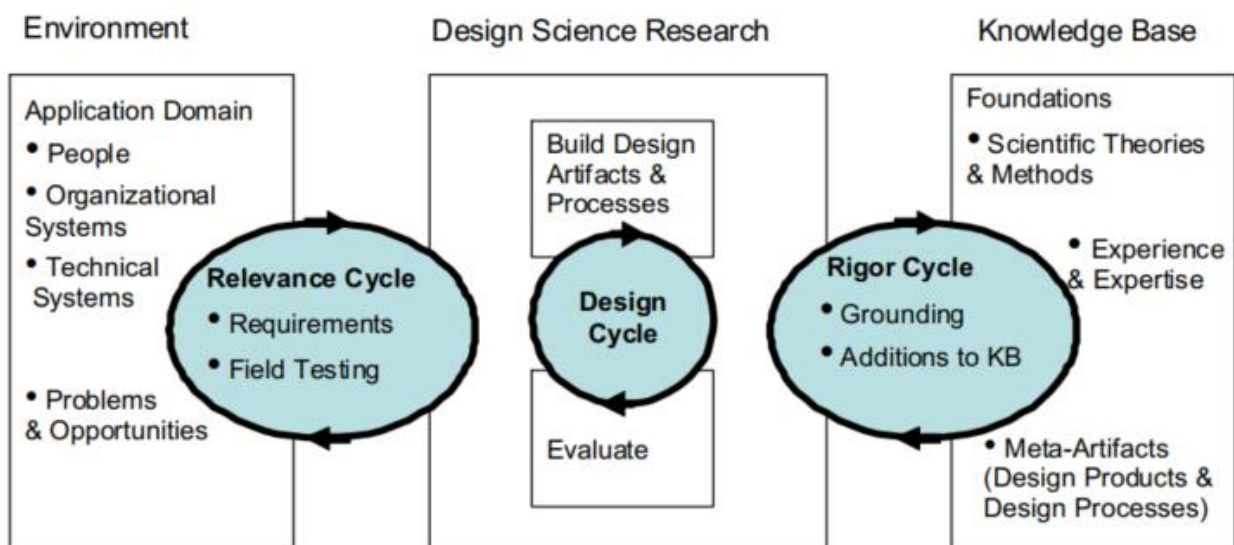


Figure 10: Design Science Research Cycles (Hevner, 2007)

4.4.1 Design Science Research Methodologies

DSR has gained wide attention among researchers in IS (Gregor & Hevner 2013; Hevner et al. 2004; March & Smith 1995; Myers & Venable 2014; Peffers et al. 2008). Several attempts have been made by researchers to provide understanding (March & Smith 1995), principles (Hevner et al., 2004) that should guide its usage, methods (road maps or process) (Hevner et al., 2004; Peffers et al., 2008), ethical considerations (Myers & Venable, 2014) and actual application of these methods and principle in the development and evaluation of IT artefacts. The attraction of attention has therefore led to the development of several methodologies that can be rigorously applied to satisfy the criteria for science. These methodologies act as intermediaries between the conceptualisation of the problems and the activities of building and evaluating the artefacts (Hevner, 2007). Despite the difference in the methodologies, they all involve, in one way or the other, activities that identify the organisational problem or requirement gathering and utilise them to guide the design and development. They also involve the process of testing which determines whether or not further iterations are required to solve the problem. Feedback from the testing process is used to refine the artefact. This study adopted the Peffers et al. (2008) DSR Process Model.

4.4.2 Application of Peffers et al. DSR Process Model (DSRPM)

In an attempt to provide clarity in DSR, Peffers et al. (2008) developed a process model to augment the principles and practice rules which had been developed by Hevner et al. (2004). The model was intended to help IS researchers to produce and present high quality DSR that is rigorous enough to provide solutions to organisational problems. The process model integrates the following six steps: problem identification and motivation, definition of the objectives for a solution, design and development, demonstration, evaluation, and communication.

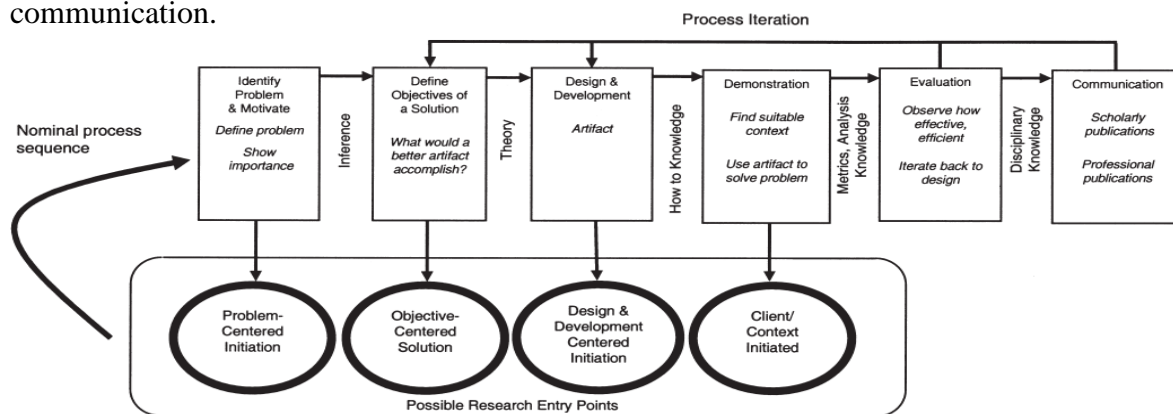


Figure 11: DSR Process Model (Peffers et al., 2008)

i. Problem Identification and Motivation

The first step, according to Peffers et al. (2008) is the definition of the research problem and the proposition of a solution to the problem. By identifying the relevant problem and showing that no adequate solution exists, the researcher is able to conceptualise the overall problem, understand its complexity and create buy-in among stakeholders, which motivates them to pursue a solution. Problem identification can emanate from multiple sources including literature, industry reports and empirical investigations.

This study is concerned with the ineffectiveness or the non-existence of IT governance mechanisms for companies within the Ghanaian Financial Services landscape, despite the increased investment in IT by shareholders. Based on the agency theory, the research alludes to the role of the auditor to ensure the effectiveness or introduction of governance mechanisms. To get a thorough understanding of the problem, the research conducted a literature review (presented in Chapter Two), which confirmed that IT auditors have failed to live up to the expectation of shareholders because they do not consider EGIT in the audit activities. The literature review helped to provide understating of the phenomenon (EGIT and IT audit), the environment and clarified the challenges auditors face in the audit of EGIT. It allowed the researcher to justify the relevance of the study and also provide an understanding of the linkages between practical issues and literature conversions.

To confirm that the problem identified from literature was applicable to the Ghanaian context, the researcher further conducted a practice-oriented empirical study using the Delphi approach (presented in Chapter Five). This Delphi study used expert IT auditors from the local Accra chapter of ISACA to identify the problems faced in EGIT audit and assess their relative importance. The problems were classified using the Integrative theoretical framework (presented in Chapter Three) as the lens. After three rounds of validation, evaluation and iterations, the experts reached a consensus on the problems faced by IT auditors.

With this stage of the model, the researcher justified the research problem and proved the need for an artefact that will aid the audit of EGIT in the industry. Developing an audit framework for auditing governance mechanisms in the industry will ensure the continued relevance of these mechanisms and their effectiveness to deliver value to shareholders and other stakeholders.

ii. Objectives for a Solution

Following the problem identification step is the stage for the development of the objectives to be incorporated into the artefact. Peffers et al. (2008) explain that the objectives of a solution should be inferred from the problem identified and the researcher's knowledge of what is possible and feasible to solve the problem. The objectives could be espoused in quantitative or qualitative terms. Quantitative objectives provide terms in which the solution would be better while the qualitative objectives provide a description of how a new artefact is expected to solve the problem.

Given the problem statement that EGIT within the Ghanaian financial services sector is not effective and the failure of auditors to audit the governance mechanisms due to the lack of auditing tools, the researcher proposes that a COBIT driven audit framework or tool can guide auditors to regularly review the governance mechanisms and offer relevant recommendations that will improve EGIT in the sector. The objectives for the tool are: 1) to facilitate the regular audit of governance mechanisms, 2) to be relevant to the financial services sector, 3) should align to the needs and expectations of shareholders and other stakeholders, 4) should be easy to use by a knowledgeable IT auditor. The research problem identified in the previous stage helped to define the objectives. Hevner and Chatterjee (2010) argue that to develop a useful and relevant artefact, its design requirement (objectives) should be gathered from the contextual environment.

iii. Design and Development of the Artefact

The design and development process involves a series of iterations beginning with the design of the artefact, evaluations of the artefact and then the feedback used to improve the artefact. According to Hevner and Chatterjee (2010), artefacts can include constructs, models, methods, or instantiations. It can also be “new properties of technical, social, and/or informational resources” (Peffers et al., 2008). This stage includes the determination of the artefact's expected functionality and its architecture and the making of the actual artefact. It involves an iterative process which continues until nothing new is to be learnt (Tremblay, Hevner, & Berndt, 2010). Although the determination of when “nothing new” is a challenging task, the researcher would at a point determine when to move forward from this stage. This is because in any development activity there is always room for improvement and determination of the completion stage of the artefact involves some subjectivity based on several factors with time

being a key factor. Resources required for the design and the development of the proposed solution is the knowledge of theory and concepts that can be used in a solution (Peppers et al., 2008).

Focus Group

For this step the researcher utilised focus groups during the design and the evaluation processes. Morgan (1997) defines 'focus group' in research as group interviews that rely on interaction within the group, based on topics that are supplied by the researcher who typically takes the role of a moderator. Focus groups differentiate from other qualitative interviews in the sense that it is not an alternation between a researcher's questions and the research participants' responses. Focus group as a research tool is widely used to investigate new ideas in many research fields including IS (Tremblay et al., 2010). Following the recommendations of Tremblay et al. (2010), focus groups in DSR have begun to gain ground. It is considered appropriate for DSR because:

1. It is *flexible* to handle a wide range of design topics and domains. This is because it can be adapted to fit several evaluation procedures.
2. It provides the researcher with *direct interaction with respondents*. Researchers can seek clarifications about the artefact and probe respondents on pertinent design issues.
3. It produces *large amount of rich, well-targeted and pre-filtered data in a short period of time*. This allows the researcher to gain deeper understanding not only of the artefact but also of other relevant issues in the industry that would impact the design.
4. The nature of the group setting presents an avenue for interactions which sometimes stimulate *emergence ideas that would not come up under individual interviews*.

In this study, the researcher utilised an Exploratory Focus Group (EFG) and a Confirmatory Focus Group (CFG) to achieve the two main research aims of DSR (Tremblay et al., 2010). EFG aids in the provision of feedback that will be used for making design improvements to the artefact. This is a vital element of a rigorous DSR. It is suitable for design projects where little is known or not thought out in detail to achieve incremental improvement in the artefacts (Tremblay et al., 2010). They provide reasons for individual experiences and opinions. On the other hand, CFGs are used in the evaluation stage to confirm the utility and efficacy of the artefact.

Recruitment of Participants

The process of selecting participants for the focus group is critical to obtaining the desired results. Morgan (1997) argued that poor recruitment practices are the main sources of problems in focus groups and espoused following careful procedures to ensure that the selection is not random, and participants show up for the group. Tremblay et al. (2010) also recommended that participants in focus groups in DSR should be selected based on their characteristics in relation to the domain. They should be familiar with the topics to effectively contribute to the refinement and evaluation of the artefact (Tremblay et al., 2010). Several other issues need to be considered in the recruitment of the participants, such as the need for diversity, size of the group and their familiarity with the researcher. Participants with diverse backgrounds can potentially ignite creative ideas. However, groups which are too diverse may result in the development of an artefact with insufficient depth (Tremblay et al., 2010). Morgan (1997) claimed that the smaller and more diverse the group, the greater the participation from each participant, and recommended a lower limit of four and an upper limit of twelve participants. Participants who are less familiar with the researcher are much preferred because familiar participants may take for granted certain pertinent assumptions that will affect the design (Morgan, 1997).

In the recruitment of EFG participants for this study, the researcher established three criteria to use. First the participant should be in the financial services sector. In addition, participants must be at the level of senior management and above in the areas of auditing, Legal, IT and compliance. Lastly, participants must confirm their willingness to participate in the group. Using the member database from the Local Accra chapter which was provided by the chapter executives for the study, the researcher contacted six individuals to participate in the EFG for the DSR.

Table 2: List of EFG Members and Credentials

Gender	Current Position	Years of Experience	Level of Education
Male	Internal Auditor	12 years	MBA (Accounting), Chartered Accountant
Male	IT Auditor	8 Years	Certified Information Systems Auditor (CISA), MSc (MIS)
Female	Compliance Officer	6 Years	Lawyer
Male	IT Manager	9 Years	MSc Information Technology
Female	IT Auditor	15 Years	CISA, BSc Information Technology
Male	Internal Auditor	9 Years	MBA (Accounting)

iv. Demonstration of Designed Artefact

To ensure that the designed artefact can solve the problems identified in the first stage, it has to be applied. With this step the researcher is able to determine the use of the artefact to solve one or more instances of the problem (Peffer et al., 2008). The demonstration could be in the form of an experiment, case study or simulation. In this study, a case study would be used. One important requirement for this stage is the effective knowledge of how the artefact can be used to solve the identified problem. Demonstration can be done with a single act of demonstration to prove the efficacy or through formal evaluation procedures (Peffer et al., 2008). To demonstrate the proper application of the developed audit tool, it would be given to selected IT auditors who would use it as part of their audit program over a period of time.

v. Evaluation of Designed Artefact

Evaluation refers to the process of observing and assessing the efficacy of the developed artefact. During this stage the objectives of a solution proposed in activity two is compared to the actual observed results based on the demonstration of the artefact. Evaluation could be done in many ways, depending on the nature of the problem and the artefact. It could be qualitative or quantitative using evaluation methods such as case study, action research, experiment or any form of empirical evidence or logical approach that will confirm that the artefact meet the objectives (Hevner et al., 2004). The evaluation process provides an analysis of the hypotheses about the behaviour of the artefact with evaluation criteria that are made explicit in the objective of the solution phase (Vaishnavi & Kuechler, 2012). It also substantiates the quality of the knowledge outcomes by providing evidence that the theory that led to the development of the artefact is useful. It further elaborates the knowledge outcomes by providing boundary reasons why an artefact works or not (Kuechler & Vaishnavi, 2008).

The evaluation process at this stage can contribute to all the three cycles espoused by Hevner (2007). For the relevance cycle, evaluation is focused on appraising the efficacy of the artefact in relation to the environment. An application of the artefact in a real business environment provides stronger evidence to its efficacy. For the rigour cycle, the focus extends to the contribution of the artefact to the knowledge base and, for the design cycle, the focus is on the improvement of the artefact (Hevner, 2007). The multi-purpose nature of evaluation qualifies DSR as a scientific method which is relevant and rigorous.

Venable, Pries-Heje, and Baskerville's (2016) concepts of formative and summative evaluation were used. Formative evaluation is designed and used to assess empirically the artefact to provide a basis to improve the artefact while summative evaluation is designed purposely to assess empirically the utility of the artefact in relation to the objectives. In this study, formative evaluation would involve experts in a Confirmatory Focus Group (CFG) who would assess the framework and provide feedback for improving the framework. The auditors will provide their perceptions about the perceived usefulness and perceived ease of use of the artefact. Qualitative data, mainly through the CFG, were collected in a team of four Certified Information Systems auditors. The researcher's supervisor, who is also an expert in IT Governance, provided useful feedback at this stage which was included in the evaluation. At the end of the evaluation the researcher determined the need to go through another iteration, with the aim to automate the designed artefact to make it easier to use.

The recruitment process of participants in the CFG for the evaluation process was similar to the process used in the EFG. However, at this stage, the researcher opted to use only IT auditors because they are the actual users of the artefacts. A different set of members were consulted to participate in the CFG to ensure that they provided an independent assessment of the artefact.

Summative evaluation was the focus of research activity four which assessed the extent of change in the enterprise after the usage of the framework for auditing. The EGIT maturity of the case companies was measured, and its coherence assessed prior to the usage of the artefact. The artefact was then given to IT auditors to use over a period. The EGIT maturity of the case companies and its coherences were reassessed after seven months. A comparison of the difference in the maturity levels and how the coherence influenced effective EGIT is presented in Chapter Eight.

vi. Communication of the Design Science Study

After the evaluation of the artefact, the result would be communicated to researchers and practitioners. This communication provides an opportunity for the researcher to explain the problem and its relevance, the nature of the artefact, the rigour of the design, and the efficacy of the artefact to relevant researchers and practitioners (Peppers et al., 2008). This thesis was used as the main avenue to communicate the result of the evaluation. However, as a member of the local Accra chapter of ISACA, researcher has requested an avenue to present portions of the study in the monthly meetings to other practitioners who were not involved in the project.

This has not been done to date but is expected to be done as soon as the opportunity is made available. Sections of the thesis were also published in highly ranked academic conferences.

4.5 Ethical Considerations

To prevent problems in data collection and ensure trust between the researcher and participants, ethical considerations must be made. Ethical consideration involves deciding in advance how information would be handled (Saunders et al., 2009). To do that, there is the need to have informed consent from participants, review board approval and confidentiality of the information provided by participants. Ethical considerations were made at each stage of the study. To ensure ethical research, the proposal should be reviewed and approved by a review board at the University level (Saunders et al., 2009). The University of Cape Town Ethics Committee reviewed and approved the ethics for the study. The research proceeded to data collection after the approval by the Ethics Committee. The researcher also sought approval from the executives of ISACA, local Accra chapter to gain access to its members who are mostly auditors and IT personnel. The researcher also sought approval from the case companies.

Critical issues for potential ethical concern in the use of focus groups in DSR are disclosure of confidential information and the issue of intellectual property. The sensitive nature of the information needed for the DSR makes accessibility to necessary data difficult. Despite the fact that auditors and other senior managers consider the need for the tool, the participants in the EFG and CFG also believe that disclosing critical information about their organisation may lead to disclosing competitive information or embarrassing information about their organisations. Before each EFG and CFG session, participants were informed against disclosing confidential information relating to their organisations. Participants at the group recommended that to prevent any issue, the group discussion should not be audio recorded. This was agreed and complied. With the nature of the topic under discussion, it is highly possible for participants to disclose some issues which in their knowledge may not be confidential but in fact are confidential. This research also utilised anonymous questionnaires as the source for data for the summative evaluation of the efficacy and utility of the artefact instead of face-to-face interviews.

4.6 Summary of Chapter

This chapter has explained the research methodology, paradigm and ontological stances of the researcher. It provided a detailed explanation of the philosophical underpinnings of the research and justification for the key decisions made in the research design, including the use of a mixed-methods approach and development of study. The chapter discussed design science research, the choice of Peffers et al., (2008) DSR methodology and a detailed presentation of how it was applied in this study. The quantitative research method was used in the problem identification phase, while both quantitative and qualitative methods were adopted in the formative and summative evaluation of the artefact. Overall, this chapter described how this research was conducted. The next chapter describes the problem awareness and identification.

CHAPTER FIVE

EGIT AUDITING CHALLENGES

5.1 Introduction

This chapter explores the challenges faced by IT auditors in conducting EGIT audits. The input of this study helps in the problem identification that necessitates the need for a COBIT 5 tool. For this research activity, a Delphi research approach was used to build up a consensus among experts regarding a validated list of challenges.

The research methodology and procedure used are presented in the next section, followed by a literature review of the challenges which was used as the initial list of challenges to be validated. The results of the three-round Delphi are also presented, and following that, a discussion of the results.

5.2 Research Method, Data Collection

The researcher adopted a practice-based research approach (Delphi Technique) which orientates towards mapping expert opinions. This is due to the general low level of theoretical and empirical grounding for EGIT audit challenges literature, especially within the African context. The chosen Delphi study method is often used in academic research in the field of information systems to gather pertinent issues and to explore an emerging topic (Okoli & Pawlowski, 2004; Schmidt, 1997; Skinner, Nelson, Chin, & Land, 2015). This study also combines the Delphi study with detailed review of literature and theoretical foundation to gain a complete understanding of the subject matter (Skinner et al., 2015). Linstone and Turoff, (1975) defined Delphi Technique as “a method for structuring a group communication process so that the process is effective in allowing a group of individuals, as a whole, to deal with a complex problem”. The aim of the technique is mainly to achieve consensus through the utilisation of questionnaires and the provision of feedback to participants who are considered experts in the field of study.

As a first step, the study explored the literature domain of EGIT and its audits by conducting a detailed literature review and forming a theoretical foundation for understanding the concepts and identifying an initial list of challenges that might be encountered. Following this activity, the Delphi study commenced with the selection of experts. The selection of experts was limited

to inviting experts who are practitioners and as such members of the ISACA Accra local chapter. The selected experts were from different types of entities both public and private, of reasonable size and have good level of experience. Entities included Banks, Telecommunication companies, government ministries etc. The local chapter of ISACA approved the use of its members for the purpose of the study. The selection was done using the database of members provided by the association. The researchers set a minimum level of five years of experience in the area of IT/systems auditing and control in order to qualify as an expert. The researcher chose to include IT practitioners/experts not necessarily working as auditors or control officers but with considerable experience in the management and governance of IT in their respective organisations. This was to enrich the opinion and not skew it towards the views of the auditors only and also to enhance the group decision-making process. Members were ranked based on their area of expertise, years of experience and background. Experts were contacted to seek their consent to participate in the study in the order of the rankings. This selection process was consistent with the process recommended in literature (Okoli & Pawlowski, 2004; Schmidt, 1997).

For a focused Delphi study, 10 to 15 experts are considered adequate to participate (Okoli & Pawlowski, 2004). The researcher therefore invited 46 experts for the study of whom 35 accepted the invitation and consented to participate in the study. The IT auditors or control officers panel included 18 experts while the IT management panel had 17 experts. Due to work schedules of the experts in the field of studies, the researchers gave them ample time to complete and submit the questionnaires for the three rounds of iteration. The first questionnaire for round one was focused on identifying and validating the list of audit challenges. The second round focused on rating the perceived impact of the challenges, the perceived effort to address the challenge, and ranking of the challenges in order of importance. The third round was undertaken to ensure that consensus was achieved within the expert panels.

The experts were allowed five days to complete the questionnaire at each round, given the complex nature of the subject matter. For the first round the experts were provided with the initial list of EGIT audit challenges and were asked to validate these by ticking their suitability to their respective organisations. The experts were also given the opportunity to add more challenges where they felt necessary. The initial list of challenges were identified based on the detailed literature review conducted and segregated using integrated framework for EGIT audits developed in Chapter Three.

For the second and third rounds, the experts were required to rate on a 6-point scale, for each of the initial list and added list of EGIT audit challenges, the “perceived impact” (0 = no impact, 5 = high impact) and the “perceived effort to address” (0 = no effort, 5 = high effort). Then they were asked to take the previous attributes of impact, effort to address, and personal experience into account in order to provide their perception of the top-10 EGIT audit challenges.

The Delphi technique used in this study is strong in achieving content validity and reliability. The content validity is improved by developing data collection instrument that is informed by literature and including IT experts from ISACA who are knowledgeable on IT governance and its auditing. The iterative process in round two and three gave the panel of experts the opportunity to review their responses further increasing the content validity of the instrument. With the anonymous approach, the survey enhanced the instrument’s reliability because the panel of experts engaged in the decision-making process without any face-to-face interaction thereby eliminating any form of group bias or group thinking. The three rounds of iteration also improved the reliability of the findings. Reliability was computed independently for rounds 2 and 3 of the Delphi process. Cronbach’s alpha was above the required threshold 0.7 for both rounds with 0.926 for round 2 and 0.946 for round 3.

5.3 Theoretical Review of EGIT Auditing Challenges

The integrative framework presented in Chapter Three was used as the lens in the review of EGIT audit literature to form the initial list of challenges. The theoretical basis for the mechanisms informed the selection of the challenges from literature and its categorisation. The literature review was done based on the overall IT governance concept and the underlying concepts captured in the integrative framework. Below is a detailed explanation for initial list of challenges from the literature reviewed.

Weak Reporting Lines: Audit independence is a crucial requirement for all auditing standards. Reporting lines influence the independence of the auditor; for instance if the IT auditor reports to the Chief Information Officer (CIO), it would be difficult to audit the governance activities of the CIO and remain independent (Coderre & Lohyer, 2011). In the fifth annual IT Audit Benchmarking Survey of over 1200 professionals towards the identification of challenges facing the IT audit profession, Brand (2016) found that although the majority of the enterprises surveyed had a designated IT Audit Director or equivalent

position within their organisations, in half of all these enterprises, these individuals do not attend audit committee meetings and have reporting lines that are considered less optimal instead of the ideal situation of reporting to the Chief Audit Officer (CAO). The less ideal reporting lines do not empower IT auditors to move beyond their limited scope of technical audits into the strategic directions.

Inadequate Top Management Support: Just in any systems development or implementation efforts, a critical factor to ensure IT auditing success is the role of top management and Board oversight. Despite its importance to the overall governance effectiveness Merhout and Havelka, (2008) explain that top management usually considers IT auditing as only a “necessary evil” or is sometimes completely overlooked top management. This is mostly because the actual value for the auditing is usually not expressed in monetary terms. Without the utmost support of top management for IT auditing, several repeated audit findings would be left unresolved because management lack the will to implement the recommendations (Motubatse, Barac, & Odendaal, 2015).

Ill-Established Internal Audits Units: Theoretically, internal audit units are set up to help management to improve performance activities. A well-instituted internal audit unit has a robust IT audit function to augment operational risk analysis and review IT governance and management activities. In a review of 40 federal government ministries, departments and agencies in Malaysia, Ali et al., (2012) revealed that internal audit units are not fully set up with the required complement of staff and the diverse skill-set needed to undertake overall review of enterprise activities.

Accountability for IT Services: According to Webb, Pollard, and Ridley, (2006), good corporate governance structures provides accountability commensurate with risks. Effective governance structures require the existence of codes or rules of conduct, clear depictions of function with commensurate authority to effect sanctions and regular assessment of actions against established rules to guide management actions (Schlenker et al., 1994). As a starting point for this study, the apparent lack of accountability for IT management makes the efforts of IT audits insignificant or unimportant.

Influence of Audit Committees: The role of the audit committee in governance has been highly researched. Studies (Barišić & Tušek, 2016; Motubatse et al., 2015) have established

the increased need for the audit committee to exert significant influence to ensure the independence of IT auditors and the integrity of internal controls.

Board Commitment to IT Governance: The commitment of the board has been studied to be a critical requirement for the effective IT governance. Just as in the case of the strategic choice theory, the internal characteristics of the board affects its ability to make reasonable decisions (Whittington, 1988). A board with a low level of commitment towards EGIT will, therefore, not make significant commitment toward strategic alignment of IT and business by ensuring regular audit of the governance activities to ensure its effectiveness (Wilkin & Chenhall, 2010).

Poor Control Environment: 'Control environment' as a term refers to the integrity, values, attitude or philosophy of management and employees on controls. A strong control environment is established through the demonstration of high ethical standards and integrity, the implementation of clear policies and procedures, and the continuous monitoring or auditing of activities to ensure that they are within the stated policies (Barišić & Tušek, 2016). Management structures with strong ethical standards at the top create a favourable 'tone at the top' which affects the universal ethical awareness in the company.

Audit Charter: Section SISA 010 of the Information Systems Audit and Control Association (ISACA) auditing standards, requires that the responsibility, authority and accountability of the IS audit function should be appropriately documented in the audit charter without which the activities of the IS auditor can be questioned, or completely ignored by top management without any consequences (Yang & Guan, 2004).

Poor Training Arrangements for IT Auditors: The auditing profession requires strong ethical standards and competencies that should be regularly updated to ensure continued relevance. Continuous professional development is a major requirement for certification by major certification bodies such as ISACA. Especially with the IT environment where significant changes occur within short period of time, the need to regularly train IT auditors to make relevant contributions toward EGIT has been studied and found to be critical to ensure overall effectiveness. Merhout and Havelka's (2008) study into the quality of IT auditors confirmed earlier studies that audit team training is a factor that significantly affects the overall audit quality.

Non-Technical Skills Set: IT auditors work at the intersection between the IT systems and the people who specify, develop, implement, use, manage, and maintain them, and thus need to be

competent and comfortable with both aspects (Hinson, 2007). In the assessment of technical system weaknesses, for instance, the auditor requires a solid comprehension of the technology to identify and describe genuine technical issues. However, with the evolved strategic role, the IT auditor is expected to have a broad range of knowledge about the regulatory, competitive and other external environments that affect the enterprise as well as a full knowledge of the internal resource capabilities of the enterprise (Zororo, 2014). Because of high levels of interactions at the strategic level, IT auditors are also required to have behavioural skills, such as good communication skills, leadership and attitudes favouring the continuous learning of new technologies and the examination of IT risks. D'Onza et al. (2015) recognised that most existing IT auditors possess the technical set of skills as against the non-technical sets. Inadequate non-technical skills mean that the IT auditor would focus too deeply on technology and as such would be unable to bridge the IT and business as well as miss the wider organisational context and human issues, hence neglecting important business risks (Hinson, 2007).

Cooperation from Business and IT Functions: One main objective of EGIT is to ensure strategic alignment of IT and business objectives. EGIT auditing, as such, stands at the intersection of both IT and business management to ensure that both are working to achieve overall company objectives (Merhout & Havelka, 2008). This requires cooperation from both functions, without which audit findings may not result in any meaningful recommendations.

Expectation Gap between Perceptions of EGIT Audit and Actual EGIT Audit Practices: As a concept, audit the expectation gap has been critically analysed from different perspectives within the auditing and/or accounting literature. Inadequate user understanding of the purpose of auditing has been raised as a factor for the gap between what management expects and the actual objective of audits is (Babonyire, Nana Yaw Simpson, & Mensah Onumah, 2009). The stand-off in perceptions may hinder the overall audit process due to lack of cooperation of possible mistrust.

Regulatory Requirement for EGIT Audits: Industry regulation usually puts pressure on management to ensure that audits are undertaken, and recommendations are implemented to safeguard shareholders interest. Regulations in it form complement governance activities by exerting pressure on firms to adopt effective monitoring or auditing structures (Becher & Frye, 2011).

Formalised IT Processes and Policies: The core of auditing is the review of formalised processes with which actions can be matched to identify discrepancies. Though best practices exist and can be adopted, a clear formalisation and institutionalisation of strategic IT decision procedures will ensure that the monitoring of daily activities is streamlined to provide input back into decisions (De Haes & Van Grembergen, 2015). These formalised processes are enshrined in policy documents approved by the Board for use within the enterprise. Without formalised processes and properly documented policies, actions will not be consistent and strategic IT decision-making processes may not follow a coherent approach to ensure achievement of objectives.

Non-Compliance with Known Governance Frameworks: EGIT strongly emphasises the need for alignment between business and IT functions. It requires both IT and business functions to be jointly accountable and responsible for the achievement of strategic IT objectives (Afzali, Azmayandeh, Nassiri, & Shabgahi, 2010). To manage this effectively, governance frameworks such as COBIT, ITIL, and ISO have been developed to provide some coherence in the management of IT and business functions to achieve the strategic IT objectives. A key part of these frameworks is the requirement to ensure continuous monitoring of governance activities (Afzali et al., 2010). However, compliance with these frameworks have been studied to be an enormous task requiring huge financial commitments (Lovaas & Wagner, 2012). Non-compliance with the framework can therefore, hinder EGIT auditing activities due to the lack of a coherent approach to EGIT.

Inadequate Budget Support for IT Governance Audits: The complexities of EGIT make its auditing and monitoring a daunting task requiring high competencies and skills that are not readily available. To effectively provide assurance of the effectiveness of governance processes, the IT audit team need to be fully equipped with the requisite human, financial and other resources. Budget constraints for auditing according to Cohen and Sayag, (2010) are mostly due to the lack of top management support and poor management commitment to effective audits. With low budgets the quality of the audit is hugely affected (Merhout & Havelka, 2008).

Table 3: Summary of the challenges from previous research

Group	Index	EGIT Audit Challenge	Literature Reference
Structures	S1	Weak Reporting Lines (e.g. IT auditor report to CIO)	(Brand 2016)

	S2	Inadequate Top Management support for extensive IT governance auditing programs.	(Merhout and Havelka 2008)
	S3	Ill-established internal audits units	(Merhout and Havelka 2008)
	S4	Lack of accountability for IT services	(Webb et al. 2006)
Leadership	L1	Reduced influence of audit committees	(Barišić and Tušek 2016)
	L2	Lack of board commitment to IT governance	(Wilkin and Chenhall 2010)
	L3	Poor Control environment (i.e. the philosophy of Leadership does not favour governance audit)	(Barišić and Tušek 2016)
	L4	Audit charter does clearly authorise IT Governance audits / No Audit charter	(Yang and Guan 2004)
Relational Mechanisms	R1	Poor training arrangements for IT auditors	(Merhout and Havelka 2008)
	R2	Lack of necessary skills and competencies to undertake effective IT governance audits	(D'Onza et al. 2015; Zororo 2014)
	R3	Lack of cooperation from both business and IT functions	(Merhout and Havelka 2008)
	R4	Expectation gap between perceptions of IT Governance audit and actual ITG audit practices	(Babonyire et al. 2009)
Processes	P1	No regulatory requirement for IT Governance Audits from the company code, stock exchange requirements, etc.	(Simpson 2014)
	P2	Lack of formalised IT Processes within the organisation	(De Haes and Van Grembergen 2009)
	P3	Lack of IT Governance policies	(De Haes and Van Grembergen 2009)
	P4	Non-compliance with known Governance frameworks COBIT, and ISO	(Lovaas and Wagner 2012)
	P5	Inadequate budget support for IT Governance audits	(Merhout and Havelka 2008)
Technology	T1	Fast emerging technology and infrastructure changes	(Merhout and Havelka 2008)
	T2	Lack of developed auditing tools to keep pace with changes	(Omari et al. 2013)
	T3	Lack of electronic audit evidence	(Merhout and Havelka 2008)

5.4 Analysis of Findings

5.4.1 Round One – Validating and Discovery of EGIT auditing Challenges in Ghana

At this issue discovery or brainstorming stage, experts were asked to validate the list of challenges and add more perceived challenges as applicable to their organisation and within

the Ghanaian context. Experts were also required to provide a clear explanation of the added challenges. Based on the results of the questionnaire, all the initial 20 lists of challenges were validated and included as part of the revised list for the second round. A challenge is considered validated if at least one expert agrees that it is applicable within the context. Suggestions for new challenges were made for addition. The results were collated, structured and analysed. Obvious duplicates were removed and necessary reclassification under the constructs within the conceptual framework were made. In all, seven additional challenges were added to the initial list to generate the extended list use for the round 2.

5.4.2 Round Two – Evaluating the Extended List of Challenges

To evaluate the challenges validated in the earlier round, experts were required to rate the challenges along three strands (i.e. perceived impact of the challenge, perceived effort to address the challenge and rank the challenges). The researcher found out whether there were large differences between the responses of the two expert panels. The arithmetic mean of the responses grouped into the two expert panels was used as the dataset for SPSS for the analysis of Kendall’s tau. Kendall’s tau values, which measure the level of consensus between the panels and among the groups, in this round showed some mixed results. The values for both Perceived Impact and Perceived Effort were below the threshold of 0.5 which according to Okoli and Pawlowski (2004) and Schmidt (1997) shows low level of agreement between the panels. The rankings of the relative importance of challenges, however, showed a positive and significant value of 0.677, considered to be a moderate level of consensus between the panels. Due to the low consensus in this round for both the Perceived Impact and Perceived Efforts the researcher conducted round 3 of the survey. This time, experts were given the total arithmetic mean and asked to re-evaluate the challenges along the same strands.

Table 4: Round Two Kendall’s Tau values for Perceived Impact of the Challenges

			Perceived Impact Panel 2	Perceived Impact Panel 1
Kendall's tau_b	PerceivedImpact2	Correlation Coefficient	1.000	.321*
		Sig. (2-tailed)	.	.022
		N	27	27
	PerceivedImpact1	Correlation Coefficient	.321*	1.000
		Sig. (2-tailed)	.022	.
		N	27	27

*. Correlation is significant at the 0.05 level (2-tailed).

Table 5: Round Two Kendall’s Tau values for Perceived Efforts to address the Challenges

			Perceived Effort Panel 2	Perceived Effort Panel 1
Kendall's tau_b	PerceivedEffort2	Correlation Coefficient	1.000	.104
		Sig. (2-tailed)	.	.452
		N	27	27
	PerceivedEffort1	Correlation Coefficient	.104	1.000
		Sig. (2-tailed)	.452	.
		N	27	27

Table 6: Round Two Kendall’s Tau values for Ranking of the Challenges in order of importance

			Ranking Panel 2	Ranking Panel 1
Kendall's tau_b	Ranking2	Correlation Coefficient	1.000	.677**
		Sig. (2-tailed)	.	.000
		N	27	27
	Ranking1	Correlation Coefficient	.677**	1.000
		Sig. (2-tailed)	.000	.
		N	27	27

** . Correlation is significant at the 0.01 level (2-tailed).

5.4.3 Round Three – Re -Evaluating the Extended List of Challenges

The results from the round 3 showed significant consensus between the panel of experts along the three strands of evaluating factors. Schmidt, (1997) recommends that values between 0.5 and 0.7 show moderate-level agreement between the panel while, between 0.7 and 0.9 shows strong agreement. The results indicate that after a re-evaluation of the factors, the panel of experts strongly agreed (0.773, sig 0.00) on the impact of the challenges but moderately agreed (0.553, sig 0.00) on the efforts required to address the challenges. With regards to the ranking of the order of importance of the challenges the results show that the experts strongly agreed and therefore a consensus was reached.

Table 7: Round Three Kendall's Tau values for Perceived Impact of the Challenges

			Perceived Impact Panel 2	Perceived Impact Panel 1
Kendall's tau_b	PerceivedImpact2	Correlation Coefficient	1.000	.773**
		Sig. (2-tailed)	.	.000
		N	27	27
	PerceivedImpact1	Correlation Coefficient	.773**	1.000
		Sig. (2-tailed)	.000	.
		N	27	27

** . Correlation is significant at the 0.01 level (2-tailed).

Table 8: Round Three Kendall's Tau values for Perceived Efforts to address the Challenges

			Perceived Effort Panel 2	Perceived Effort Panel 1
Kendall's tau_b	PerceivedEffort2	Correlation Coefficient	1.000	.553**
		Sig. (2-tailed)	.	.000
		N	27	27
	PerceivedEffort1	Correlation Coefficient	.553**	1.000
		Sig. (2-tailed)	.000	.
		N	27	27

** . Correlation is significant at the 0.01 level (2-tailed).

Table 9: Round Three Kendall's Tau values for Ranking of the Challenges in order of importance

			Ranking Panel 2	Ranking Panel 1
Kendall's tau_b	Ranking2	Correlation Coefficient	1.000	.761**
		Sig. (2-tailed)	.	.000
		N	27	27
	Ranking1	Correlation Coefficient	.761**	1.000
		Sig. (2-tailed)	.000	.
		N	27	27

** . Correlation is significant at the 0.01 level (2-tailed).

5.5 Discussions of Findings

From the analysis of the responses, the findings show that the panel of experts validated, identified and evaluated some of the EGIT audit challenges as having higher impact or requiring more effort to address than others. The result strongly emphasised the impact of leadership mechanisms and their ability to impact and influence the effective audit of EGIT. It should be recalled that the objective of this study was to examine expert opinion on the challenges that impede EGIT auditing and their relative importance. The results from the Delphi study revealed the critical need to address the challenges categorised in accordance with the constructs in the integrative EGIT framework. Leadership challenges stand out as dominant in all three strands of evaluations because three out of the top five challenges (on all three strands) relate to the Board of Directors and how their activities and attitudes influence the effectiveness of EGIT audits. This result supports several studies (Coertze & Von Solms, 2014; Jewer & Mckay, 2012) in information systems which require top management support and board involvement in IT Governance and Management activities. The findings also agree with the theoretical assertions made in the integrative IT Governance framework that the effective leadership is required to drive strategy and ensure the effectiveness of the overall IT Governance activities.

It was surprising that within the context of Ghana, none of the challenges related to processes and relational mechanisms fell within the top 10 challenges. While many researchers in literature have emphasised the relative importance of these mechanisms, the experts conceded they do not pose a major challenge in the EGIT auditing compared to Leadership, Structures and Technology. With regards to the relational mechanisms, the findings coincide with the study of De Haes and Van Grembergen, (2009) which reported a low level of implementation of relational mechanisms. They explained that this was due to the lack of knowledge and expertise on relational issues which are informal and intangible. This may imply that experts focus very little attention on relational mechanisms. The results also depict that challenges related to structures and relational mechanisms were easier to address because they did not require significant effort as compared to the other mechanisms. The findings supports earlier findings of De Haes and Van Grembergen, (2009) that structures and relational mechanisms are easier to implement.

Table 10: Validated List of EGIT audit Challenges

Mechanisms	Index	Challenge	Perceive Impact(0-5)	Perceived Efforts(0-5)	Relative Importance
Structures	S1	Weak Reporting Lines (e.g. IT auditor report to CIO)	3.06	1.69	13 th
	S2	Inadequate Top Management support for extensive IT governance auditing programs.	3.17	1.89	8 th
	S3	Ill-established internal audits units	2.46	1.74	14 th
	S4	Lack of accountability for IT services	1.40	1.31	12 th
	S5	No IT steering committee to ensure effective implementation of audit recommendations.	2.49	1.66	5 th
Leadership Mechanisms	L1	Reduced influence of audit committees	2.97	3.23	10 th
	L2	Lack of board commitment to IT governance	3.14	3.29	7 th
	L3	Poor Control environment (i.e. the philosophy of Leadership does not favour governance audit)	1.77	3.46	9 th
	L4	Audit charter does clearly authorise IT Governance audits /No Audit charter	3.29	3.23	2 nd
	L5	Poor IT Knowledge for Board audit committee members	3.94	2.74	4 th
	L6	Board activities only a rubber stamp on management actions (Very little due diligence on management activities)	3.00	2.89	1 st
	L7	Board members do not devote much attention to audit reports	2.91	3.03	6 th
Relational Mechanisms	R1	Poor training arrangements for IT auditors	2.26	2.66	11 th
	R2	Lack of necessary skills and competencies to undertake effective IT governance audits	1.60	1.34	16 th
	R3	Lack of cooperation from both business and IT functions	2.89	1.60	26 th
	R4	Expectation gap between perceptions of IT Governance audit and actual ITG audit practices	0.77	1.57	18 th
	R5	Lack of independence and Objectivity due to familiarity with Top Management.	2.80	2.26	20 th
Processes	P1	No regulatory requirement for IT Governance audits from the company code, stock exchange requirements, etc.	3.06	3.37	19 th
	P2	Lack of formalised IT Processes within the organisation	2.29	2.57	17 th
	P3	Lack of IT Governance policies	1.80	2.29	27 th
	P4	Non-compliance with known Governance frameworks COBIT and ISO	2.71	3.31	22 nd
	P5	Inadequate budget support for IT Governance audits	2.43	2.03	21 st
	P6	Poor access to vital information	3.49	2.66	24 th
	P7	Lack of proper risk assessment	3.11	2.94	15 th
Technology	T1	Fast emerging technology and infrastructure changes	2.49	1.43	23 rd
	T2	Lack of developed auditing tools to keep pace with changes	2.83	2.69	3 rd
	T3	Lack of electronic audit evidence	0.80	1.26	25 th

5.5.1 Top Five Challenges based on the Perceived Impact

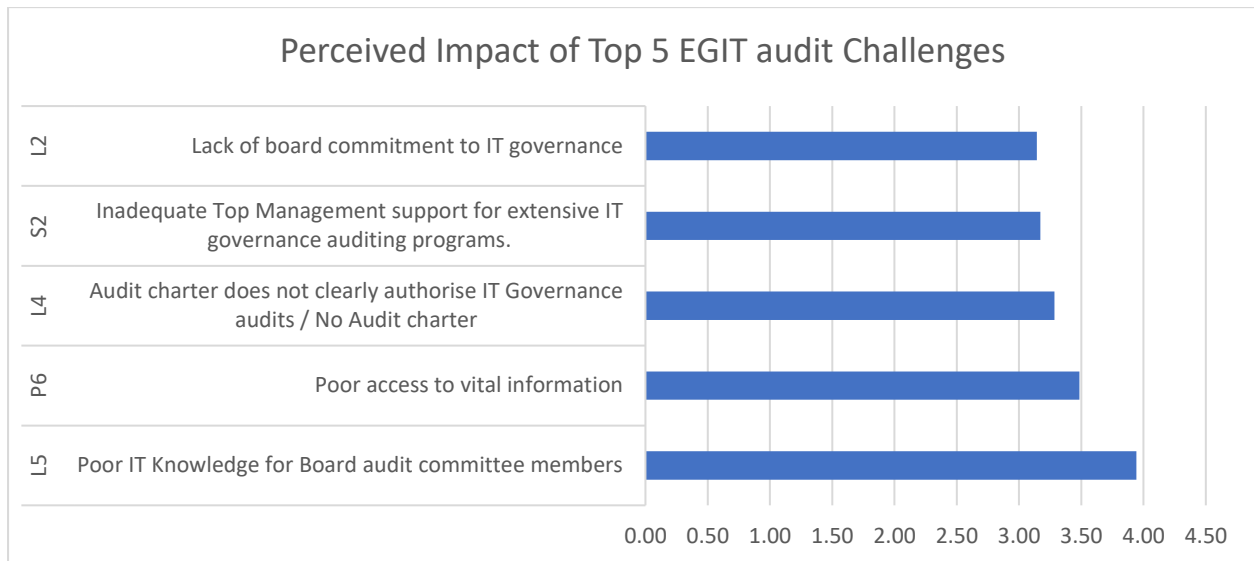


Figure 12: Top Five Challenges based on Perceived Impact

The panels of experts agreed that within the context of Ghana, “poor level of IT knowledge for board audit committee members” had the greatest impact on EGIT auditing with an average mean of 3.94 on the Likert scale. This finding agrees with studies by Moeller (2013) and Tušeka,(2015) which have concluded that the Audit Committee plays a pivotal role in the overall Enterprise Governance, especially IT Governance. The committee is required to ensure the independence of auditors and the objectivity of reports by creating and overseeing a control environment good enough to foster EGIT audits (Moeller, 2013). Several Enterprise Governance frameworks recommend the dominance of finance and accounting experts on the Audit Committee; however, the pervasiveness of IT and its importance in business and society make it necessary to emphasise that having only finance and accounting experts might not ensure the achievement of IT objectives, making it necessary to improve this approach and recommend the need for companies to also encourage IT experts on Audit Committees to enhance the oversight role of the audit committee on all audits whether finance-related or IT-related.

With an average mean of 3.49, the expert panels conceded that the “poor access to vital information” was the second most important challenge in Ghana, based on its impact on EGIT auditing. It is imperative to note that auditing EGIT is not a typical system audit and as such, requires much more information which is usually concentrated among top management and the Board of Directors. In the instance of any hindrance in accessing the information, the entire scope of the audit is limited. Limitation of scope on audits renders EGIT auditing ineffective

and unproductive in ensuring that stakeholders’ interests are protected (Merhout & Havelka, 2008).

Further to this, the expert panels conceded the importance of and need for the existence of an audit charter and for the audit charter to clearly authorise EGIT audits. The audit charter represents the formal contract agreement that binds the IT auditor to conduct regular audits and ensures the provision of the needed resources to conduct such audits. The lack of the charter therefore makes it difficult to undertake any productive EGIT audit. This finding agrees with studies by Yang and Guan (2004), which concluded that the audit charter should not be a mere document on the shelves gathering dust but should ostensibly inform the investing stakeholders about the role and responsibilities of the audit committee and the auditors of the enterprise and to provide authorisation, direction and discipline the conduct of regular audits.

Also, with an average mean of 3.17 and 3.14 the expert panels rated “inadequate Top management support for extensive IT governance auditing programmes” and the apparent “lack of board commitment to IT governance” respectively as part of the top five challenges based on their impact of EGIT auditing. These two findings have been noted in several information systems research (Coertze & Von Solms, 2014; Jewer & McKay, 2012) and support several calls for top management to provide support by creating a fertile environment for enhancing audits.

5.5.2 Top Five Challenges based on the Perceived Effort

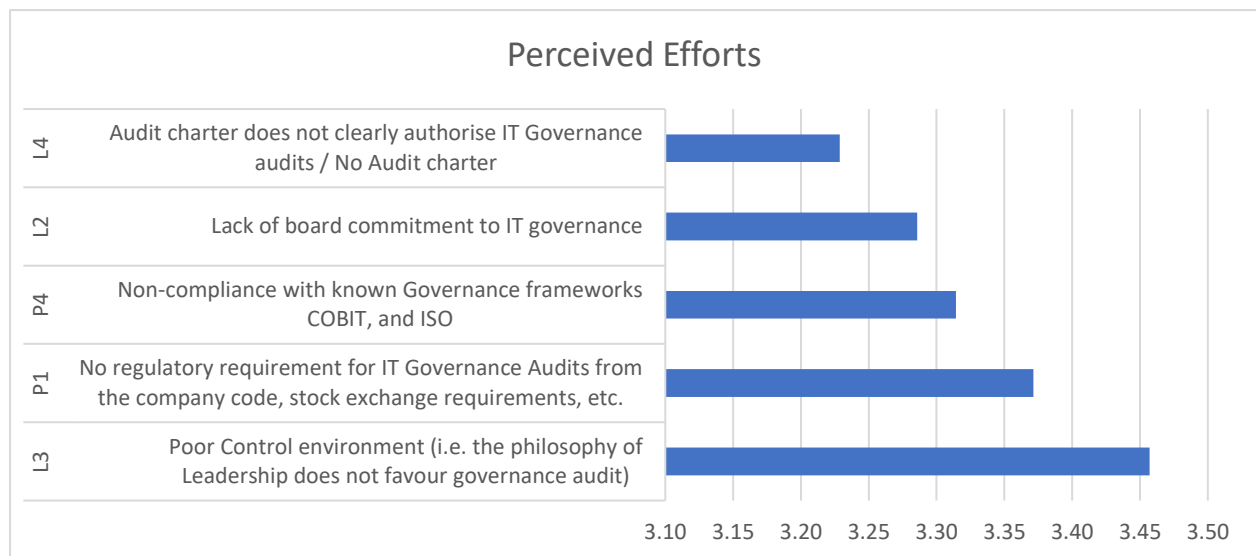


Figure 13: Top Five Challenges based on Perceived Effort

When asked to evaluate the challenges in relation to the efforts required to address them, the experts agreed on the significant importance of the control environment by rating “poor control environment (i.e. the philosophy of Leadership does not favour governance audit)” with an average mean of 3.46. Several studies (Barišić & Tušek, 2016; De Haes & van Grembergen, 2009; Rubino et al., 2017) have highlighted the importance of the control environment and have shown that audit activities are enhanced when the philosophy at the top makes it conducive. This consensus agrees with Barišić and Tušek's (2016) findings that a supportive control environment increases significantly the chances that the IT audit will be effective and its recommendations will be taken into account to a greater extent. With a supportive control environment, access to vital information becomes relatively easier and the audit function is enhanced.

Furthermore, the experts conceded with an average mean of 3.37 that “No regulatory requirement for IT Governance Audits from the company code, stock exchange requirements, etc” will require significant effort to address. Indeed, there is no specific regulatory requirement for EGIT compliance in Ghana and efforts to address this might require the parliamentary amendments of the Companies Act, and stock exchange requirements which would be difficult to address. Despite this Banks and Telecommunications companies are encouraged by regulatory bodies to adopt the COSO framework. This framework has been criticised (Rubino & Vitolla, 2014; Tuttle & Vandervelde, 2007) for its abstract nature and its inability to address the complexities and specific risks inherent in IT. Tuttle and Vandervelde, (2007) highlight that, as a framework, COSO does not identify control objectives with a higher level of specificity sufficient to design detailed audit tests.

The issue of “Non-compliance with known IT governance framework” was also ranked by the experts as one of the top five challenges based on the effort to address them. An average mean of 3.31 showed its relative importance in ensuring effective EGIT audits. Although several IT governance frameworks exist, the *de facto* standard recognised by both practitioners and researchers is COBIT 5. This perception of the experts supports studies (Lovaas & Wagner, 2012; Omari et al., 2012) that have criticised the *de facto* standard for being broad and difficult to manage and implement, requiring significant effort. Although some attempts (Lynne Gerke & Ridley, 2009; Omari et al., 2012) have been made to optimise it for easy adoption, these attempts which try to ‘cherry-pick’ some control objective over others have not shown significant improvement in its adoption and implementation.

As a re-emphasis on the need for leadership to improve its oversight role over EGIT, the expert conceded that the “Lack of board commitment to IT Governance” and the “audit Charter does not clearly authorise IT Governance audits/No Audit Charter” will require more effort to address relative to the other challenges. The persist lack of adequate leadership oversight despite several theoretical (Coertze & Von Solms, 2014; Jewer & Mckay, 2012; Turel & Bart, 2014) and practical recommendations confirm the difficulty and the effort to address the challenge as expressed by the expert panels. Jewer and Mckay, (2012) suggest that a restructuring of the board characteristics to include more IT competencies would improve the commitment of the board to EGIT and its auditing. Despite these theoretical recommendations, practical improvement in board commitment to IT within the context of Ghana will take significant efforts and time to address because governance practices are still at the embryonic stage in Ghana, with very few regulatory and supervisory requirements (Simpson, 2014).

5.5.3 Top Five Challenges based on its Relative Importance

The last strand of evaluation required the experts to rank the identified and validated challenges in order of importance from 1 to 27. The result continues to emphasise the need for leadership to drive IT strategically and create a supportive environment to enhance effective EGIT auditing. Just as for the two earlier strands three out of the top five challenges rated as important related to the board and its activities; however, the specific challenges rated showed some differences. For instance, in ranking the order of importance, the experts rated as the most important challenge “Board activities only a rubber stamp on management action”. This finding sparks a new level of debate to understand the activities of the board within the Ghanaian community. This may be attributed to the poor IT knowledge of board members, as highlighted by Coertze and Von Solms (2014) and Jewer and Mckay, (2012) in that they support whatever decision management take. Interestingly the experts also supported this assertion by rating “Poor IT knowledge of Board Audit Committee members” as the fourth most important EGIT challenge. It could also be attributed to the generally poor composition and characteristics of the Board, especially in State-Owned Enterprises (SOE) (Aseweh Abor, Abekah-Nkrumah, & Abor, 2008; Simpson, 2014). Simpson, (2014) highlights the fact governance practices are still at the embryonic stage in Ghana with very little regulatory and supervisory requirement for board effectiveness, as such, Boards do not conduct their oversight duties effectively.

The experts further ranked the lack of EGIT audit authorisation from the audit charter as the second most important challenge. As stated earlier, the importance of the audit charter cannot

be over-emphasised as it gives the audit team the authority to access any vital information required to undertake the audit activity.

Besides the leadership mechanisms that were evaluated significantly as challenging the conduct of effective EGIT audits, experts also ranked the “lack of developed auditing tools to keep pace with changing environment” as the third most important challenge. If there is the need to conduct EGIT audits, generally the auditors must be given the necessary tools to work with. Lovaas and Wagner, (2012) found this as a major IT audit challenge affecting enterprises, especially Small and Medium Enterprises (SMEs), and recommended the need to develop a simple and easy-to-manage EGIT auditing tool that is driven by the *de facto* COBIT 5 to ease the regular audit of IT governance.

The fifth most important challenge according to the experts was ineffective structures as a result of “No IT steering committee to ensure effective implementation of audit recommendations”. After all, EGIT audit recommendations must be monitored and implemented to gain the full benefits. The need for alignment between the governance mechanisms makes it necessary that the IT steering committee works to improve the audit by following up on all audit recommendations and ensuring that executive management implement the recommendations.

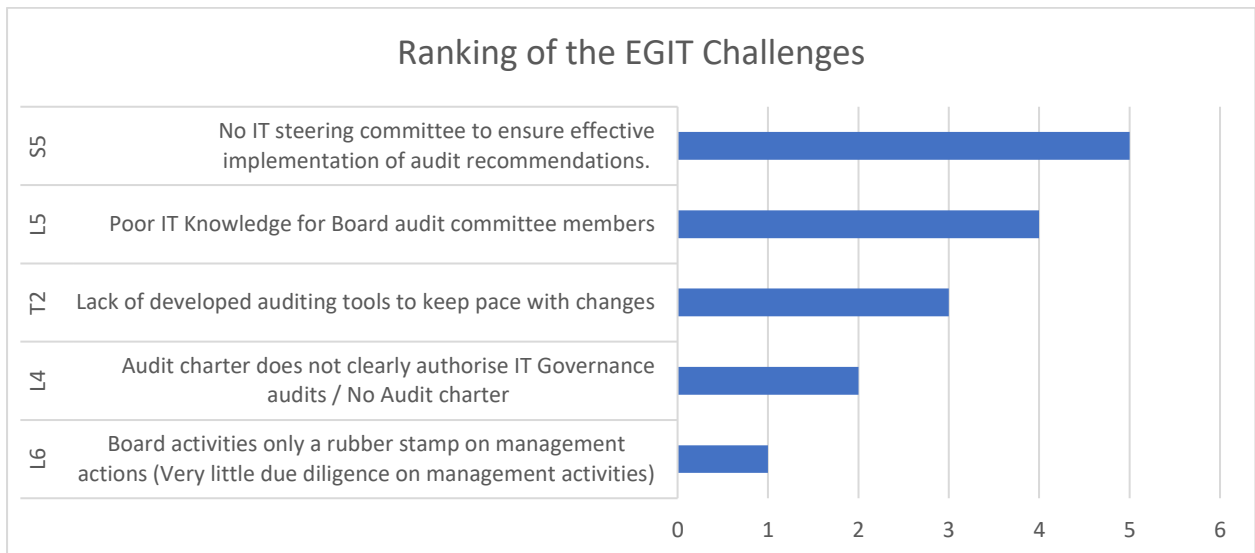


Figure 14: Top Five Challenges based Relative Importance

5.6 Summary of Chapter

This chapter sought to identify the challenges of EGIT auditing and their relative importance to the overall achievement of strategic IT objectives. In order to achieve this, a Delphi

technique was adopted. The technique helped to gain useful insight into the subject, which is highly complex. The study identifies 27 EGIT auditing challenges. The findings reveal clearly that some of the challenges have more impact and/or require more effort to address than others.

Challenges related to the Board and its activities were noted to have much more impact and significantly difficult to address than the other governance mechanisms. The findings also revealed that challenges related to structures and relation mechanisms were easier to address, supporting earlier literature that structures and relational mechanisms are easier to implement.

The lack of audit charter/ the audit charter not authorising EGIT audits was rated among the top five challenges that have a significant impact, require significant effort to address and are hugely important to EGIT. Other leadership challenges, such as the poor IT knowledge of Board Audit Committee members and the lack of commitment from the board were also classified as having high importance that needed to be addressed.

The need to develop a tool that will provide scope to EGIT auditing was established through the emphasis placed on the following challenges: “Lack of developed auditing tools to keep pace with changing environment”, “Poor IT Knowledge for Board audit committee members” and “Lack of accountability for IT services”. This provides a basis for the problem identification in the Design Science Research methodology adopted and presented in Chapter Seven.

This chapter provides empirical insight into the challenges that inhibit the effective conduct of EGIT audits within the Ghanaian context and highlights the need for a tool to guide the auditing of EGIT practices. The next chapter presents a configurational analysis of the case companies prior to the use of the artefact.

CHAPTER SIX

CONFIGURATIONAL ANALYSIS OF EGIT

6.1 Introduction

This chapter presents a discussion of the EGIT maturity and effectiveness of the case companies prior to the use of the artefact. To assess the efficacy of the artefact, the study made the artefact available to audit team members of the case organisations to be used over time. In this chapter, the study follows the configurational theories based on the integrative framework presented in Chapter Three, that for EGIT to improve performance, all the governance mechanisms must be implemented coherently.

Cluster analysis was used to assess the nature of the configuration in the case companies. The analysis examined how these governance mechanisms aligned to influence EGIT effectiveness. Questionnaires were the main tool used for the collection of data. Respondents who were senior managers were asked to measure the maturity of the Governance mechanisms for their respective organisations. The chapter ends with a discussion of the various clusters identified and the nature of the EGIT configuration of the clusters. This result would be used to compare the nature of the configuration after the use of the artefact by the audit team members.

6.2 Selection of Organisations to undertake the Survey (Inclusion and Exclusion Criteria)

To elicit as much information as possible using the survey, the researcher used five-point inclusion criteria, in line with the scientific objective of the study, intended to optimise the external and internal validity, and minimise ethical concerns (Salkind, 2010). The whole objective of EGIT is to ensure that significantly, the interest of stakeholders is protected. As such, the inclusion criteria adopted included a) organisation with significant public interest; b) organisation with significant IT investments; c) organisation within a highly regulated industry; d) organisation registered as a company limited by shares; e) willingness of the organisation to participate in the research. These criteria were adopted to ensure that selected entities had the organisational setting open to EGIT. It was decided that for an organisation to be included in the study it should meet all five selection criteria.

Criterion A was selected because the interest of the public in an entity is a good enough reason for managers to ensure effective governance. Governance in public interest companies is paramount to ensure that the various stakeholders' rights are protected. Several countries adopt different definitions for the classification of companies as Public Interest Entities (PIE). They are defined based on the nature of their business, their size, and their number of employees; or by their corporate status by virtue of their range of stakeholders. Although no formal definition exists in for PIE in Ghana, the definition adopted by the Institute of Chartered Accountants Ghana (ICAG) was considered appropriate for use within this study. The institute classifies the following organisations as PIE: banks, insurance companies, investment funds, pension funds, medical schemes, listed companies, and large enterprises. With this definition all companies classified under financial services in Ghana can be categorised as PIE.

Criterion B was adopted because EGIT is concerned mostly with IT investments and how these investments are protected. Decisions on IT investments are guarded using the governance mechanisms. For this study, significant IT investment is considered as more than One million Ghana Cedis over a period of five years. Criterion C was selected because within highly regulated industries, companies are compelled to implement adequate measures to ensure strict compliance. A loosely regulated industry does not provide the organisational setting required for governance. Several EGIT mechanisms involve compliance with regulations and laws. As such, the researcher deemed it appropriate to include the regulatory element as a criterion for inclusion.

Criterion D was included to ensure that the tenets of agency theory which instigate the need for governance is strong. An entity registered as a company, is required in Ghana to comply with the Companies Act 1963 which provides a framework for overall governance of an entity. The Act provides regulations for every company, for instance it requires the appointment of directors with powers to oversee the general operations of the business and the appointment of auditors to regularly review the system of financial controls with the goal to protect shareholders' investment. Criterion E was selected because of the importance of access in every research. Research efforts may prove futile if the researcher is not granted access to gather the required data for analysis (Saunders et al., 2009). Given the nature of this study, primary data would be critical to ensure the achievement of research objectives. As such it is very important for the researcher to be granted access to the organisation.

6.2.1 Selection Process

The financial services industry in Ghana is a highly regulated industry. The Central Bank of Ghana (BoG), National Pensions Regulatory Authority (NPRA), Securities and Exchange Commission (SEC), and National Insurance Commission (NIC) are the main regulators of aspects of the financial Services industry in Ghana. Because of the nature of regulation in the industry, Criterion C was the first criterion used in the selection process. The research generated a list of companies operating under these regulatory bodies totalling 124 companies including Banks (29), Insurance Companies (25), Pension Fund Managers (33), Savings and Loans (37). Other special deposit taking institutions such as Micro-finance and Rural banks were excluded due to their size. It was considered that they would not meet Criterion B. The researcher (who is skilled in financial reporting) proceeded to review the financial statements of the companies to assess their level of IT investments. Companies who did not meet Criterion B were excluded. For companies who did not have their financial statements online, attempts were made to contact their representatives to make the assessments. After this review, the number of companies dropped to 54; Banks to 29, Insurance Companies to 9, Pension Fund Managers to 8, Savings and Loans to 8. Using the online platform of the Registrar Generals Department, the researcher confirmed that 52 companies met the criterion D; Banks (29), Insurance Companies (9), Pension Fund Managers (8), Savings and Loans (6). A letter from the Department of Information Systems was delivered to all 52 companies to request their participation in the study. This daunting task ended with only 7 companies (2 banks, 2 Pension Fund Managers, 3 Savings and Loans) accepting the invitation to participate in the study on the condition that anonymity was guaranteed. The diversity of the companies was considered appropriate to understand the nature of EGIT in the financial services industry.

Table 11: Profile of Case Organisations

Organisation	Sector	Nature	Number of Branches
A	Banking	Multinational	30 Branches in 4 regions
B	Banking	Multinational	28 Branches in 3 regions
C	Savings & Loans	Local	130 Branches in 16 regions
D	Savings & Loans	Multinational	43 Branches in 10 regions
E	Savings & Loans	Local	37 Branches in 5 regions
F	Pension Fund	Local	15 Branches in 6 Regions
G	Pension Fund	Local	29 Branches in 4 Regions

6.3 Sampling

Following the selection of cases, a researcher needs to decide who the respondents within the cases should be (Saunders et al., 2009). This is often determined by the research questions, objectives and the theoretical framework guiding the study. Sampling of respondents is a crucial step because the nature of the respondents determines how much or little of the phenomenon can be known at the end of the study. Purposive and maximum variation sampling strategies were used in choosing the respondents from the selected case organisations. Purposive sampling is deemed effective where limited numbers of people can serve as primary data sources due to the nature of research objectives. EGIT is a top management phenomenon and information about it can be derived from top level personnel, hence the adoption of purposive sampling. In maximum variation sampling, the researcher's judgment was relied on to select respondents with diverse knowledge about the phenomenon to ensure maximum variability within the data. Despite that, EGIT is an IT phenomenon, the researcher targeted non-IT managers to provide broad perspective. In all, Top Executives, Senior IT and non-IT managers as well as IT/IS auditors were targeted.

6.4 Instrument Development

Churchill's (1979) sequential steps for designing a survey instrument was used as a guide to ensure its reliability and validity. These are 1) specifying the domain of construct by delineating what is and is not included in each construct, 2) generating sample of items using literature review, 3) collecting data and purifying measure face and content validity, pretesting and pilot study, and revision when necessary), (4) data collection, 5) assessing reliability 6) assessing validity, 7) developing norm.

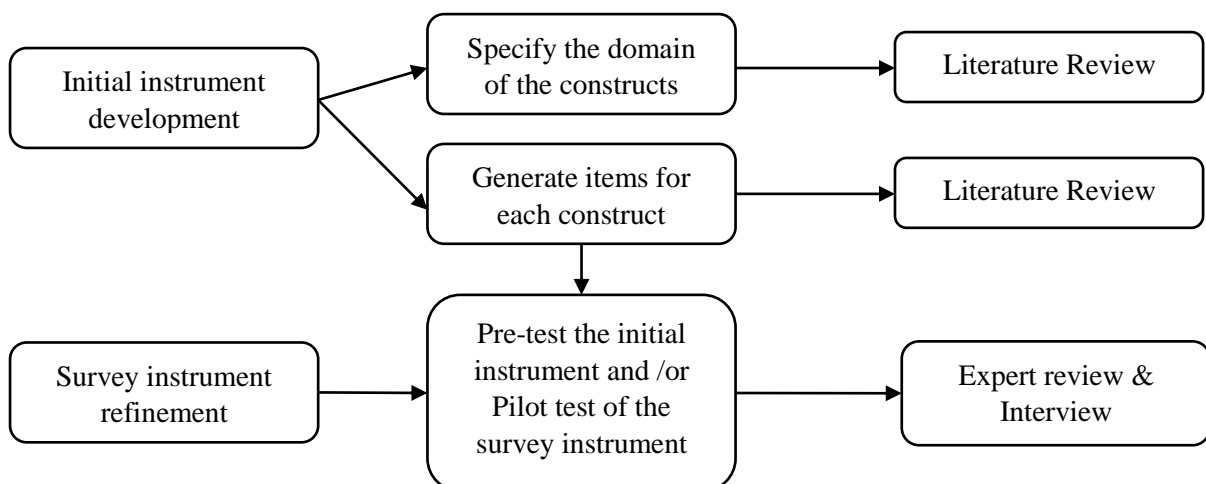


Figure 15: Instrument Development Process

The researcher developed the survey instrument following the theoretical background concerning EGIT. EGIT being a fairly research area of study, the researcher adapted several items from existing literature (De Haes & Van Grembergen, 2009; Lunardi et al., 2017). From an in-depth review of literature, EGIT reports and COBIT 5 implementation guide documentations, 65 different items emerged as possible variables to measure the 10 specified domains.

Face and Content validity were used at the refinement stage to improve the instrument. Face validity refers to the subjective judgment on the operationalisation of a construct (Drost, 2004; Saunders et al., 2009). It measures the degree to which an item appears to be related to a specific construct through examination of wording, interpretation, consistency of style, logical sequencing, clarity and overall impression from the look and feel of the survey (Churchill, 1979). The researcher and his supervisor undertook the face validation after several meetings. The supervisor of the study, who is an expert in EGIT provided useful insight for the refinement of the variables.

Content validity measures the extent to which the items on the survey instrument adequately capture different dimensions of a construct (Boudreau, Gefen, & Straub, 2001; Drost, 2004; Taherdoost, 2017). In general, content validity involves evaluation of a new survey instrument to ensure that it includes all the items that are essential and eliminates items undesirable to a particular construct domain. There are two different approaches to content validation, which are judgmental and quantitative (Boudreau et al., 2001; Lewis, Snyder, & Rainer, 1995). The judgmental approach follows a detailed literature review with expert review while the quantitative approach involves the testing of the importance of each item using a Likert scale and subsequent measurement of the content validity ratio to assess which of the items to include. Despite the potential benefits of content validity, Straub and Gefen (2004) argue that the process is recommended for IS research but not necessarily mandatory. The researcher in this study adopted the judgemental approach to content validity relying on one Chief Audit Executive and two IT managers. In the presence of the researcher the experts provided their judgments which led to the reduction of the items to 63 and further rewording of some of the questions.

The questionnaire was divided in four sections. The first section, A contained demographics, with questions regarding the respondents. The second section, B contained demographics with questions regarding the organisation and industry of the respondents. The third section, C

contained the items used to measure the governance mechanisms. In all, 48 items were used in the assessment of the five constructs espoused in the conceptual framework. The fourth section, D presented items to measure the overall effectiveness of EGIT using the five governance domains (Strategic IT/Business Harmony, Value Delivery, Risk Management, Performance Management and Resource Management). The table below provides details on the various items and the literature sources.

Table 12: Variables for Data Collection

Construct	Abbreviated Items	Sources of Items
Structures	<ol style="list-style-type: none"> 1. Steering Committee 2. Reporting Lines 3. Roles and Responsibilities 4. Empowered IT personnel 5. CIO 6. Coordination of Governance 7. Monitoring of KPIs 8. Alignment of Tasks 9. CAE 10. Project Committee 	(Al Qassimi & Rusu, 2015; De Haes & Van Grembergen, 2015; IIA, 2018; Ko & Fink, 2010)
Processes	<ol style="list-style-type: none"> 1. Strategic IT Planning 2. Budgetary Control 3. Chargebacks 4. IT Risk Assessment 5. Change Management 6. Performance Monitoring 7. SLA 8. Benefits Monitoring 9. Incidence Response 10. Formalised Operations 	(De Haes & Van Grembergen, 2015; Ko & Fink, 2010; Mohamed & Kaur, 2012)
Leadership	<ol style="list-style-type: none"> 1. Board Expertise 2. Strategy Committee 3. Environment Analysis 4. Governance Oversight 5. Risk Management 6. Governance Disclosure 7. Portfolio Evaluation 8. Capability Monitoring 9. Regulatory Compliance 	(Coertze & Von Solms, 2013, 2014; De Haes & Van Grembergen, 2015; Jewer & Mckay, 2012)
Technology	<ol style="list-style-type: none"> 1. Decision Support Systems 2. IT Architecture 3. Transparency 4. Stakeholders 5. Communication and Collaboration 6. Information Security 7. Transactional activities 8. Knowledge Management 9. Assurance Activities 10. Systems Compliance 	(Bin-Abbas & Bakry, 2014; Brandas, 2011; IIA, 2018)
Relational Mechanisms	<ul style="list-style-type: none"> Cross Training Job Rotation 	(Al Qassimi & Rusu, 2015; De Haes & Van

	Closer Relation Internal Communications Regular Campaigns Informal Activities Inclusive Committees Conducive Environment Value Definition	Grembergen, 2015; Ko & Fink, 2010; Winkler, 2013)
EGIT Effectiveness		
<i>Strategic Business/IT Harmony</i>	1. Infrastructure Harmony 2. Strategy Harmony 3. Harmony in IT Choices	(Henderson & Venkatraman, 1993; Kyobe, 2008)
<i>Value Delivery</i>	4. Competitive Advantages 5. Operational Efficiency 6. Cost Reduction	(Van Grembergen, 2004; Lunardi, Maçada, Becker, & Grembergen, 2017)
<i>Risk Management</i>	7. Risk Profile 8. IT Security 9. Reduces Uncertainties	(Calder, 2005)
<i>Performance Management</i>	10. Results Oriented 11. Effective Delivery 12. Timeliness	(Van Grembergen, 2004; Lunardi, Maçada, Becker, & Grembergen, 2017)
<i>Resource Management</i>	13. Value for Money 14. Resource Deployment 15. Accountability	(Lunardi et al., 2017; Bradley et al., 2012; De Haes & Van Grembergen, 2015)

The items evaluating the EGIT mechanisms were measured using a five-point Likert scale based on the COBIT 2019 recommended Capability Maturity Model (CMM) (Level 1 – Level 5) to measure the level of design and effectiveness of the various mechanisms or items.

Level 1 – Non-existent or Initial/Ad Hoc: Complete lack of the control element or there is evidence that the enterprise has recognised that the control element needs to be addressed. However, no standardised approach exists; instead there are *ad hoc* approaches that tend to be applied on an individual or case-by-case basis. The overall approach to management is disorganised.

Level 2 – Repeatable but Intuitive: Controls are implemented but not documented, since they depend on the knowledge and motivation of individuals. There is no formal training or communication of the control, and responsibility is left to the individual. There is a high degree of reliance on the knowledge of individuals and, therefore, errors are likely.

Level 3 – Defined Process: Control elements have been standardised, documented, and communicated. It is mandated that these controls should be adhered to; however, it is unlikely

that deviations will be detected. The controls themselves are not sophisticated but are the formalisation of existing practices.

Level 4 – Managed and Measurable: Management monitors and measures compliance with the control and acts where control element appears not to be working effectively. Controls are under constant improvement and provide good practice. Automation and tools are used in a limited or fragmented way.

Level 5 – Optimised: Controls have been refined to a level of good practice, based on the results of continuous improvement and maturity modelling with other enterprises. IT is used in an integrated way to automate the workflow, providing tools to improve quality and effectiveness, making the enterprise quick to adapt.

The detailed explanation of the various levels were included in the survey to guide respondents. This model was deemed appropriate because the CMM provides an assessment model of maturity which measures the degree of formality and optimisation of processes. Past studies (De Haes & van Grembergen, 2009; De Haes & Van Grembergen, 2005, 2009) in the area of EGIT have adopted the model to measure governance mechanisms. The items evaluating the EGIT effectiveness were measured using a five-point Likert scale ranging from “strongly disagree” (1) to “strongly agree” (5). The five-point Likert scale was adopted to ensure consistency with the numerical measure of the governance mechanisms.

6.5 Data Collection and Response Rate

Knowing the busy schedule of the respondents, the researcher adopted a data collection methodology that was suitable to them. Prior to the decision, the researcher met with the contact persons in each organisation to discuss the method of survey that would be preferable. It was established that a printed version of the questionnaire was suitable compared to online tools such as google form. A total of 138 questionnaires were prepared to be distributed and administered in the offices of the respondents in the presence of the contact persons of each case organisation. Based on the sampling technique adopted, 138 individuals were targeted for the survey. Respondents were given a period of two weeks to complete the questionnaire after which the researcher proceeded to collection. At the end of the time set for collection, 70 respondents completed and submitted their questionnaires, thus giving a response rate of 50.72%. For quantitative studies, the minimum acceptable sample size for analysis is at least 30 (Saunders et al., 2009), as such the response rate was deemed adequate.

6.6 Data Coding and Cleaning

After collection, the researcher keyed the responses in Microsoft Excel for further analysis. Responses to demographic questions were entered as nominal scales, while remaining constructs were entered as ordinal scales. After the data was coded and captured, it was screened to check for missing, incomplete or invalid responses. Missing Data is not uncommon in quantitative data collection. The researcher followed the steps recommended by Hair, Black, Babin, and Anderson (2014) to evaluate the actions required to improve the data for analysis. They recommend that variables with 15% missing data can be deleted while cases with 75% missing data should be deleted. After the review three cases were deleted on the basis of not completing more than half of the responses. The researcher proceeded to test for reliability after being satisfied with the data set.

6.7 Assessing Reliability

Reliability tests measure the extent to which a measurement of a construct provides results that are stable and consistent (Boudreau et al., 2001; Churchill, 1979; Taherdoost, 2017). In other words, reliability is concerned with the accuracy of measurement which represents “the extent to which respondents can answer the same question or close approximations the same way each time” (Straub, 1989). Several recognised techniques are available for measuring reliability, such as Internal Consistency, unidimensional reliability, split halves, etc. (Straub & Gefen, 2004). Considerable debates focus on which technique provides the best estimate of reliability. However, Boudreau et al., (2001) found that the majority of IS researchers employ internal consistency when developing their survey instrument. This study adopted the internal consistency standard using the widely known and used Cronbach alpha (α) to test for the reliability of the instrument.

The Cronbach alpha tests the consistency of responses to the items measuring a construct and checks the extent of correlation between these items. The closer the Cronbach alpha's coefficient is to 1, the stronger the reliability of the measures (Hair et al., 2014). The rule of thumb for the estimate of reliability using the Cronbach alpha is that 0.7 or higher suggests good reliability. For this study, the Cronbach alpha test was carried out using Statistica. The results of the reliability test for each relevant construct is summarised in Table 12. The results show that all the constructs for the study produced estimates well above the threshold showing

the stability and consistency of the items to measure the constructs. Based on the reliability of the instruments, the researcher proceeded to assess the validity of the constructs.

Table 13: Cronbach's Alpha

Construct	Number of Items Measured	Cronbach's Alpha
Effective EGIT	15	0.9739
Leadership	9	0.9559
Processes	10	0.959
Relationships	9	0.9567
Structures	10	0.9697
Technology	10	0.9824

6.8 Assessing Validity

The measurement of reliability provides the internal consistency or internal homogeneity of the set of items. Although the internal consistency is necessary, it is regarded as not sufficient because it does not guarantee that a construct is measured accurately and therefore valid (Churchill, 1979; Hair et al., 2014; Straub & Gefen, 2004; Straub, 1989). Churchill (1979) recommends that researchers must proceed to measure “the extent to which the measures correlates with other measures designed to measure the same thing and whether the measures behave as expected”. Correlation with other measures is based on either evidence of convergent validity or discriminant validity.

Convergent validity tests the extent to which items of constructs that theoretically should be related, are in fact related, while discriminant validity tests that constructs that should have no relationship do, in fact, not have any relationship (Churchill, 1979; Straub & Gefen, 2004; Straub, 1989). Convergent validity of the constructs was assessed using the average variance expected (AVE) criterion, which exceeded the minimum threshold (Hair et al., 2014) level of 0.50 for each construct (See Table 13). Factor loadings and construct AVE values provide the basis for the confidence that the constructs in the analysis achieved convergent validity.

Table 14: Average Variances Expected

Constructs	Number of Items Measured	Average Variance Expected
Effective EGIT	15	0.7335
Leadership	9	0.7926
Processes	10	0.7316
Relationships	9	0.8533
Structures	10	0.8052
Technology	10	0.8904

The researcher further assessed the discriminant validity with the cross-loadings criterion (each item is expected to be greater than all of its cross-loadings), which suggests that the constructs achieved discriminant validity. Eight items out of the 63 were deleted because they were cross-loading on other constructs. These are ‘Board Expertise (L1)’; ‘Strategy committee (L2)’; ‘Closer Relations (R3)’; ‘Internal Communication (R4)’; ‘Inclusive Committees (R7)’; ‘Conducive Environment (R8)’; ‘Project committee (S10)’; ‘System Compliance (T10)’.

Table 15: Cross-loadings

		Effective EGIT	Leadership	Processes	Relationships	Structures	Technology
E1	Infrastructure Harmony	0.8373	0.6253	0.5738	0.6793	0.6714	0.592
E2	Strategy Harmony	0.7794	0.6328	0.6703	0.546	0.6067	0.5029
E3	Harmony in IT Choices	0.8658	0.6284	0.6879	0.7292	0.6655	0.6229
E4	Competitive Advantages	0.8461	0.6457	0.5846	0.6731	0.7012	0.5841
E5	Operational Efficiency	0.8438	0.6671	0.7324	0.6566	0.6623	0.5841
E6	Cost Reductions	0.8672	0.6409	0.7021	0.7411	0.6759	0.642
E7	Risk Profile	0.8281	0.6627	0.585	0.6518	0.6605	0.5749
E8	IT Security	0.9061	0.7074	0.7717	0.7737	0.72	0.6922
E9	Reduces Uncertainties	0.8725	0.6331	0.7109	0.7448	0.6838	0.6442
E10	Results Oriented	0.8975	0.7776	0.7276	0.6754	0.7768	0.6652
E11	Effective Delivery	0.8707	0.7126	0.7868	0.6695	0.725	0.6405
E12	Timeliness	0.8622	0.6203	0.682	0.7199	0.675	0.6293
E13	Value for Money	0.7985	0.6322	0.5748	0.6283	0.6393	0.5814
E14	Resource Deployment	0.8805	0.6969	0.7436	0.758	0.7211	0.7017
E15	Accountability	0.8817	0.6545	0.7114	0.7034	0.6851	0.6425
L3	Environment Analysis	0.6713	0.9381	0.7271	0.5876	0.7321	0.6368
L4	Governance Oversight	0.6566	0.803	0.7294	0.44	0.767	0.5527
L5	Risk Management	0.7185	0.9029	0.7551	0.6464	0.7094	0.7081
L6	Governance Disclosure	0.6766	0.9283	0.7447	0.6106	0.7467	0.6484
L7	Portfolio Evaluation	0.7282	0.8852	0.7576	0.675	0.7616	0.6779
L8	Capability Monitoring	0.6757	0.8947	0.7263	0.5892	0.6872	0.6691
L9	Regulatory Compliance	0.6876	0.8731	0.7289	0.5205	0.7046	0.5786
P1	Strategic IT Planning	0.706	0.7694	0.866	0.5455	0.7069	0.5767
P2	Budgetary Control	0.6748	0.6993	0.8891	0.5597	0.677	0.5362
P3	Chargeback	0.6942	0.7577	0.8996	0.5756	0.7069	0.6435
P4	Risk Assessment	0.6065	0.6394	0.8037	0.455	0.6201	0.401
P5	Change Management	0.7434	0.7301	0.855	0.625	0.6673	0.5802
P6	Performance Monitoring	0.6695	0.6919	0.8237	0.4999	0.6594	0.5551
P7	SLA	0.5773	0.6535	0.7984	0.3982	0.6527	0.4647
P8	Benefit Monitoring	0.6944	0.748	0.8989	0.5719	0.7033	0.6468
P9	Incidence Response	0.7268	0.7074	0.8757	0.6826	0.6795	0.5973
P10	Formalised Operations	0.7257	0.693	0.836	0.6151	0.6435	0.5796
R1	Cross Training	0.7501	0.5972	0.5932	0.9557	0.6878	0.6605
R2	Job Rotation	0.7468	0.6259	0.6211	0.9327	0.7114	0.7554

		Effective EGIT	Leadership	Processes	Relationships	Structures	Technology
R5	Regular Campaigns	0.7258	0.6009	0.5859	0.8707	0.6653	0.5981
R6	Informal Activities	0.7434	0.5986	0.576	0.9038	0.6951	0.7184
R9	Value Definition	0.764	0.6055	0.634	0.953	0.6919	0.6619
S1	Steering Committee	0.6814	0.7138	0.6885	0.573	0.8762	0.5515
S2	Reporting Lines	0.6371	0.7162	0.6883	0.4758	0.8789	0.5828
S3	Roles and Responsibilities	0.7332	0.7772	0.7497	0.7478	0.947	0.7782
S4	Empowered IT personnel	0.7754	0.7253	0.7204	0.7703	0.8815	0.8049
S5	Chief Information Officer	0.7576	0.7919	0.7409	0.7436	0.9242	0.7854
S6	Coordination of Governance	0.7658	0.694	0.665	0.812	0.8813	0.7802
S7	Monitoring of KPIs	0.7415	0.7498	0.705	0.6909	0.9133	0.8239
S8	Alignment of Tasks	0.6985	0.7386	0.7247	0.6454	0.9113	0.7016
S9	Chief Audit Officer	0.6456	0.7145	0.6556	0.5136	0.8585	0.5744
T1	Decision Support Systems	0.6033	0.602	0.5611	0.6204	0.7172	0.9492
T2	IT Architecture	0.6437	0.6573	0.5824	0.6474	0.7216	0.9604
T3	Transparency	0.772	0.7373	0.6544	0.8183	0.775	0.9589
T5	Communication & Collaboration	0.6744	0.6778	0.6509	0.6559	0.7466	0.9302
T6	Information Security	0.6258	0.6168	0.5849	0.6255	0.7368	0.9338
T7	Transactional Activities	0.6475	0.6567	0.5698	0.6485	0.7223	0.9522
T8	Knowledge Management	0.7683	0.7494	0.681	0.8009	0.7858	0.944
T9	Assurance Activities	0.7058	0.6994	0.6452	0.6844	0.7948	0.9195

Discriminant validity of the constructs was also evaluated by comparing the square roots of the AVE to the correlation between constructs. This provided an assessment of the extent to which each construct shared more variance with its measures than with other constructs (Hair et al., 2014; Straub, 1989; Taherdoost, 2017). The results presented in the correlation matrix in Table 14 include correlations among constructs in the off-diagonal cells and the square root of AVE in the diagonal cells. For adequate discriminant validity, the diagonal values should be significantly greater than the off-diagonal values in the corresponding rows and columns. The diagonal values (the square root of AVE) in Table 15 are all greater than their respective off-diagonal values, indicating adequate discriminant validity. In other words, for each construct the root of the AVE measures is significantly larger than the latent variable correlation. This demonstrates that all the constructs have adequate discriminant validity.

The results from the assessment of reliability and validity signify that the items reliably and validly represent the constructs they measure, providing adequate grounds to proceed to the next stage of analysis; the testing of the hypotheses.

Table 16: Comparing the square roots of the AVE to the correlation between constructs.

	Effective EGIT	Leadership	Processes	Relationships	Structures	Technology
Effective EGIT	0.8565					
Leadership	0.7741	0.8903				
Processes	0.8007	0.8304	0.8554			
Relationships	0.8079	0.6557	0.6521	0.9237		
Structures	0.8003	0.8203	0.7855	0.7475	0.8973	
Technology	0.7263	0.7194	0.6567	0.7353	0.7972	0.9436

6.9 Cluster Analysis

To recap, the conceptual model postulated that coherence is required among the governance mechanisms to ensure effective EGIT. Testing the coherence among the governance mechanisms in a linear approach is unrealistic due to the complex nature of the relationships; as such the study adopted the concept of gestalts theory which measures using the configurational approach (Ketchen, Thomas, & Snow, 1993; Miller, 1989; Venkatraman, 1989). A statistical procedure widely known for extricating natural configurations among the data and the populations is cluster analysis (Balijepally, Mangalaraj, & Iyengar, 2011; D. J. Ketchen et al., 1993).

Cluster analysis was therefore adopted to test the coherence among the mechanisms by grouping the cases based on the responses to the variables and deriving patterns that reflect the organisational configuration (Miller, 1989) that will ensure effective EGIT. Cluster analysis as an interdependence technique analyses all the variables simultaneously in an effort to find an underlying structure to the entire set of variables (Hair et al., 2014) and therefore makes it appropriate for use in this study. The method has been used in exploratory studies across several disciplines such as psychology, biology, sociology, economics, engineering, marketing and information systems. Its usage in IS research has grown over the years, however usage to understand the configuration for EGIT has been low or arguably non-existent.

Clustering algorithms are grouped under the broad categories of hierarchical and non-hierarchical partitioning procedures to derive the clustering solution (Osei-Bryson & Samoilenko, 2014). The accuracy of the clustering solution is highly dependent among other things on the clustering algorithm used in the analysis (Balijepally et al., 2011).

6.9.1 Hierarchical Algorithm

Hierarchical algorithm is a method of cluster analysis which seeks to build a tree-like structure of clusters based on a series of decision points to declare objects as members of clusters (Hair et al., 2014; Ketchen & Shook, 1996). Objects are then linked together by either merge or split decisions to form larger and larger clusters of increasingly dissimilar elements. The merge procedure is known as agglomerative, while the split procedure is referred to as divisive. Despite the unique nature in providing cluster solutions, hierarchical algorithms present several disadvantages. It suffers from its inability to perform adjustments once a merge or split decision has been executed, making it difficult to change a poor clustering solution (Ketchen & Shook, 1996). In addition, using a hierarchical procedure requires a definite choice of the type of algorithm to use, which is often a difficulty, as most researchers cannot determine the nature of a sample beforehand (Balijepally et al., 2011). Hierarchical algorithms also present unstable solutions should cases be dropped and the sample size decrease. They are also more vulnerable to outliers (Balijepally et al., 2011). These challenges to the method threaten the validity of the cluster solutions produced.

6.9.2 Non-hierarchical Algorithm (k-Means)

In *k*-Means algorithm, cases are grouped iteratively into *k* clusters by minimising the average squared Euclidean distance between the observation and its cluster centre. The algorithm starts with the *k* random clusters, and then move objects between those clusters with the objective to minimise the distance within clusters and maximise the distance between clusters (Osei-Bryson & Samoilenko, 2014). In other words, the similarity rules will apply maximally to the members of one cluster and minimally to members belonging to the rest of the clusters. With the initial cluster information (*k* clusters), the method computes the centroids for a set of trial clusters then assigns each object in the cluster to the nearest centroid, re-computes the centroids and reassigns the objects (Osei-Bryson & Samoilenko, 2014). The iteration process continues until there are no more changes in the cluster membership and the centroids are stabilised.

6.9.3 Why *k*-Means?

Selecting the clustering algorithm is a critical decision in the analysis of data using the Clustering Method because it has significant impact on the cluster solution (Ketchen & Shook, 1996). Both hierarchical and non-hierarchical procedures can produce different cluster solutions, and so the choice of a particular algorithm should be grounded in the objective of

the analysis, the data set and the potential benefits or pitfalls of the methods (Balijepally et al., 2011). In this study, *k*-means was selected due to its superior computational efficiency over the different hierarchical methods. Besides the computational efficiency, the following reasons accounted for the choice over other hierarchical techniques. First, unlike the hierarchical algorithms, the *k*-means are less affected by the presence of outliers in the data set (Ketchen & Shook, 1996). The survey instrument used in this study was developed after in-depth review of literature and thus has not been tested over the years within the context of study. Although the reliability and validity of the instruments were tested and found to be adequate for use, the presence of outliers due to observational or measurement error cannot be ruled out.

Second, the statistical approach (used by *k*-means) of assigning objects to a cluster based on its proximity to the centroid makes it appropriate to assess the level of coherence within clusters. The main objective for clustering EGIT mechanisms is to test the hypothesis that effective EGIT is achieved only when there is coherence among the governance mechanisms. As such by using the *k*-means the cluster solutions will clearly show which cluster achieve greater coherence by showing the cluster with the least distance to the stabilised centroid. Past studies which have used the *k*-means to assess the level of coherence among constructs have produced interesting results to confirm its efficacy (Ajumobi & Kyobe, 2017; Ketchen & Shook, 1996). Thirdly, of the three algorithms, *k*-means deals better with a small sample size. The sample population for this analysis was sixty-seven, and to prevent possible distortions or misrepresentation in the clustering solution, the researcher chose the *k*-means algorithm, since it deals better with small sample sizes (Ketchen & Shook, 1996).

Fourthly, one major criticism of *k*-means algorithm is the determination of the appropriate number of clusters prior to the analysis. However, this limitation is significantly reduced in this study using the elbow method to validate the optimal number of clusters. The idea of the elbow method is to run *k*-means algorithm on the dataset for multiple times using a range of values of *k* (Purnima & Arvind, 2014; Syakur, Khotimah, Rochman, & Satoto, 2018). For each *k*, the Within Sum of Squares (WSS) is computed and the results for all range is used to draw a graph. WSS is defined as the sum of the squared distance between each member of the cluster and its centroid. The elbow point on the graph shows the number of clusters beyond which the change in the WSS is insignificant (Purnima & Arvind, 2014). Using the elbow method this study was able to determine the optimal number of clusters that will provide the insights on the level of coherence required to achieve effective EGIT.

6.9.4 Elbow Point – Determining the optimal number of Clusters – First Survey

The Elbow Point method presents the percentage of variance explained as a function of the number of clusters. This method provides the optimal number of clusters beyond which adding another cluster does not give any significantly different or better configuration of the variables. Computing the elbow point, the researcher started off with a random k of 2 which produced an average WSS of 32.70. The number of clusters was thereafter increased by one and the subsequent three increases produced an average WSS of 22.90, 21.48, and 20.33 respectively. It was noted that at three clusters, the subsequent increase produced only a marginal drop in the average WSS. Cluster three was therefore chosen as the “elbow criterion” or the optimal number for clusters.

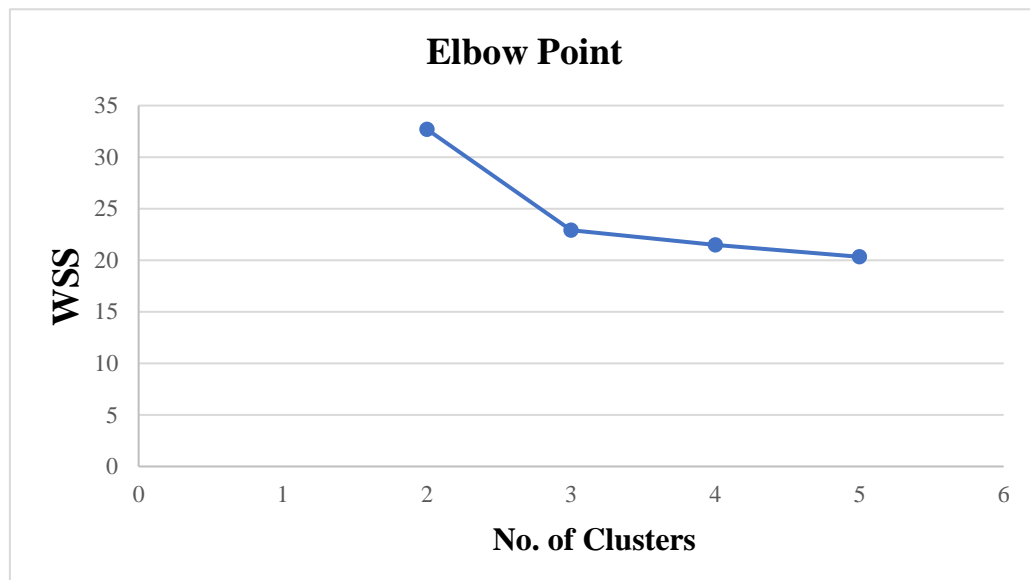


Figure 16: Elbow Point - Determining the Number of Clusters – First Survey

6.9.5 Standardisation of Variables

Standardisation of the variables is an important decision in the analysis of clusters to eliminate scale differences across the cluster variables (Balijepally et al., 2011). The purpose is to get each variable to contribute equally to the cluster solution. The analysis was conducted with variables that had continuous (ordinal) scales. The variables with categorical (nominal) scales were excluded to minimise potential distortions or inconsistencies in the distance measures of the variables. The categorical variables and values were deduced and assigned to each cluster once the clustering solution was achieved. Although the continuous scales used were the same (1 – 5) for sections C and D, the description for the scales were different. The researcher

therefore decided to follow the conservative approach and performed the analysis with and without the standardisation of variables. After both analyses, the cluster solutions produced were the same as expected. The researcher proceeded to analyse the results using the raw scores.

6.10 Analysis of Findings

6.10.1 Demographics – First Survey

This section discusses the demographic profile of the organisations and respondents who took part in the survey. They have been profiled using the categorical variables for each cluster. Cluster 1 (n=21) represents portion of respondents from Pension Funds and few respondents from savings and loans institutions, Cluster 2 (n=26) mainly represents respondents from Savings and Loans Institutions, while Cluster 3 (n=20) represents respondents from banks. Overall, respondents for all clusters can be classified as Senior Business and IT managers beyond the age of 31 years.

Cluster 1 had a fair balance of senior Business and IT managers. Most of them were males, with five to ten years of work experience in their respective fields and were Bachelor's degree holders with a few professional qualifications. Cluster 1 respondents were mostly from Pension Fund organisations with about 500 employees. Their companies had made moderate investment in IT over the past five years (i.e. GHs 11m – 50m).

With a slight variation, Cluster 2 was mostly characterised by male respondents with more working experience between 10 -15 years. However, most respondents for Cluster 2 were senior business managers with a few IT audit officers and IT managers. Institutions in Cluster 2 also had moderate investment in IT over the past five years (between GHs 11m – 50m). Cluster 2 respondents were mostly from Savings and Loans organisations with about 500 employees.

Cluster 3 was characterised by female respondents and had a fair balance of senior Business and IT managers. Few of the respondents in this cluster occupied key roles within the organisation such as the Country Chief Inspector (which is the same as the Chief Audit Executive) and the Country Head of Internal Control. Most respondents had over 10 years of work experience in their respective fields. Institutions in Cluster 3 had made huge investments

in IT (of over GHs 50m) over the past five years. Cluster 3 respondents were mostly from Banking organisations with over 500 employees.

Table 17: Demographics

Characteristics	Total	Cluster 1 (n=21)		Cluster 2 (n=26)		Cluster 3 (n=20)	
		Count	%	Count	%	Count	%
Age							
25-30	7	2	9.5	5	19.0	0	0.0
31-35	29	12	57.0	9	35.0	8	40.0
36-40	21	5	23.0	7	27.0	9	45.0
>50+	10	2	9.5	5	19.0	3	15.0
Total	67	21	100	26	100	20	100
Sex							
Male	41	15	71.0	17	65.0	9	45.0
Female	26	6	29.0	9	35.0	11	55.0
Total	67	21	100	26	100	20	100
Educational Level							
Bachelor's Degree	25	12	57.2	10	38.5	3	15.0
Master's Degree	24	2	9.5	13	50.0	9	45.0
PhD	0	0	0.0	0	0.0	0	0.0
Professional Qualification	18	7	33.3	3	11.5	8	40.0
Total	67	21	100	26	100	20	100
Years of Experience							
Less than 1 Y	0	0	0.0	0	0.0	0	0.0
1 Y less than 5 Y	5	3	14.0	2	8.0	0	0.0
5 Y less than 10	23	12	57.0	7	27.0	4	20.0
10 Y less than 15 Y	21	1	5.0	10	38.0	10	50.0
More than 15 Y	18	5	24.0	7	27.0	6	30.0
Total	67	21	100	26	100	20	100
Role							
Mgr – IT Audit	7	2	9.5	3	11.6	2	10.0
Mgr – IT / IS	18	7	33.3	5	19.0	6	30.0
Mgr – Risk Mgt	11	3	14.4	4	15.4	4	20.0
Non-Executive Director	0	0	0.0	0		0	0
Executive Director	9	2	9.5	5	19.0	2	10.0
Others – Mkt /Bus Dpt/ HR Mgr	22	7	33.3	9	35.0	6	30.0
Total	67	21	100	26	100	20	100
Industry / Sector							
Banking	19	1	5.0	0	0.0	18	90.0
Savings & Loans	25	8	38.0	17	65.0	0	0.0
Pension Funds	23	12	57.0	9	35.0	2	10.0
Total	67	21	100	26	100	20	100
Number of Employees							
51 - 200	0	0	0.0	0	0.0	0	0.0
201 – 500	48	20	95.2	26	100.0	2	10.0

>500+	19	1	4.8	0	0.0	18	90.0
Total	67	21	100	26	100	20	100
Estimated IT Investment (GHs) in past five years							
2m – 10m	0	0	0.0	0	0.0	0	0.0
11m – 50m	48	20	95.2	26	100.0	2	10.0
>50m +	19	1	4.8	0	0.0	18	90.0
Total	67	21	100	26	100	20	100

6.10.2 Nature of Elements across Clusters – First Survey

As stated earlier, the analysis presented was based on the raw scores. The mean values presented shows the mean for the cluster and not the mean for the entire sample population. In the ANOVA table below, all the variables returned significant p-value at a significance level of 0.01. The cluster solution produced clearly distinct clusters which provide insights into the nature of the governance mechanisms.

Table 18: Analysis of Variance – First Survey

Variable	Analysis of Variance					
	Between SS	df	Within SS	df	F	sig. p
STRUCTURES						
Steering Committee	30.46	2	12.71	64	76.71	0.00
Reporting Lines	46.75	2	16.44	64	90.99	0.00
Roles and Responsibilities	38.07	2	16.56	64	73.58	0.00
Empowered IT personnel	43.16	2	15.89	64	86.91	0.00
Chief Information Officer	29.27	2	10.19	64	91.92	0.00
Coordination of Governance	21.63	2	11.36	64	60.95	0.00
Monitoring of KPIs	27.88	2	14.39	64	62.02	0.00
Alignment of Tasks	30.46	2	14.05	64	69.40	0.00
Chief Audit Officer	37.72	2	14.07	64	85.76	0.00
PROCESSES						
Strategic IT Planning	31.40	2	22.27	64	45.12	0.00
Budgetary Control	27.59	2	22.32	64	39.55	0.00
Chargeback	31.94	2	18.80	64	54.36	0.00
Risk Assessment	36.26	2	20.91	64	55.50	0.00
Change Management	27.33	2	21.33	64	41.01	0.00
Performance Monitoring	28.11	2	27.80	64	32.36	0.00
SLA	38.31	2	27.10	64	45.23	0.00
Benefit Monitoring	33.44	2	19.30	64	55.44	0.00
Incidence Response	28.26	2	18.31	64	49.39	0.00
Formalised Operations	25.57	2	21.17	64	38.65	0.00
LEADERSHIP						
Environment Analysis	25.21	2	22.20	64	36.34	0.00
Governance Oversight	51.82	2	16.03	64	103.41	0.00
Risk Management	38.54	2	26.03	64	47.38	0.00

Governance Disclosure	26.76	2	20.91	64	40.94	0.00
Portfolio Evaluation	28.50	2	15.14	64	60.24	0.00
Capability Monitoring	29.22	2	26.69	64	35.03	0.00
Regulatory Compliance	51.84	2	36.10	64	45.94	0.00
TECHNOLOGY						
Decision Support Systems	22.18	2	23.94	64	29.65	0.00
IT Architecture	25.04	2	21.62	64	37.07	0.00
Transparency	66.73	2	22.46	64	95.06	0.00
Stakeholders	55.17	2	23.01	64	76.71	0.00
Communication & Collaboration	55.40	2	27.64	64	64.14	0.00
Information Security	21.64	2	22.03	64	31.42	0.00
Transactional Activities	26.55	2	22.20	64	38.27	0.00
Knowledge Management	55.66	2	22.19	64	80.27	0.00
Assurance Activities	33.59	2	19.09	64	56.31	0.00
RELATIONAL MECHANISMS						
Cross Training	30.30	2	21.32	64	45.48	0.00
Job Rotation	40.55	2	10.20	64	127.20	0.00
Regular Campaigns	31.08	2	35.04	64	28.38	0.00
Informal Activities	49.10	2	16.81	64	93.47	0.00
Value Definition	37.53	2	19.64	64	61.15	0.00
EFFECTIVE EGIT (Outcome)						
<i>Strategic Business/IT Harmony</i>						
Infrastructure Harmony	25.21	2	22.41	64	36.00	0.00
Strategy Harmony	59.06	2	46.71	64	40.46	0.00
Harmony in IT Choices	61.10	2	31.08	64	62.92	0.00
<i>Value Delivery</i>						
Competitive Advantages	26.23	2	22.93	64	36.61	0.00
Operational Efficiency	78.26	2	47.51	64	52.71	0.00
Cost Reductions	62.96	2	29.73	64	67.76	0.00
<i>Risk Management</i>						
Risk Profile	25.91	2	24.86	64	33.35	0.00
IT Security	81.94	2	23.85	64	109.94	0.00
Reduces Uncertainties	65.45	2	30.19	64	69.37	0.00
<i>Performance Management</i>						
Results Oriented	65.14	2	29.94	64	69.62	0.00
Effective Delivery	78.84	2	29.79	64	84.68	0.00
Timeliness	57.79	2	29.85	64	61.95	0.00
<i>Resource Management</i>						
Value for Money	21.46	2	25.94	64	26.48	0.00
Resource Deployment	75.87	2	21.33	64	113.83	0.00
Accountability	56.26	2	28.42	64	63.34	0.00

i. Structures Across Clusters

The results indicate that Cluster 1 had structures which were relatively formalised. They were relatively standardised, documented and communicated to foster coherence. The respondents

indicated that there was a steering committee which operates in a formalised way (m = 3.76). Similarly, reporting lines (m = 3.81) are clearly defined, documented and communicated. Roles and responsibilities (m = 2.95) within this cluster was also coordinated in a standardised way. IT personnel (m = 2.71) including the CIO (m = 2.95) are empowered and are discharging their duties formally. Similarly, the respondents indicated that their organisations have defined and documented approach to monitor KPIs (m = 2.86) and hold individuals accountable for their actions. The EGIT coordination activities (m = 2.90) for the cluster was also done with proper documentations and communication, and so the duties for business and IT people were documented and communicated in a way to ensure alignment of task although not optimised across the cluster (m = 3.00). There is a Chief Audit Executive (CAE) with a defined task to ensure accountability (m = 3.71).

Overall governance structures for Cluster 2 were weak to form any coherence for effective EGIT. The respondents showed that the presence of the steering committee (m = 2.42) was not in accordance with clearly defined, documented and communicated responsibilities. Similarly reporting lines for IT (m = 2.12) as well as roles and responsibilities (m = 2.12) were loosely coordinated and managed in an intuitive fashion, relying on key personnel to provide the way forward. As a result, IT personnel (m = 2.12) including the CIO (m = 2.19) are not clearly empowered. Respondents in this cluster also indicated that governance activities (m = 2.42) were poorly coordinated and there was no defined and documented approach to monitor KPIs (m = 2.23). Similarly, the duties for business and IT people were not documented and communicated in a way to ensure alignment of task (m = 2.08) and the presence of a CAE did not provide accountability for IT activities (m = 2.19).

Cluster 3 respondents perceived matured governance structures. Based on the mean of the responses, the IT steering committee operated with defined, documented communicated guidelines (m = 3.85). Also, IT reporting lines (m = 3.85), as well as roles and responsibilities for IT (m = 3.95) have been formalised based on existing practices. The CIO (m = 3.80) and other IT personnel (m = 4.05) are empowered and so such EGIT activities are conducted in a fairly coordinated (m = 3.80) fashion because the roles for business and IT people are documented and communicated in a way to ensure alignment of roles (m = 3.70). Defined processes exist to continually monitor performance against KPIs (m = 3.80) and the CAE is empowered to provide accountability of IT activities (m = 3.75).

Table 19: Cluster Solution

Variable	Cluster Means		
	Cluster No. 1 (n = 21)	Cluster No. 2 (n = 26)	Cluster No. 3 (n = 20)
STRUCTURES			
Steering Committee	3.76	2.42	3.85
Reporting Lines	3.81	2.12	3.85
Roles and Responsibilities	2.95	2.12	3.95
Empowered IT personnel	2.71	2.12	4.05
Chief Information Officer	2.95	2.19	3.80
Coordination of Governance	2.90	2.42	3.80
Monitoring of KPIs	2.86	2.23	3.80
Alignment of Tasks	3.00	2.08	3.70
Chief Audit Officer	3.71	2.19	3.75
PROCESSES			
Strategic IT Planning	2.67	1.88	3.55
Budgetary Control	2.52	1.65	3.20
Chargeback	2.52	1.77	3.45
Risk Assessment	3.33	1.81	3.30
Change Management	2.57	1.85	3.40
Performance Monitoring	2.62	1.92	3.50
SLA	3.24	1.69	3.25
Benefit Monitoring	2.52	1.73	3.45
Incidence Response	2.43	1.77	3.35
Formalised Operations	2.52	1.85	3.35
LEADERSHIP			
Environment Analysis	2.71	1.96	3.45
Governance Oversight	3.81	2.08	3.95
Risk Management	2.43	1.65	3.50
Governance Disclosure	2.62	1.96	3.50
Portfolio Evaluation	2.71	2.12	3.70
Capability Monitoring	2.38	1.69	3.30
Regulatory Compliance	3.43	1.96	4.00
TECHNOLOGY			
Decision Support Systems	2.43	2.08	3.45
IT Architecture	2.33	2.00	3.45
Transparency	2.38	2.04	4.35
Stakeholders	3.76	2.12	4.15
Communication & Collaboration	2.52	2.12	4.25
Information Security	2.52	2.08	3.45
Transactional Activities	2.29	1.96	3.45
Knowledge Management	2.43	2.08	4.20
Assurance Activities	2.52	2.12	3.80
RELATIONAL MECHANISMS			
Cross Training	2.00	1.73	3.30
Job Rotation	2.00	2.00	3.70
Regular Campaigns	2.38	1.69	3.35

Informal Activities	1.86	1.81	3.70
Value Definition	1.95	1.65	3.40
EFFECTIVE EGIT			
<i>Strategic Business/IT Harmony</i>			
Infrastructure Harmony	2.62	2.12	3.60
Strategy Harmony	3.33	1.81	4.00
Harmony in IT Choices	2.57	1.85	4.15
<i>Value Delivery</i>			
Competitive Advantages	2.71	2.08	3.60
Operational Efficiency	3.33	1.81	4.40
Cost Reductions	2.57	1.81	4.15
<i>Risk Management</i>			
Risk Profile	2.62	2.04	3.55
IT Security	2.71	1.77	4.45
Reduces Uncertainties	2.62	1.81	4.20
<i>Performance Management</i>			
Results Oriented	3.43	2.08	4.45
Effective Delivery	3.38	1.81	4.40
Timeliness	2.67	1.85	4.10
<i>Resource Management</i>			
Value for Money	2.57	2.08	3.45
Resource Deployment	2.57	1.85	4.40
Accountability	2.76	1.77	4.00

*the values above average are in Bold fonts

ii. Processes Across Clusters

Cluster 1 respondents indicated that governance processes were not clearly formalised. Strategic IT Planning process (m = 2.67) and the IT budgetary processes (m = 2.52) were performed intuitively without formalisation of the existing practices. However, for risk management, existing practices have been formalised, documented and communicated, though there are gaps for control failures (m = 3.33). Also, IT cost are not clearly charged back to business units probably because IT is considered a support unit instead of a strategic partner (m = 2.52). In addition, existing practices for change management (m = 2.57) and performance monitoring (m = 2.62), benefit monitoring (m = 2.52), Incidence response (m = 2.43) have not been formalised to ensure optimisation. This is despite some documented agreement between IT and Business units for IT projects (m = 3.24).

Cluster 2 respondents indicated a low level of EGIT process maturity for their organisations. All of the governance processes were either non-existent, performed in ad hoc fashion or was intuitive. None of the governance processes have been formalised to ensure optimal IT performance or coherence with other mechanisms. Strategic IT planning process is not properly

coordinated within the organisation to ensure strategic alignment of resources (m = 1.88). Similarly, the budgetary control process for IT resources have not been formalised and probably done on a need basis (m = 1.65). Risk assessment of IT resources is performed loosely (m = 1.81) and IT incidences are not responded to using a documented procedure (m = 1.77). Similarly, change management process is porous (m = 1.85) and no clear system has been operationalised to monitor the performance (m = 1.92) and benefits of IT resources (m = 1.73). There was no formalised system in place to surcharge the cost of IT to the various business units (m = 1.77) probably because no clear agreement exists between IT and other Business units (m = 1.69).

Organisations in Cluster 3 have formalised their existing EGIT processes though the processes are not sophisticated enough and not continuously monitored for gaps. To begin with, practices for strategic IT Planning processes have been defined, documented and communicated to all relevant stakeholders (m = 3.55). Similarly, the budgetary process for IT resources (m = 3.20) and IT risk management practices (m = 3.30) are also formalised throughout the organisation. There are clear guidelines and procedures for change management (m = 3.40) and incidence response (m = 3.35); however, these procedures are not automated. Existing practices for performance (m = 3.50) and benefit monitoring (m = 3.45) of IT resources have also been clearly defined and documented. There is a formal agreement between IT (m = 3.25) and business units which aids the chargeback of IT cost to the various units (m = 3.45).

iii. Leadership Across Clusters

Cluster 1 respondents indicated that their board of directors did not provide the level of leadership required to drive EGIT. The respondents indicated that, although the board direct IT strategies based on the environmental changes, this is not done in a formalised approach but rather intuitively based on the efforts of individuals (m = 2.71). They however indicated that the boards have formalised practices to ensure the effective performance of EGIT (m = 3.81). Despite this, the boards do not follow any clearly defined approach to direct IT risk management practices (m = 2.43) and have not formalised communications with stakeholders on IT performance (m = 2.62). The respondents indicated that the board have not instituted a formalised approach to regularly evaluate the IT-enabled investments, services and assets to determine the likelihood of achieving enterprise objectives (m = 2.71). Similarly, they indicated that the boards have not defined and documented a clear approach to ensure the adequacy and sufficiency of IT-related capabilities (m = 2.38). However, the boards have put

measures in place to ensure compliance with relevant IT laws and regulations, though there are loopholes for non-compliance (m = 3.43).

The respondents for Cluster 2 reported very low scores for the maturity of their board to ensure EGIT effectiveness. They indicated that their boards did not regularly determine IT strategies based on the environment or determined IT strategies on *ad hoc* bases (m = 1.96). Similarly, governance oversight of IT was not documented probably because they do not have formal training to undertake same (m = 2.08). IT risk assessment by the boards was weak (m = 1.65) and no documented procedure exists to ensure that stakeholders have the requisite information on the EGIT activities (m = 1.96). The respondents further indicated that the boards use an intuitive approach based on key individuals to evaluate the IT-enabled investments, services and assets to determine the likelihood of achieving enterprise objectives (m = 2.12). Similarly, they indicated that the boards ensure the adequacy and sufficiency of IT-related capabilities on case-by-case basis (m = 1.69). The boards have not put measures in place to ensure compliance with relevant IT laws and regulations (m = 1.96).

Cluster 3 respondents pointed out that their board executed their duties toward EGIT in a more formalised approach. First, they have formalised existing practices that ensure regular review of the environment to direct IT strategies (m = 3.4). Similarly, the boards have developed a managed and measurable approach to provide oversight of IT (m = 3.95). Also, existing practices for the assessment and management of IT related risk have been clearly defined, documented and communication (m = 3.50). Likewise, the boards have adopted a formalised approach to ensure regular communication with stakeholders concerning IT performance though gaps still exist in the approach (m = 3.50). The respondents also indicated that the boards continually evaluate the portfolio of IT-enabled investments, services and assets to determine the likelihood of achieving enterprise objectives (m = 3.70). They further espoused that the boards have formalised the practices to regularly ensure the adequacy and sufficiency of IT-related capabilities (m = 3.30). The boards ensure compliance with relevant IT laws and regulations (m = 4.00).

iv. Technology Across Clusters

The researcher sought to assess the extent to which information technologies and systems are used in governance to support decision making and reduce information asymmetry. Cluster 1 respondents indicated that though the organisation has established systems to support IT

decision making, there is no formal training to enhance its use and the responsibility is left with some individuals (m = 2.43). Likewise, the IT architecture does not provide a clear and common platform to support business and IT and is prone to some errors (m = 2.33). The respondents further indicated that the established systems and technologies to provide EGIT information to external stakeholders were not managed in a more formalised approach (m = 2.38); however, existing practices to provide IT information to key stakeholders have been formalised (m = 3.76). They also indicated that communication and collaborative systems are managed loosely (m = 2.52), and adequate measures have not been defined and documented to protect information and information resources (m = 2.52). Knowledge sharing mechanisms are not managed in a coordinated fashion (m= 2.43) as such internal audit function does not get adequate information to provide assurance (m = 2.52).

As with Cluster 1, Cluster 2 respondents reported low score for the establishment of decision support systems (m = 2.08). They also reported that their IT architecture does not provide a clear and common platform to support business and IT and is prone to some errors (m = 2.00). The respondents further indicated that the established systems and technologies to provide EGIT information to external stakeholders were not managed in a more formalised approach (m = 2.04), as such key stakeholders are not provided with adequate IT information to influence their decision (m = 2.12). They also indicated that communication and collaborative systems are managed loosely (m = 2.12), and adequate measures have not been defined and documented to protect information and information resources (m = 2.08). Knowledge-sharing mechanisms are not managed in a coordinated fashion (m= 2.08) and so their internal audit function does not get adequate information to provide assurance (m = 2.12).

Cluster 3 respondents indicated much more matured technological mechanisms compared to Clusters 1 and 2. Established systems to support IT decision-making processes have been standardised (m = 3.45). IT architecture provides a common platform to support business and IT strategies (m = 3.45). Technologies for presenting IT governance information to outside stakeholders are managed well and improved regularly (m = 4.35) as such shareholders and other stakeholders have access to IT information to influence their decisions (m = 4.15). Respondents further indicated that collaborative communication systems (m = 4.25) are properly managed and constantly improved to foster knowledge sharing (m = 4.20). Adequate controls have been defined, documented and communicated to protect information and information resources (m = 3.45).

v. Relational Mechanisms Across Clusters

Both Cluster 1 and 2 reported low maturity for relational mechanisms in their organisations. Cluster 1 reported that, control mechanisms to train employees on “cross IT/Business knowledge” are handled intuitively ($m = 2.00$) while Cluster 2 reported that they are done on a case-by-case basis ($m = 1.73$). Also, both cluster’s respondents indicated that job rotations among business and IT employees are implemented but not documented ($m = 2.00$ for both clusters). Campaigns to explain the need for EGIT are not organised regularly for both Cluster 1 ($m = 2.38$) and 2 ($m = 1.69$). Both cluster respondents further reported that informal meetings and other activities between IT and business managers are either not regularly organised or management thereof is disorganised ($m = 1.86$ and 1.81 respectively). They also showed no clear definition of purpose, values and behaviours toward IT and Business strategies ($m = 1.95$ and 1.65 respectively).

Cluster 3, on the other hand showed a higher level of maturity in IT and Business relationships. Cross-training has been standardised and handled using a documented and communicated procedure though gaps still exist ($m = 3.30$). Similarly, job rotation among business and IT personnel is encouraged and have been standardised ($m = 3.70$). There are clearly defined and documented procedures for regular EGIT campaigns ($m = 3.35$) as well as informal activities among IT and business managers to foster collaboration ($m = 3.70$). There are also clear definitions of purpose, values and behaviours toward IT and Business strategies ($m = 3.40$).

vi. EGIT Effectiveness (Outcome)

To assess the EGIT effectiveness respondents were asked to rate the level of the five governance domains.

Strategic Business/IT Harmony Across Clusters

Respondents in Cluster 1 did not agree that their internal operational processes were in line with the IS infrastructure and IS processes ($m = 2.62$). Similarly, they did not agree that their business strategies were in line with their IS strategies ($m = 3.33$) as such majority of their IT choices were not in harmony with business strategies, goals and needs ($m = 2.57$). For Cluster 2, respondents indicated that their internal process did not synchronise with their IS infrastructure and process ($m = 2.12$). Similarly, their business strategies were far apart from

their IS strategies (m = 1.81). They also indicated that IT decisions were distant from their business goals and strategies (m = 1.85).

Members of Cluster 3 agreed somewhat when asked whether their organisational internal processes were in line with the IS infrastructure and processes (m = 3.60). They were also affirmative that their business strategies were in line with their strategies (m = 4.00) and IT decisions are in harmony with defined goals, strategies and needs (m = 4.15).

Value Delivery Across Clusters

Respondents were asked to evaluate the extent to which the use of IT offers value to their organisation. Members of Cluster 1 could not affirm that the investment in IT by their organisation yielded any competitive advantages (m = 2.71) or reduced their operational cost (m = 2.57). However, they rated higher when asked whether IT improves operational efficiency (m = 3.33). Cluster 2 members reported that IT did not offer any competitive advantage (m = 2.08) and also did not reduce cost (m = 1.81) or improve operational efficiency (m = 1.81). Cluster 3 respondents reported that IT improves their operational efficiency (m = 4.40) and reduces their operational cost to a large extent (m = 4.15). They also indicated that IT investments to some extent helped their company to compete in the market (m = 3.60).

Risk Management Across Clusters

Members of Cluster 1 could not clearly indicate that the ability for their organisation to tackle IT risk had improved (m = 2.62) and were unsure whether their IT infrastructure are safe guarded from unauthorised access (m = 2.71). Similarly, they could not affirm whether the uncertainties surrounding IT projects and investments had reduced (m = 2.62). On the other hand, respondents from Cluster 2 reported that there was no improvement in their ability to handle IT risk (m = 2.04) and IT infrastructure was not safe guarded from unauthorised access (m = 1.77) as significant uncertainty looms over the investment made in IT projects (m = 1.81).

Cluster 3 respondents reported that their organisations had improved their IT risk profile to some extent (m = 3.55). They also indicated that IT infrastructure have been safe guarded from unauthorised access (m = 4.45) and as a result, the uncertainties that shrouded IT investment had reduced significantly (m = 4.20).

Performance Management Across Clusters

The performance of IT investment is crucial in the EGIT. Respondents were asked to confirm the extent to which IT projects and services are successful. Cluster 1 respondents agreed somewhat that IT projects and services achieve business results ($m = 3.43$) and were delivered without failures ($m = 3.38$). However, they could not confirm the timeliness of IT projects ($m = 2.67$). Cluster 2 respondents clearly indicated that they did not agree that IT projects achieved the intended business results ($m = 2.08$), they were delivered with some failures ($m = 1.81$) and usually delivered after the initial timelines agreed ($m = 1.85$). For Cluster 3, IT projects achieved the intended business results ($m = 4.45$). They were delivered on time ($m = 4.10$) and without significant failures ($m = 4.40$).

Resource Management Across Clusters

In the assessment of the level of IT Resource Management, respondents were tasked to indicate the extent to which their organisations had optimised IT infrastructure and knowledge to create stakeholder value. Members of Cluster 1 could not confirm that their IT resources were properly deployed ($m = 2.57$), accounted for ($m = 2.76$), indeed provided value for money ($m = 2.57$). Cluster 2 respondents, however, reported that their IT resources were not deployed to required areas ($m = 1.85$), not accounted for ($m = 1.77$) and did not provide any value for money ($m = 2.08$). Cluster 3 respondents indicated that IT resources were deployed to required areas of the business ($m = 4.40$) and were properly accounted for ($m = 4.00$). They were, however, unsure whether their IT resources provided value for money ($m = 3.45$).

6.11 Discussion of Findings

It should be recalled that the objective of this part of the study was to examine companies in the financial services industry of Ghana with the aim to identify the configuration of governance mechanisms that achieve an effective EGIT. The results from the cluster analysis reveal the nature of each configuration. In the following sections, the characteristics of each configuration and level of coherence of the mechanisms measured in this study is discussed.

6.11.1 Cluster 1

Respondents in Cluster 1 indicated that their companies had achieved a moderate level of IT Governance maturity. However, their implementation efforts have not reached the desired levels to foster coherence and achieve effectiveness. In these companies, attempts have been

made to create structures to ensure that there is a shared understanding by defining, documenting and communicating (structures of significance) the rules, roles and the responsibilities of individuals towards EGIT (structures of legitimisation). Efforts have also been made to institute measures (such as the presences of CAE and the monitoring of KPIs) to ensure that individuals comply with these regulations (structures of domination). With presence of a structured IT steering committee, IT project committee, CIO, CAE and the definition of IT reporting lines, these companies can ensure that business priorities are highly considered in IT investments (Lunardi et al., 2017).

However, the mere establishment of the structural mechanisms does not guarantee effective EGIT (De Haes & Van Grembergen, 2015; Ketchen et al., 1996). Considerable efforts should be made to optimise the activities of these structures by enhancing them with the necessary technologies (technological mechanisms) that can improve their decisions and processes that will ease their implementation efforts (De Haes & Van Grembergen, 2015). This is not the case for this cluster. As suggested by Bakos and Chris, (1992), the value of information is its ability to increase the economic utility of the decision makers. Individuals within an organisation's hierarchy require timely information to make IT decision. Without adequate technological mechanisms as seen in this cluster, decision makers are bound to take wrong IT decisions with dire consequences. Similarly, after decisions are made, they are required to be implemented with optimised processes. Several strategic management and IT Governance studies (Ketchen et al., 1996; van Grembergen & de Haes, 2009) have emphasised the need to create optimised processes to create stakeholder value.

While it has been generally researched and found that relational mechanisms are soft and easy to implement (De Haes & van Grembergen, 2009; Mohamed & Kaur, 2012), organisations within this cluster have not taken adequate steps to formulate collaborative ties among individuals and functions. Relational mechanisms are very important especially where an entity has not adequately embedded structures and processes into its day to day activities as seen in this cluster (De Haes & van Grembergen, 2009).

With the nature of the configuration, organisations within this cluster run the risk of operating a bureaucratic type (Miller, 1990) of configuration within their EGIT efforts. This type of configuration focus on rules, regulations and hierarchies. Bureaucratic type of configuration thrives well within a stable environment where rational decisions are intended (Miller, 1990). However, with the current technological landscape and the volatility of financial services

industry especially with the adoption and use of technology, a bureaucratic approach to EGIT will be rigid, not dynamic to the environment, and will be costly to change (Miller, 1990).

6.11.2 Cluster 2

Cluster 2 was the lowest performing cluster of the three clusters that emerged. Respondents in this cluster showed that their entities have not taken adequate steps to formalise EGIT. They have employed more intuitive approach to implement various mechanisms, in some instances the mechanisms are non-existent. This approach proves unreliable because of the high degree of reliance on the knowledge of key individuals instead of clear documentation to reduce the likelihood of errors. As postulated in the theoretical framework, when organisations attain coherence among the mechanisms, the whole will become stronger and will lead to an effective EGIT. The inability of these organisations to coherently implement these governance mechanisms within the dynamic environment led to the poor results in EGIT effectiveness.

These organisations are mostly Savings and Loans companies who have invested, about GHs 11million - 50 million over the past five years. This level of investment requires significant efforts to create stakeholder value. Although they have recognised the need for governance by adopting some mechanisms, the *ad hoc* implementations and intuitive approach to the overall governance activities exposes them to the risk of loss of investments due to poor decisions. The savings and loans sector in Ghana is a highly competitive sector with over 37 licensed institutions in a small market space. Due to the intensity of the competition, entities may be tempted to invest considerable funds into IT in a bid to stay in competition without a clear plan to governance. Their incoherent implementation effort may be as a result on unintentional implementation of the governance mechanisms (Al Qassimi & Rusu, 2015). The nature of this EGIT configuration is consistent with the strategic management configuration classified as reactors (Miles & Snow, 2003). Reactors have no coherent mechanisms to adapt to the market. They are forced by competition pressures to take strategic decisions in a bid to prevent loss of important customers and/or maintain profitability (Miles & Snow, 2003; Smith, Guthrie, & Chen, 1989).

De Haes and Van Grembergen (2009) suggest that the mere investment in IT resources do not create business value but organisations require to adopt other competencies to harness full potentials. Studying the implementation of EGIT mechanisms in a healthcare organisation, Wilkin and Riddett (2009), further stressed the need for a mixture and a balanced

implementation of clear reporting lines, lateral communication, interactions and transparency to gain real value. Organisations within this cluster can start off EGIT implementations with a focus on relational mechanisms to create the awareness and cause a change in the culture and operations of IT (De Haes & Van Grembergen, 2009). Similar sentiments were made by Lunardi, Becker, Maçada, and Dolci (2014) who found no direct relations with the adoption of the governance mechanisms and market competitive advantage but stressed that more effective communication of the benefits of EGIT would make the market perceive the efforts made by firms to improve their IT management and, consequently, their organisational performance.

6.11.3 Cluster 3

This was the best performing cluster among the three clusters. Respondents in this cluster showed that their entities have coherently implemented the various governance mechanisms. This is because the various governance mechanisms have all been formalised attaining a maturity score of 3 and above. Although some of the mechanisms are not fully optimised to achieve the highest performance, the level at which the mechanisms have been standardised and embedded together into the activities of the company has led to the positive results. COBIT 2019 recommends maturity levels beyond level 3 as “Higher” enough to stimulate the required benefits. Similarly, De Haes and Van Grembergen, (2009) in a study of the IT governance implementations and its impact on strategic alignment, argued that at least maturity level 3 is appropriate to ensure high business/IT alignment. At this level, these organisations have standardised structural practices and embedded the practices into their daily EGIT processes. Adequate technological mechanisms have been adopted to enhance information asymmetry within and outside the organisation. The board provides just enough strategic oversight on IT and collaborative ties have been created among the various actors within and outside the organisation. The careful implementation of all these mechanisms have created a coherent whole. For instance, the collaborative ties created with the relational mechanisms such as informal meetings and campaigns have been strengthened by the adoption of technologies that support collaboration, communication and knowledge management. They have also reinforced the structures of significance (providing shared understanding of the need for EGIT). The IT architecture, along with the decision support systems have reinforced to some extent the structures domination and legitimation.

Testing the linear relationships between governance mechanisms and EGIT effectiveness, Lunardi et al., (2017) concluded that the adoption of structural, procedural, and relational

mechanisms of EGIT is positively associated with all five EGIT domains; suggesting that the effectiveness of these mechanisms improves the IT governance performance. Several other studies (De Haes & Van Grembergen, 2009; Mohamed & Kaur, 2012; Wilkin & Riddett, 2009) have confirmed the need for the mechanisms but most of them focus on only one of the governance domains unlike Lunardi et al., (2017) who tested the relationships with all the domains. The linear nature of their analysis led to their conclusion that IT Resource Management did not have any statistically significant relations with governance effectiveness. The results from Cluster 3 further extends the academic discussion by proving the need for coherent implementation.

One interesting finding from this cluster is the dominance of technological mechanisms as opposed to leadership. While several studies have emphasised the need for the Board to have more involvement in IT, the findings suggest that the adoption of EGIT technology can dominate and influence other mechanisms including the board. Organisations within this cluster had adequately adopted and implemented systems and technologies that provide information to various stakeholders, and support collaboration and timely communication among decision makers. They have also formalised adequately systems that share knowledge within the organisation and to outside stakeholders. With the timely information provided by these systems, decision makers are able to take a good decision (Bakos & Chris, 1992). Though this finding does not support the earlier stands posited in the theoretical framework, it confirm past studies on alignment among organisational elements (Levy et al., 2003; Miller, 1990) which suggests several alignment paths or configurations . In their study of alignment in SMEs, Levy et al., (2003) demonstrated that with technology determinism, a change in technology can force change in the other elements in an organisation. Organisations within this cluster are mostly banks with more than 500 employees and over GHs 50 million investment in IT over the past five years, as such cannot be classified as SMEs in Ghana according to the Ghana Statistical Service (GSS) and the National Board for Small Scale Industries (NBSSI). Despite this, the notion of different configuration is applicable due to the dynamic nature of the environment (Twum, 2018).

Joshi et al. (2013) reported that enterprises do not maintain a central repository of information on EGIT and so decision makers are burdened with the task to review multiple public documents to gather the information they require. This finding proves that with adequate

technological mechanisms the utility of decision-making is enhanced because of the ease with which information becomes readily available to decision makers.

6.11.4 Summary of the Clusters/Configurations

The table below shows an overview of the nature of Gestalt/configurations and the status of alignment in each cluster. Assessing EGIT from a configurational perspective has helped to identify how the various governance mechanisms implemented in organisations interact and what drives the configurations. It also reflects the level of coherence and shows the outcome of the interaction of the mechanisms.

Table 20: Summary of the Clusters/Configurations – First Survey

		CLUSTER 1	CLUSTER 2	CLUSTER 3
Nature of Configuration	Dominant Mechanism (What drives EGIT)	Structures	Not clear	Technology
	Sector	Pension Funds	Savings & Loans	Banking
	Level of IT investment	GHs 10 m – 50 m	GHs 10 m – 50 m	> GHs 50m
	Number of Employees	200 – 500	200 – 500	> 500
Coherence Status	Level of coherence among Structures, Processes, Leadership, Technology and Relational Mechanisms	Incoherent	Incoherent	Coherent
Outcomes	Strategic Business/IT Harmony Value Delivery Risk Management Performance Management Resource Management	<ul style="list-style-type: none"> • IT/Business is somewhat strategically harmonised • IT creates some Value • IT Risks are not properly managed • IT performance is monitored • IT resources are not optimised 	<ul style="list-style-type: none"> • IT/Business is not strategically harmonised • IT does not create the value • IT risks are not properly managed • IT performance is not monitored • IT resources are not optimised 	<ul style="list-style-type: none"> • IT/ Business is strategically harmonised • IT creates Value • IT risks are adequately managed • IT performance is monitored • IT resources are optimised

While the prior literature on EGIT (De Haes & Van Grembergen, 2005) have argued for a balance implementation of three governance mechanisms (structures, processes and relational mechanisms), very little has been done to understand the extent of the balance and how the combined implementation of the mechanisms can be configured to deliver positive outcomes. Our study extends this notion by examining the configurations of governance mechanisms and which configurations result in positive outcomes.

Our findings present interesting extensions to studies by Lunardi et al. (2017) and van Grembergen & de Haes (2009) in the analysis of the governance mechanisms and how they impact on strategic alignment and other governance focus areas. Using a linear analysis Lunardi et al., (2017) concluded that adoption of structural, can improve IT governance by enhancing IT-business alignment, monitoring the performance of IT, managing IT resources in an effective way, delivering value from IT, and managing the IT-related risks. Based on the configurational theory, our findings highlight that within a fast-changing environment, an over reliance on structures could create bureaucratic type of configuration that can hinder effectiveness. Although cluster 1 had implemented structures, they couldn't attain an effective EGIT mainly because they have not complemented the structures with informal activities that foster collaboration and give a sense of shared value as well as formalised processes. This reinforces the findings by Cao et al., (2014), in their analysis of IT outsourcing governance that, formal or structural governance mechanisms frequently fails to respond to the dynamically changing business need.

With the expanded theoretical framework, our findings extend existing EGIT studies and conclude that organisations can drive governance implementation by adopting systems and technology that can foster IT decision and enhance collaboration. By enhancing collaborations, these technologies can complement relational mechanisms especially in the initial stages of IT Governance implementations where De Haes & Van Grembergen (2009) suggest the need for informal meetings to fosters collaboration, increase trust among various actors (Cao et al., 2014) and create a shared sense of value. Balaji & Brown, (2014) argues that the shared values and norms serves as a “lubricant” of relationships and complement the effects of formal structural mechanisms. However, this study shows that appropriate technologies can increase the ‘lubricating effects’ of the relational mechanisms by providing an easy way to enhance collaboration and drive other mechanisms to achieve positive results. Prior studies (De Haes & van Grembergen, 2009; Lunardi et al., 2017; Mohamed & Kaur, 2012; Weil & Ross, 2004) have not highlighted the need for decision making and collaborative systems and technologies, however the results from Cluster 3 confirms this study’s argument for the adoption of technologies to support IT Governance.

Extant IT Outsourcing governance studies (Cao et al., 2014; Huber, Fischer, Dibbern, & Hirschheim, 2014; Tiwana, 2010) have argued that positive outcomes can be achieved by swinging back and forth between structural governance mechanisms and relational governance

mechanisms. In other words, they argue that these mechanisms can be used as substitutes at a point in time and as complements in other times. Huber et al., (2014) concluded that the oscillations between complementarity and substitution is triggered by goal fuzziness, goal conflict and goal misalignment. Adopting a configurational approach for EGIT, the empirical evidence from the pattern or the gestalt for cluster 3 contradicts this argument because in that cluster, all the governance mechanisms (not only structures and relational governance mechanism) were formalised in a way that they complemented each other as suggested by configurational theorists (Venkatraman, 1989) and so mechanisms cannot substitute each other but must work together in a coherence whole.

In this section the main hypothesis being tested is “*H1: The greater the level of coherence among the governance mechanisms, the higher the level of EGIT effectiveness*”.

According to the configurational theory, when organisations attain coherence among the elements within them, the whole will become stronger and will lead to an improved performance for the organisation. It can be inferred from the analysis that an enterprise needs to attain a maturity Level 3 across all governance mechanisms to create the needed coherence and the resultant EGIT effectiveness. The findings thus show that in cluster 3 the organisations had attained high coherence in the governance mechanisms, in that all the various mechanisms had been implemented and maintained at a “Higher” maturity level that integrates and complement other mechanisms as such the EGIT was effective in creating the needed value.

The nature of dominant imperatives identified in the study confirms Miller's (1990) argument that several imperatives can evolve temporarily and further highlights the need for decision makers to regularly assess the level of coherence to ensure that the dominant imperative is suitable for the environment. In Cluster 1, structural mechanisms evolved as the dominant mechanisms at the time of the survey. Structural imperative in a highly competitive environment can stifle growth the outcomes because of its rigidity to change. However, In Cluster 3, technological mechanism emerged as the dominant imperative which steered the level of coherence achieved to derive the required value for IT. Cluster 2 on the other hand had not clearly implemented the mechanisms to the level required, and as such there was no clear imperative.

This section of the study sought to explore EGIT with the sub-research question being: *What configuration of governance mechanisms will achieve an effective EGIT?* The answer to the

research question is as follows; to achieve EGIT effectiveness, organisations within the Ghanaian Financial Services sector can adopt a technology driven IT Governance implementation by adopting systems and technologies that can provide timely information for decision makers and enhance the collaboration of various actors in the entity. They can achieve the coherence by ensuring that the baseline mechanisms are well formalised within the organisation (the way cluster 3 organisations have) and not adopted on an ad hoc basis (the way cluster 1 organisations have). This involves implementing adequate governance structures, that will prevent collusion, facilitate checks and balances and ensure accountability. Structures such as IT control function and IT audit function can regularly review IT activities to ensure compliance with policies and provide accountability. Whereas IT control reviews IT activities prior to implementations, IT audit reviews them after implementation. This acts as checks and balances. Also, they could adopt an IT Governance function, that will coordinate all the governance activities. The Board can complement the structures by providing adequate oversight and guidance. To do that, the Board should have IT competencies and be actively involved in IT decisions. For instance, the scope of the Board Audit committee should be enhanced to evaluate the design and implementation of internal IT controls. The current practice of focusing on financial controls only do not provide adequate supervision of IT activities. This means that membership of the audit committee should be improved to include also individuals with IT competences in addition to individuals with financial competence (which is the usual requirement in practice now).

Organisations within the sector can also adopt clear governance processes that will ensure seamless implementation of Board IT decisions. Processes such as strategic IT planning when formalised can ensure that IT decisions are taken to harmonise IT strategies with business strategies. Also, a good IT budgetary control processes complemented with adequate supervisory structures (such as effective IT Steering committee) and leaderships ensures that the IT projects stay within budgets. IT projects are largely characteristic with over budget or out of control due to issues such as scope creeping and poor monitoring (Buckby & Best, 2007). With the governance mechanisms complementing each other, there will be adequate checks and regular monitoring to ensure that IT projects stay within budget and satisfies the strategic purpose intended. In the SSNIT scandal highlighted in section 1.2, the then Board Chairman in a TV interview suggested that his board may have been negligent in the discharge of its oversight duties (GhanaWeb, 2018b). He explained that the practice existing at the time was for the board to ratify agreements entered by management without any proactive oversight on

IT projects, thus, they did not complement other structures but substituted the leadership mechanisms with other mechanisms and this led to the poor IT decision. The software which was earlier planned to cost USD34million ballooned to USD72million on completion (GhanaWeb, 2018a).

They should also adopt relational governance mechanisms such as informal meetings and regular IT Governance campaigns to create awareness and establish a bond between IT and Business Managers. This will help the various actors to have a shared sense of value for IT governance and create a congruence of goals.

6.12 Summary of Chapter

In this chapter, an assessment of the EGIT maturity of the selected organisations was conducted. This was done prior to the usage of the artefact. The purpose of the chapter was to understand the nature of EGIT configurations and explore the configuration that achieved best results. Results from this analysis would be used in the summative evaluation of the COBIT 5 driven IT audit framework.

In this Chapter the researcher examined the nature of interactions among IT Governance mechanisms and the nature of interactions that improve IT Governance effectiveness. The results suggest that there is the need to ensure coherence in all the governance mechanisms as against implementing some mechanisms more than the others. One main theoretical contribution of this study is the use of configurational approach to understand the IT Governance holistically. Configurational theorist postulates that organisational elements must be examined holistically and not in parts. This is based on the principle that these elements within an enterprise must be coherent to generate a pattern that can explain the performance of the enterprise. The configurational theory was thus adopted to measure the governance mechanisms and how they aligned to produce positive outcomes.

Extant IT Governance studies have neglected the technological mechanisms and the impact they have on overall IT Governance effectiveness. This study has shown the relative importance of adopting collaborative and decision-making technologies to drive other mechanisms in a fast-changing environment. In the highest performing cluster, the respondents showed that their organisations have adequately implemented systems and technologies that foster communication and collaboration and also provide timely information to decision makers within the organisation and outside the organisation. With these systems, in place the

utility of decisions were improved because decision makers had adequate information on timely basis. Joshi et al., (2013) reported that enterprises do not maintain a central repository of information on IT Governance as such decision makers are burdened with the task review multiple public documents to gather the information they require. This study has proved that with adequate technological mechanisms the utility of decision making is enhanced because of the easy with which information becomes readily available to decision makers.

From the analysis it was noted that strong focus on structural mechanisms can lead to a rigid governance system which does not easily adapt to the fast-changing environment. However, this can be adopted in a stable environment where strong decisions are the focus as against quick decisions. The findings also suggest that companies that adopt IT Governance unintentionally, do not gain effectiveness in their governance because the nature of the adoption will be disorganized. This heightens the need for companies to adopt a clear and systematic approach to implement the governance mechanisms. The findings confirms Miller, (1989) argument for different imperatives and suggests that strong leadership is not the only mechanism required to drive governance effectiveness. It showed that in a fast-changing environment such as the financial services in Ghana, adopting the right technologies for IT Governance activities can also foster and improve governance effectiveness, by providing timely information for decision making, creating collaborative ties among individuals and stakeholders and reduce information asymmetry. This confirms organization configurational studies which suggest difference configurations for different environment.

The next chapter presents the design and development of the artefact based on Peffers et al.'s (2008) Design Science Research Methodology.

CHAPTER SEVEN

DESIGNING A COBIT 5-DRIVEN IT AUDIT FRAMEWORK

7.1 Introduction

The aim of this chapter is to design an IT Audit framework that can guide IT auditors to perform IT governance reviews. Though design science research has been widely accepted in information systems discipline, there is a lack of consensus on the methodology, but unanimity on the need to demonstrate the design innovativeness, relevance, rigour and problem centredness of DSR. For the development of the IT audit framework, this study adopted the problem-centred approach of the design science research methodology (DSRM) presented by Peffers et al. (2008) while following the seven guidelines for design science research proposed by Hevner et al. (2004). This chapter focuses on the design and the formative evaluation of its usefulness. The summative evaluation of its efficacy is presented in the next chapter.

The remainder of this chapter discusses the research procedures that we performed during this study. The six main activities in the adopted DSRM was used to frame the presentation of the design. The processes are: problem identification and motivation, definition of the objectives for a solution, design and development, demonstration, evaluation, and communication. The details of the design process for the IT audit framework is discussed and the rigour of the research performed at each stage is also articulated.

7.2 Problem Identification – Failed IT Governance Practices in the Financial Services Sector

Hevner et al. (2004) advocate that DSR should have the objective of developing solutions to important and relevant business problems. Business problems can be defined as the differences between business goals and the current situation (Hevner et al., 2004). The predominant tools used in the problem search process are literature research and expert views (Offermann, Levina, Schönherr, & Bub, 2009). The researcher conducts this study with the philosophical stances of a pragmatist with the ontological argument that truth essentially is what works in practice (March & Smith, 1995). For the intended artefact to work in practice, it must solve an identified business problem which is the purpose of this stage of the DSRM.

EGIT has received considerable attention in recent years to ensure that IT decisions are made in the interest of relevant shareholders and other stakeholders. With increased investment in IT, the need for value creation also has become paramount to ensure that IT delivers the results that was intended (De Haes et al., 2013). Several governance mechanisms described in the literature review have been adopted by both public and private entities to ensure that decisions concerning IT are made to align with the interest of shareholders. However, the studies have confirmed that the mere introduction of these mechanisms does not guarantee IT value and constant monitoring is required (De Haes & van Grembergen, 2009; Lunardi et al., 2017). In accordance with the agency theory, IT auditors (both internal and external) are employed as a governance mechanism to ensure that IT decisions create value for shareholders and not the managers (D'Onza, Selim, Melville, & Allegrini, 2015).

The importance of EGIT in the financial services sector in Ghana has recently been highlighted in several IT-related scandals that have led to the loss of billions of dollars. The first of the scandals involves an investment of USD 72 million by the state's major pension services provided to procure enterprise software. Over the years there have been calls for the company to improve the conditions of pensioners. Despite these calls, pensioners continue to live in extreme poverty which has led to fraudulent practices of several individuals to reduce their ages with the aim to stay in continued employment. The value of the software was questioned heavily, and the interests of the decision makers came under intense scrutiny. After a review of the case by the state attorney general, several EGIT failures were noted. The Chief Information Officer was recruited with fake Master's and Doctoral degrees (Myjoyonline, 2017b). Also, the Managing Director continually disregarded cautions of the Legal experts not to sign the agreement.

Similar EGIT failed practices occurred in the banking industry which cumulatively led to the collapse of nine banks in 2018. Practices such as ineffective boards, overriding Board chairs and CEOs, incompetent and unqualified board members, passive board committees, poor risk management practices, weak IT infrastructures and monitoring systems were cited by the Central Banks as the cause of their collapse. Due to the collapse of these banks, the central government issued a bond to pay off the liabilities amounting to over GHs 12billion (USD 2.67billion). With the bond, the central government exceeded its expenditure targets for the year. Debts to Gross Domestic Product (GDP) ratio increased and the economy was under

intense pressure to recover from these shocks. The situation also resulted in over thousand employees losing their livelihoods.

The effects of failed EGIT practices in the financial sector was felt in all areas of the economy leading to one important question: What was the role of the auditors and what was their contribution to the failure? Both internal and external auditors have specific roles to ensure the effectiveness of EGIT. The literature review was first used to understand the nature and extent of the problem. In a qualitative study of Italian banks, D'Onza et al. (2015) found that IT auditors' contribution to EGIT practices fell short of the expectation of stakeholders because they lacked the requisite technical and non-technical skills and tools that would allow them to expand their activities and to be more proactive in ensuring the effectiveness of EGIT. As such, their ability to add value which depends on their contribution to the evaluation of the effectiveness of governance mechanisms is curtailed (D'Onza, Selim et al., 2015). Although the context of their study was different from the Ghanaian context, the pervasive nature of the failure in Ghana makes the findings somewhat relevant. In another study, Lovaas and Wagner (2012) explained that organisations mostly SMEs find it very expensive to invest in large frameworks and develop the skills of IT auditors. Most of the companies in the financial services sector in Ghana are not SMEs, however, because the country is a developing country, the issue of cost is relevant and can be applicable.

The evidence from the literature provided clues to the problem; however, the researcher further conducted an empirical study to identify the problems IT auditors in Ghana face in the audit of EGIT practices. IT auditors were asked to identify, validate and evaluate the challenges they faced in the conduct of EGIT audits in the sector (presented in Chapter five). After three rounds of evaluation, the experts identified 27 challenges that hinder the IT auditors in their duty to provide assurance to stakeholders on the effectiveness of EGIT. They also ranked the challenges based on the perceived efforts to address them, the perceived impact on their audit activities and their relative importance. Key among the identified challenges was the lack of developed auditing tools to keep pace with changes. This was ranked the third most important challenge needing attention. Although several other important challenges were identified, majority of the key challenges related to the board and its activities. These challenges were beyond the reach of the researcher as the researcher was focused on the lack of developed auditing tool as a problem to provide a solution to.

With the development of the COBIT 5-driven IT audit framework using the DSR, this study postulates that regular audits of governance mechanisms with the tool will led to an effective EGIT and as a result reduce the menace of ineffective EGIT practices that has engulfed the Financial sector in Ghana.

7.3 Objectives of a Solution: Creation of a COBIT 5-Driven IT Audit Framework

Peffer et al. (2008) explain that the objectives of a solution should be inferred rationally from the identified problem based on the researcher's knowledge of what is possible and feasible. The problem analysis clearly shows that IT auditors in Ghana are faced with several challenges in their audit of EGIT. The overall objective of this study is the development of a COBIT 5-driven IT audit framework which will guide IT auditors in their regular review of EGIT practices. The design of this framework will seek to meet five objectives. These objectives guides the study ontologically to confirm the truth (March & Smith, 1995) behind the artefact by providing a criteria to evaluate the utility of the artefact (Peffer et al., 2008).

7.3.1 Facilitate the Regular Audit of IT Governance Mechanisms

The problem identification stage of the DSR established that auditors do not proactively monitor and review the existence and effective operation of governance mechanisms. The directive of the Central Bank, the court action, and the mere implementation of governance mechanisms do not guarantee effective EGIT. Past studies (De Haes & Van Grembergen, 2009; Gantz, 2014b) have recognised the need for the continuous monitoring and the review of the mechanisms to validate that they are working as intended and provide assurance to stakeholders. With the tool which is driven by the *de facto* governance framework (COBIT 5), auditors can regularly undertake their reviews. The framework is intended to ensure that auditors comply with industry best practices. It also is intended to ensure that auditors add value by being proactive with EGIT and as such provide reasonable assurance to stakeholders.

7.3.2 Be Relevant to the Financial Services Sector

The problem identified is peculiar to the Financial Services sector in Ghana. Relevance is one of the key principles and the cycles of DSR (Hevner et al., 2004). Hevner and Chatterjee (2010) contend that, to develop a useful and relevant artefact, its design requirement (objectives) should be gathered from the contextual environment. In this case, the contextual environment represents the people, organisational and technical systems' problems and opportunities in the

Financial Services sector. Categories of entities classified under the financial services sector include pension companies, banks, savings and loans companies, insurance companies, microfinance and other companies under the regulatory guidance of BoG, SEC, and the Insurance commission. To achieve this objective, the researcher recruited experts who are employees in the Financial Services sector.

7.3.3 Align to the Needs and Expectations of Shareholders and other Stakeholders

The problem identification showed that auditors fall short of the expectations of shareholders and other stakeholders (D'Onza, Lamboglia, et al., 2015). The Agency theory, Stakeholder theory and other theories that necessitate the need for auditing and EGIT explain that shareholders and other stakeholders have the expectation that auditors will ensure that managers do no work in their selfish interest. The conditions present in the Financial Services landscape show evidence of managers working in their selfish interest. The purpose of the intended solution is to make sure that in exercising their fiduciary duties, auditors ensure that the interests of stakeholders are protected.

7.3.4 Be Easy to Use by a Knowledgeable IT Auditor

The utility and efficacy of the artefact can only be determined if used by practitioners in the conduct of the auditing activities. However, for any auditor to continuously use the artefact within the context, the artefact must be free from efforts. A knowledgeable auditor is a professional who has the relevant academic or professional certification to undertake IT auditing as well as reasonable experience in IT auditing. The determination of reasonable experience is a matter of judgment; however, several professional bodies (such as ISACA, ACCA) recommend three years' experience as reasonable for an individual to be certified.

7.4 Design and Development of the Artefact: Constructing a COBIT 5-Driven IT Audit Framework

The purpose of this section is to communicate the series of activities the researcher undertook to develop and design the audit framework (C5DITAF). The C5DITAF developed in this study is relevant to the context of the study, innovative and satisfies the problems identified in the first stage of the DSR as required for design science artefacts (Hevner et al., 2004; Peffers et al., 2008).

The aim of the relevance cycle, according to Hevner (2007), is to integrate that requirement from the environment into the DSR to make the resultant artefact relevant and effective in addressing the identified problems. The final artefact goes through a series of iterations with each iteration beginning with the development of a design artefact. This is then evaluated and the feedback from the evaluation is considered by the researcher to make improvement to the artefact. In this study, the researcher used focus groups as the data-gathering approach for the development and evaluation processes. An Exploratory Focus Group (EFG) was utilised for the design. This group consisted of industry experts with significant experience in the Financial Services sector. Focus groups in DSR are particularly useful for the development and the iterative improvement of the artefact in situations where knowledge about the phenomenon being studied is not adequate (Tremblay et al., 2010). EGIT is a complex phenomenon (Zororo, 2014) that is new to the Ghanaian business environment (Simpson, 2014) and has, therefore, not been studied fully, understood and implemented properly by both researchers and practitioners. This makes the use of EFG in this DSR appropriate and useful to achieve the intended purpose.

During the iterative process of designing the C5DITAF, the EFG met eleven times over a period of eight months. Each meeting lasted 60 to 90 minutes, depending on the level of engagement and the task the group was working on. The meetings were hosted at the training room for the Centre of Entrepreneurship Philanthropy and Ethics in Accra. For each section members who were not present were given the opportunity to contribute through WebEx. The principal researcher served as the moderator and the developer of the artefact.

At the first meeting all six EFG members were present. Proceedings commenced with a formal introduction of each member to facilitate familiarisation with each other. This did not take much longer because some members were already familiar with each other because of their association at ISACA events. Discussions on the day focused on clarification of the purpose, definition of terms, and interpreting the meanings of the various COBIT 5 objectives. To provide a clearer picture, the moderator began with a broad explanation of the C5DITAF and provided a description of how the artefact is intended to be on completion and how it might be utilised. During the second meeting the EFG members were again taken through COBIT 5 to gain a better understanding of the framework and how it should be applied.

The initial task of the EFG was to evaluate the 37 objectives recommended in COBIT 5 and select those that were applicable and more important to direct attention towards. This approach

was taken to first reduce the number of COBIT 5 objectives. COBIT is considered as a large, multi-layered and complex framework, making its full and complete implementation almost impossible for companies without huge financial muscle (Omari et al., 2012). The various objectives, though, best practices have different levels of importance. Some are considered more important than others, depending on the nature of the organisation, the timelines for implementation, resources and the business environment (Almeida, Neto, & Mira, 2018; Singh, 2010). As a result, it is not uncommon for companies to ‘cherry-pick’ controls from the framework with the aim to reduce its size (Omari et al., 2012). ISACA (2013) also recommend the use of the goal cascade but cautions against its mechanistic usage because it does not contain the universal truth while entities have different priorities which change overtime. The goal cascade in its present form does not consider the difference in contextual environment but is rather a sort of common denominator for all (Almeida et al., 2018). This makes it inappropriate for use to prioritise the COBIT 5 objectives for the entire sector. In the governance system design workflow recommended with the introduction of COBIT 2019, an entity can adopt either the quantitative or qualitative approach to prioritise the COBIT objectives based on the design factors (ISACA, 2019). Design factors represent those factors that may influence the design and implementation of an organisation’s governance system to ensure appropriate use of information and technology. Design factors include enterprise strategy, enterprise goals, risk profile, compliance requirement, enterprise size, etc., however, the choice of a design factor also depends on the nature of the industry (ISACA, 2019). The quantitative approach utilises numeric mapping tables (for each design factor) with calculations to quantify the descriptive values of the factors and their correlations with the COBIT objectives. The qualitative approach on the other hand involves the subjective determination of the relevant COBIT objectives for each of the design factors (ISACA, 2019). The Financial Services sector generally is characterised by the following; high regulation of IT, strategic role of IT, large enterprises, and high-threat environment. As such, for the prioritisation of the COBIT objectives, the experts settled on five major design factors which are compliance requirements, role of IT, information and technology related issues, enterprise size and risk profile.

To prioritise the COBIT 5 objectives, experts in the focus group were asked to review the control objectives and select the objectives they considered important and relevant to their organisations and the Financial Services sector based on the agreed design factors. The qualitative approach recommended by COBIT 2019 was adopted in the prioritisation exercise.

Each EFG member was tasked to select the COBIT 5 objectives that was considered a priority for immediate attention based on the design factors and its relevance to their organisations. The EFG came together after the individual exercise to reach a consensus on the objectives that was considered more important for the industry. With a clearer understanding of COBIT 5 objectives and the intended C5DIATF, the EFG was able to go through each of the 37 objectives in detail and evaluate them to determine their relative importance and the need to focus attention in the discussion of EGIT in the Ghanaian context. As recommended by Peffers et al. (2008), this process relied on the required resources for moving from the objective stage of the DSR to the design and development stage that is the industry expertise from a recognised knowledge base to guide and assist in the development of the design artefact. At the end of the third meeting with the EFG, the first task was completed and the EFG recommended that 11 objectives (**highlighted in the table below*) should be excluded from the discussion and as such, 26 objectives were utilised in the development of the C5DITAF.

Table 21: 37 COBIT 5 Processes (Source: COBIT 5 Framework ©2012 ISACA. All rights reserved. Used by permission)

Area	Domain	Objective ID	Objective	Objective Description
Governance	Evaluate, Direct and Monitor	EDM01	Ensure Governance Framework Setting and Maintenance	Analyse and articulate the requirements for the governance of enterprise IT, and put in place and maintain effective enabling structures, principles, processes and practices, with clarity of responsibilities and authority to achieve the enterprise's mission, goals and objectives.
Governance	Evaluate, Direct and Monitor	EDM02	Ensure Benefits Delivery	Optimise the value contribution to the business from the business processes, IT services and IT assets resulting from investments made by IT at acceptable costs.
Governance	Evaluate, Direct and Monitor	EDM03	Ensure Risk Optimisation	Ensure that the enterprise's risk appetite and tolerance are understood, articulated and communicated, and that risk to enterprise value related to the use of IT is identified and managed.
Governance	Evaluate, Direct and Monitor	EDM04	Ensure Resource Optimisation	Ensure that adequate and sufficient IT-related capabilities (people, process and technology) are available to support enterprise objectives effectively at optimal cost.
Governance	Evaluate, Direct and Monitor	EDM05	Ensure Stakeholder Transparency	Ensure that enterprise IT performance and conformance measurement and reporting are transparent, with stakeholders approving the goals and metrics and the necessary remedial actions.
Management	Align, Plan and Organise	APO01	Manage the IT Management Framework	Clarify and maintain the governance of enterprise IT mission and vision. Implement and maintain mechanisms and authorities to manage information and the use of IT in the enterprise in support of governance objectives in line with guiding principles and policies.
Management	Align, Plan and Organise	APO02	Manage Strategy	Provide a holistic view of the current business and IT environment, the future direction, and the initiatives required to migrate to the desired future environment. Leverage enterprise architecture building blocks and components, including externally provided services and related capabilities to enable nimble, reliable and efficient response to strategic objectives.

Area	Domain	Objective ID	Objective	Objective Description
Management	Align, Plan and Organise	APO03	Manage Enterprise Architecture	Establish a common architecture consisting of business process, information, data, application and technology architecture layers for effectively and efficiently realising enterprise and IT strategies by creating key models and practices that describe the baseline and target architectures. Define requirements for taxonomy, standards, guidelines, procedures, templates and tools, and provide a linkage for these components. Improve alignment, increase agility, improve quality of information and generate potential cost savings through initiatives such as re-use of building block components.
Management	<i>Align, Plan and Organise</i>	<i>APO04</i>	<i>Manage Innovation*</i>	<i>Maintain an awareness of information technology and related service trends, identify innovation opportunities, and plan how to benefit from innovation in relation to business needs. Analyse what opportunities for business innovation or improvement can be created by emerging technologies, services or IT-enabled business innovation, as well as through existing established technologies and by business and IT process innovation. Influence strategic planning and enterprise architecture decisions.</i>
Management	Align, Plan and Organise	APO05	Manage Portfolio	Execute the strategic direction set for investments in line with the enterprise architecture vision and the desired characteristics of the investment and related services portfolios and consider the different categories of investments and the resources and funding constraints. Evaluate, prioritise and balance programmes and services, managing demand within resource and funding constraints, based on their alignment with strategic objectives, enterprise worth and risk. Move selected programmes into the active services portfolio for execution. Monitor the performance of the overall portfolio of services and programmes, proposing adjustments as necessary in response to programme and service performance or changing enterprise priorities.
Management	Align, Plan and Organise	APO06	Manage Budget and Costs	Manage the IT-related financial activities in both the business and IT functions, covering budget, cost and benefit management, and prioritisation of spending through the use of formal budgeting practices and a fair and equitable system of allocating costs to the enterprise. Consult stakeholders to identify and control the total costs and benefits within the context of the IT strategic and tactical plans, and initiate corrective action where needed.

Area	Domain	Objective ID	Objective	Objective Description
Management	Align, Plan and Organise	APO07	Manage Human Resources	Provide a structured approach to ensure optimal structuring, placement, decision rights and skills of human resources. This includes communicating the defined roles and responsibilities, learning and growth plans, and performance expectations, supported with competent and motivated people.
Management	Align, Plan and Organise	APO08	Manage Relationships	Manage the relationship between the business and IT in a formalised and transparent way that ensures a focus on achieving a common and shared goal of successful enterprise outcomes in support of strategic goals and within the constraint of budgets and risk tolerance. Base the relationship on mutual trust, using open and understandable terms and common language and a willingness to take ownership and accountability for key decisions.
Management	Align, Plan and Organise	APO09	Manage Service Agreements	Align IT-enabled services and service levels with enterprise needs and expectations, including identification, specification, design, publishing, agreement, and monitoring of IT services, service levels and performance indicators.
Management	Align, Plan and Organise	APO10	Manage Suppliers	Manage IT-related services provided by all types of suppliers to meet enterprise requirements, including the selection of suppliers, management of relationships, management of contracts, and reviewing and monitoring of supplier performance for effectiveness and compliance.
Management	Align, Plan and Organise	APO11	Manage Quality	Define and communicate quality requirements in all processes, procedures and the related enterprise outcomes, including controls, ongoing monitoring, and the use of proven practices and standards in continuous improvement and efficiency efforts.
Management	Align, Plan and Organise	APO12	Manage Risk	Continually identify, assess and reduce IT-related risk within levels of tolerance set by enterprise executive management.
Management	Align, Plan and Organise	APO13	Manage Security	Define, operate and monitor a system for information security management.
Management	Build, Acquire and Implement	BAI01	Manage Programmes and Projects	Manage all programmes and projects from the investment portfolio in alignment with enterprise strategy and in a co-ordinated way. Initiate, plan, control, and execute programmes and projects, and close with a post-implementation review.
Management	Build, Acquire and Implement	BAI02	Manage Requirements Definition*	Identify solutions and analyse requirements before acquisition or creation to ensure that they are in line with enterprise strategic requirements covering business processes, applications, information/data, infrastructure and services. Co-ordinate with affected stakeholders the review of feasible options including relative

Area	Domain	Objective ID	Objective	Objective Description
				<i>costs and benefits, risk analysis, and approval of requirements and proposed solutions.</i>
Management	<i>Build, Acquire and Implement</i>	BAI03	<i>Manage Solutions Identification and Build*</i>	<i>Establish and maintain identified solutions in line with enterprise requirements covering design, development, procurement/sourcing and partnering with suppliers/vendors. Manage configuration, test preparation, testing, requirements management and maintenance of business processes, applications, information/data, infrastructure and services.</i>
Management	<i>Build, Acquire and Implement</i>	BAI04	<i>Manage Availability and Capacity*</i>	<i>Balance current and future needs for availability, performance and capacity with cost-effective service provision. Include assessment of current capabilities, forecasting of future needs based on business requirements, analysis of business impacts, and assessment of risk to plan and implement actions to meet the identified requirements.</i>
Management	<i>Build, Acquire and Implement</i>	BAI05	<i>Manage Organisational Change Enablement*</i>	<i>Maximise the likelihood of successfully implementing sustainable enterprise wide organisational change quickly and with reduced risk, covering the complete life cycle of the change and all affected stakeholders in the business and IT.</i>
Management	Build, Acquire and Implement	BAI06	Manage Changes	Manage all changes in a controlled manner, including standard changes and emergency maintenance relating to business processes, applications and infrastructure. This includes change standards and procedures, impact assessment, prioritisation and authorisation, emergency changes, tracking, reporting, closure and documentation.
Management	<i>Build, Acquire and Implement</i>	BAI07	<i>Manage Change Acceptance and Transitioning*</i>	<i>Formally accept and make operational new solutions, including implementation planning, system and data conversion, acceptance testing, communication, release preparation, promotion to production of new or changed business processes and IT services, early production support, and a post-implementation review.</i>
Management	Build, Acquire and Implement	BAI08	Manage Knowledge	Maintain the availability of relevant, current, validated and reliable knowledge to support all process activities and to facilitate decision making. Plan for the identification, gathering, organising, maintaining, use and retirement of knowledge.

Area	Domain	Objective ID	Objective	Objective Description
Management	Build, Acquire and Implement	BAI09	Manage Assets	Manage IT assets through their life cycle to make sure that their use delivers value at optimal cost, they remain operational (fit for purpose), they are accounted for and physically protected, and those assets that are critical to support service capability are reliable and available. Manage software licences to ensure that the optimal number are acquired, retained and deployed in relation to required business usage, and the software installed is in compliance with licence agreements.
<i>Management</i>	<i>Build, Acquire and Implement</i>	<i>BAI10</i>	<i>Manage Configuration*</i>	<i>Define and maintain descriptions and relationships between key resources and capabilities required to deliver IT-enabled services, including collecting configuration information, establishing baselines, verifying and auditing configuration information, and updating the configuration repository.</i>
<i>Management</i>	<i>Deliver, Service and Support</i>	<i>DSS01</i>	<i>Manage Operations*</i>	<i>Co-ordinate and execute the activities and operational procedures required to deliver internal and outsourced IT services, including the execution of pre-defined standard operating procedures and the required monitoring activities.</i>
<i>Management</i>	<i>Deliver, Service and Support</i>	<i>DSS02</i>	<i>Manage Service Requests and Incidents*</i>	<i>Provide timely and effective response to user requests and resolution of all types of incidents. Restore normal service; record and fulfil user requests; and record, investigate, diagnose, escalate and resolve incidents.</i>
<i>Management</i>	<i>Deliver, Service and Support</i>	<i>DSS03</i>	<i>Manage Problems*</i>	<i>Identify and classify problems and their root causes and provide timely resolution to prevent recurring incidents. Provide recommendations for improvements.</i>
Management	Deliver, Service and Support	DSS04	Manage Continuity	Establish and maintain a plan to enable the business and IT to respond to incidents and disruptions in order to continue operation of critical business processes and required IT services and maintain availability of information at a level acceptable to the enterprise.
<i>Management</i>	<i>Deliver, Service and Support</i>	<i>DSS05</i>	<i>Manage Security Services*</i>	<i>Protect enterprise information to maintain the level of information security risk acceptable to the enterprise in accordance with the security policy. Establish and maintain information security roles and access privileges and perform security monitoring.</i>
Management	Deliver, Service and Support	DSS06	Manage Business Process Controls	Define and maintain appropriate business process controls to ensure that information related to and processed by in-house or outsourced business processes satisfies all relevant information control requirements. Identify the relevant information control requirements and manage and operate adequate controls to ensure that information and information processing satisfy these requirements.

Area	Domain	Objective ID	Objective	Objective Description
Management	Monitor, Evaluate and Assess	MEA01	Monitor Evaluate and Assess Performance and Conformance	Collect, validate and evaluate business, IT and process goals and metrics. Monitor that processes are performing against agreed-on performance and conformance goals and metrics and provide reporting that is systematic and timely.
Management	Monitor, Evaluate and Assess	MEA02	Monitor Evaluate and Assess the System of Internal Control	Continuously monitor and evaluate the control environment, including self-assessments and independent assurance reviews. Enable management to identify control deficiencies and inefficiencies and to initiate improvement actions. Plan, organise and maintain standards for internal control assessment and assurance activities.
Management	Monitor, Evaluate and Assess	MEA03	Monitor Evaluate and Assess Compliance with External Requirements	Evaluate that IT processes and IT-supported business processes are compliant with laws, regulations and contractual requirements. Obtain assurance that the requirements have been identified and complied with and integrate IT compliance with overall enterprise compliance.

**Processes excluded by the EFG*

The second task of the EFG during the design phase of the C5DITAF was to recommend governance mechanisms that in their opinion would facilitate the implementation of the 26 selected COBIT 5 objectives. Members of the group were briefed about the five classifications governance mechanisms espoused in the Integrative IT Governance Framework (presented in Chapter three) and were also exposed to the baseline governance mechanisms presented in literature (De Haes & Van Grembergen, 2009; Weill & Ross, 2005) and well as the COBIT 5 practices. This was done to provide a clearer understanding of governance mechanisms and how they are being implemented in other jurisdictions. EFG was then tasked to recommend and validate the mechanisms based on the 26 COBIT 5 objectives. First each member of the EFG was requested to individually make the recommendations. Once all members completed their recommendations, we reconvened to discuss the reason and rationale for each recommendation and its relevance to the Ghanaian Financial Services Sector. At the end of the second task, 43 governance mechanisms were recommended and mapped to the 26 COBIT 5 objectives, as shown below.

Table 22: Recommended Governance Mechanisms to enhance COBIT 5 Processes

S/N	Mechanism	Mapped COBIT 5 Process	Process ID
1	IT Steering Committee	Ensure Governance Framework Setting and Maintenance	EDM01
2	IT Decisions Reporting Lines	Manage the IT Management Framework	APO01
3	Accountability of IT Services	Manage the IT Management Framework	APO01
4	IT Project Steering Committee	Manage Programmes and Projects	BAI01
5	IT Portfolio Office	Manage Portfolio	APO05
6	Chief Information Officer (CIO)	Manage the IT Management Framework	APO01
7	The Chief Audit Executive (CAE)	Monitor, Evaluate and Assess	MEA01
8	IT Roles and Responsibilities	Manage the IT Management Framework	APO01
9	IT Governance function	Ensure Governance Framework Setting and Maintenance	EDM01
10	Internal Audit Unit	Monitor, Evaluate and Assess	MEA02 MEA03

	S/N	Mechanism	Mapped COBIT 5 Process	Process ID
Processes	11	Quality Assurance (QA) control standards	Manage Quality	APO11
	1	Strategic information systems Planning	Manage Strategy	APO02
	2	IT Performance Management	Ensure Benefits Delivery	EDM02
	3	Portfolio Management	Manage Portfolio	APO05
	4	Charge backs	Manage Service Agreements	APO09
	5	Service Level Agreements IT	Manage Service Agreements	APO09
	6	Project Governance / Management Methodologies	Manage Programmes and Projects	BAI01
	7	IT Budget Control and Reporting	Ensure Resource Optimisation	EDM04
	8	IT Budget Control and Reporting	Manage Budget and Costs	APO06
	9	Benefits Management and Reporting	Ensure Benefits Delivery	EDM02
	10	IT Risk Management and Control	Ensure Risk Optimisation	EDM03
	11	IT Assets Management	Manage Assets	BAI09
	12	Maker Checker Controls	Manage Business Process Controls	DSS06
	13	Business Continuity Plan & Disaster Recovery Plan	Manage Continuity	DSS04
	Leadership	14	IT Vendor Management	Manage Suppliers
15		Change Management	Manage Changes	BAI06
1		IT Strategy Committee	Ensure Governance Framework Setting and Maintenance	EDM01
2		IT expertise at level of Board of Directors	Ensure Governance Framework Setting and Maintenance	EDM01
3		IT Audit Committee	Ensure Governance Framework Setting and Maintenance	EDM01
4		IT Strategy	Ensure Governance Framework Setting and Maintenance	EDM01
5		Directors Responsibility to IT Governance	Ensure Governance Framework Setting and Maintenance	EDM01
6		Board of Directors oversight over the IT risk process	Ensure Resource Optimisation	EDM03
7		IT Governance Disclosure	Ensure Stakeholder Transparency	EDM05

	S/N	Mechanism	Mapped COBIT 5 Process	Process ID
Technology	1	Executive Support System (ESS)	Ensure Resource Optimisation	EDM04
	2	Decision Support System (DSS)	Ensure Resource Optimisation	EDM04
	3	IT Architecture	Manage Enterprise Architecture	APO03
Relational Mechanisms	1	Cross-training	Manage Human Resources	APO07
	2	Knowledge management	Manage Knowledge	BAI08
	3	Informal relations between business and IT management	Manage Relationships	APO08
	4	Corporate communications for IT issues	Manage Knowledge	BAI08
	5	IT Governance awareness campaigns	Ensure Stakeholder Transparency	EDM05
	6	Staff Succession Plan and Management of staff attrition	Manage Human Resources	APO07
	7	Ongoing Training and Development for Board Directors	Manage Human Resources	APO07

After the determination of the governance mechanisms, the EFG proceeded to the third task, which was to determine audit objectives for each of the governance mechanisms recommended during the second task. Members also had the opportunity to recommend new governance mechanisms where necessary to support the objectives of the solution. During this process, the EFG first individually determined the appropriate audit objectives that would provide an adequate scope for the audit of the recommended governance mechanisms. The purpose of the audit objectives is to ensure that the controls design and operation for each governance mechanisms exist and are working as intended. The group reconvened together to agree on individual audit objectives for each mechanism. During the meeting, several audit objectives were deliberated upon to assess their relevance to the problem identified and their relevance to the context of the study. While some objectives were combined, others were ignored, and some added after the deliberations to determine the complete list of audit objectives presented in Appendix 10. The third task ended after the eighth meeting. During the meeting two participants raised concerns around the need to include audit testing procedures as part of the framework. The argument was to make the

framework easy to use by any knowledgeable auditing professional as stipulated in the objectives of a solution. The EFG agreed to the recommendation and this was made a requirement for the fourth task.

The EFG were tasked to finally indicate audit testing procedures for the identified audit objectives. Participants were tasked to make their recommendations as industry specific as possible. With this stage, the study draws from the organisational knowledge base of the participants to determine the independent testing procedures. Each participant agreed to develop the testing procedures independently. The group reconvened in three meetings to discuss the procedures and make them industry specific, drawing from their organisational specific procedures. At the end of the eleventh meeting, the EFG decided on the testing procedures that resulted in the development of version one of the C5DITAF.

The result of the first iteration of the C5DITAF was shared with the Confirmatory Focus Group (CFG) to evaluate it. To ensure that the CFG understood the tool, the moderator explained the design process, the problems that led to the design and development, the objectives of a solution and the intended outcome of the evaluation exercise. The four tasks and the steps used were clearly outlined to the CFG.

The CFG raised concerns relating to the recent development in the financial sector that were not captured in the framework. First, they recommended the need to include mechanisms that would enhance data protection and information security. The Central Bank of Ghana (BoG), in its quest to clean the banking sector communicated several directives which included the need for all the banks to create the position of a Chief Information Security Officer (CISO) and directed the banks to ensure strict compliance with the Data Protection Act and the Electronic Transaction Act. The CFG were of the view that processes, structures and other mechanisms should be included that comply with the directive.

Second, the CFG were of the view that the technological mechanisms and their audit objectives captured in the framework did not emphasise the review of collaborative technologies that foster shared understanding and facilitate timely information sharing. Third, the CFG felt that the testing procedures for the various roles (such as the CIO, Steering Committee members) and the appointment of directors responsible for IT as captured in the first iterations did not ensure

compliance with the “fit and proper person” requirements of the Banks and Specialised Deposit-Taking Act, 2016 (ACT 930). They were of the view that the section of the law was critical to ensure that individual placed in positions to make IT decision should have sound and adequate capacity to undertake the responsibility.

Fourth, the CFG highlighted that, the BoG clearly espoused in its directives that all directors of financial institutions are required to obtain certification from the National Banking College, or any other college recognised by the BoG to the effect that they have participated in a corporate governance programme. This was not captured in the first iteration. Other areas of concern highlighted by CFG were Related Party IT Transactions, Directors’ Appointments, Risk Committee at Board and Management Levels and IT regulatory Compliance Officer.

This process with the CFG helped the researcher to determine the need for another iterations of the design cycle (Hevner et al., 2004; Tremblay et al., 2010) in order to effectively solve the problems identified. From the initial evaluation of the C5DITAF by the CFG, the researcher determined the need for a second iteration of the design cycle with a special focus on the issues raised by the CFG as well as a wider focus on the BoG directives.

The EFG was reconstituted and provided with the feedback from the first evaluation of the C5DIATF performed by the CFG. To provide a clearer picture of the requirement from the CFG, the moderator introduced the BoG directives which were issued in March 2018 and December 2018. The EFG was also tasked with taking a cursory look at the relevant Acts of Parliament that had not been adequately addressed with the first iteration of the framework. With a clearer understanding of the feedback from the CFG, the EFG meet and all of the recommendations from the CFG were adopted. Besides the recommendations from the CFG, the EFG added some mechanisms that were overlooked in the first version of the framework and made changes to some testing procedures to make them more relevant. In all, 10 mechanisms were included along with their respective audit objectives (Appendix 11). These additional mechanisms were mapped to the COBIT 5 objectives utilised in the first iterations. The second version of the artefact is presented in Appendix 12.

On completion of the second version, the CFG was given the opportunity to evaluate the content. At this time the group were satisfied with the additional mechanisms introduced. The researcher’s

supervisor (who is an expert in IT Governance) also evaluated the second version and was satisfied with the content but raised the need to develop the framework to make it easier to use. In his opinion, the framework needed clear instructions and the navigations should be automated. Based on this review, the researcher resolved for a third iteration purposely to redesign the excel document and to add a clear instruction for its usage. Since the third iteration was not about the content, the EFG was not reconvened.

Visual Basic for Applications (VBA) in Microsoft Excel was identified as a programming tool for the development of the third version. The choice was to maintain excel as the tool because of its popularity among auditors in the sector. Also, as this is a cross-sectional study, the researcher is bound by time and so the tool was appropriate to effect the recommendations within the timeframe. A dashboard with buttons to aid navigations was developed as well as an instruction button and a detailed instruction page (refer to Appendix 13 for snapshots of the dashboard). After effecting all the recommendations from the second review, the researcher concluded the development process and proceeded to the demonstration and the evaluation of the C5DITAF with the understanding that a successful artefact development is determined by its contribution to solving identified problems (Hevner et al., 2004; March & Smith, 1995; Peffers et al., 2008).

7.5 Demonstration of the COBIT 5-Driven IT Audit Framework

Peffers et al. (2008) recommend the demonstration of the use of the artefact to solve one or more instances of the problems through several means including, experimentations, simulation, case study, proof or other appropriate activity. Demonstration can be done with a single act of demonstration to prove the efficacy or through a formal evaluation procedures (Peffers et al., 2008). At this stage the researcher assessed the ability of the C5DITAF in a real-world setting utilising existing audit teams in the case of companies selected in Chapter Six. Using the real-world setting resonates with the ontological stances of the researcher which emphasise that the notion of truth is essentially what works in practice (March & Smith, 1995).

As postulated by Peffers et al. (2008) the audit teams engaged for the demonstration phase of the design cycle showed evidence of reasonable expertise and knowledge of how to use the artefact. Nonetheless, the researcher provided the teams with a brief training on how to use the artefact and the expected outcome. The final version of the C5DITAF was made available to the audit teams.

They were tasked with incorporating the audit objectives and testing procedures espoused in the framework in their annual plan and ensure continuous monitoring and review of the mechanisms to ensure they are working as intended. This stage benefited from the co-participatory nature of the design and development of the artefact. Several members of the audit teams utilised were participants in the EFG and CFG. With this approach, the researcher was able to create buy-in during the development phase and increase the knowledge base of the team on the use of the artefact. In-depth feedback from members of the audit teams was solicited and captured in the evaluation phase of the cycle.

7.6 Evaluation: Findings and limitations of the COBIT 5 Driven IT Audit Framework

In line with the guidelines of Hevner et al. (2004) the study adopted rigorous approach to demonstrate the utility, quality and efficacy of the design artefact using different evaluation methods. The purpose of this stage is to assess how well the design artefact can resolve the defined research problem (Peppers et al., 2008). The cycle of evaluation used in the design iterations coupled with the evaluation presented confirms the rigour of the DSR used in this study. Two major forms of evaluations were adopted; formative and summative evaluation. Both techniques were utilised to gain an in-depth understanding of the performance of the artefact from different perspectives (Venable et al., 2016).

7.6.1 Formative Evaluation

With formative evaluations, a researcher utilises empirical interpretations from participants that provides a basis for the improvement of the artefact or assessing the performance (Venable et al., 2016). With the CFG in the previous stage of the design cycle, the researcher used the in-depth discussions with the group to improve the artefact. At this formative evaluation step, qualitative data were mainly utilised first through discussion with CFG, as well as complementary data from individual interviews with the members of the group.

In the evaluation process, the researcher presented the developed framework to audit team members of the case companies selected using specified criteria in Chapter Six. The researcher provided an explanation of the intention of the framework which is to assist them in their audit planning and the substantive testing procedures to ensure that EGIT Governance auditing activities cover all the relevant areas that requires attention for effective EGIT. The researcher visited two

audit teams in their offices, urged them to utilise the artefact and interviewed some members on their impression about the relevance, usefulness and limitation of the framework to their EGIT audit activities.

The data gathered from the interviews were transcribed into MS Excel and summarised into three major areas which are perceived usefulness, perceived ease of use, and challenges. The first two areas summarise the objectives of the solution espoused in the second step of the DSR.

i. Perceived Usefulness

The utility of an artefact is mostly determined by its usefulness. Perceived usefulness assesses the degree to which the usage of an artefact would enhance the user's performance. Several theoretical propositions in the IS discipline have established how perceived usefulness of an artefact evaluate the adequacy of the artefact to perform as intended.

As espoused in the objectives of the solution, the artefact was intended to facilitate the regular audit of IT governance mechanisms, be relevant to the financial services sector, align to the needs and expectations of shareholders and other stakeholders. These objectives in essence indicate how useful the artefact is, to solving the problem. In the last CFG meeting, participants generally agreed that the final version of the C5DITAF was helpful in providing guidance regarding what need to be covered in EGIT audit programs and that the artefact could be helpful to them in their planning process. During the interview a member of the CFG made the comment below;

“I believe this exercise to develop the C5DITAF was very useful. I have been an auditor for several years and I haven't provided much attention to IT Governance issues. In my opinion, yes, the C5DIAF that I helped to develop is useful. To date there is no proper guidelines on how to commence a governance audit so I mostly focus on technical issues. I believe this framework will be beneficial to any IT auditor in Ghana”

Other participants emphasised the increased level of detail in the framework and how it would be useful to them. Below are a few comments;

One CFG member indicated that:

“What I have seen in the final version of the framework is very detailed. It doesn’t end with the audit objective for the auditor to wander around to identify the testing procedures. Its usefulness is clear. I only have to adapt a few of the steps in the testing procedures to my organisation and that is very useful to me. The framework has defined clearly my audit objectives for each Governance mechanisms and has covered almost everything that is relevant in the industry. I will be glad if we could regularly meet maybe as members of ISACA to improve the artefact because the industry is a fast changing one”

He further highlighted that:

“With the detailed audit objectives and clear testing procedure that covers several areas of IT Governance, our audit risk will be low because the detection risk will be reduced considerably. Regardless of the inherent and control risk, any reasonable IT auditor can identify critical issues that require attention”

Another member of the CFG also described how the tool would be useful. He indicated that;

“More often than not other business managers who do not really understand the importance and value of IT audit make funny comments during meetings to say we do not contribute to the income of the business and are always stifling business. Several of my audit findings are disregarded at management level and touted as trivial and time-wasting. With this framework, I believe I can make a clear contribution to the company and show the essence and importance of IT audit. I will be able to show them (other managers) that these governance issues are vital to the survival of the organisation. With the recent happenings in the financial sector, I believe findings from governance audit will not be considered trivial.”

During the visit to audit team members in the field, they provided similar comments regarding the usefulness of the artefact during its demonstration. One audit team member explained that;

“My audit plan for this year has been very engaging. I’m delving into a lot of new areas and I have received lots of attention from management. The audit dashboard (which is a list of unresolved audit exceptions) also received lots of attention. After we published the first audit report using this framework, the CEO invited the audit team for a meeting and asked the way forward to improve our IT governance. This has never happened before. More often we publish the audit reports and we receive a reply saying the report has been received and recommendations will be resolved. I have to send the dashboard several times and send several reminders before they give credence to the exceptions raised, but this year has been positively different.”

The feedback from the CFG participants and the audit team members indicates the usefulness of the tool.

ii. Perceived Ease-of-use

Perceived ease of use assesses the degree to which the usage of the design artefact is free from effort by the user. Past studies in IS have established that the extent of effort required to utilise an artefact influences the likely acceptance of the artefact. Utility is not the only evaluation objective. For the framework to be generally accepted and utilised in the industry, it has to be relatively easy to use by a knowledgeable auditor. This was recognised as a key objective of the proposed solution as espoused in the second stage of the DSR. During the evaluation some of the CFG participants provided the following comments that depict the ease of use of the artefact:

“I believe the C5DITAF is very easy to use, I don’t have to do much work in my audit planning process. With just a good risk assessment I can go on the field with the tool and expect good results”

“The audit testing procedures listed in the framework makes it easy to adapt to any organisation within the sector. The audit objectives are very clear”

“The framework was purely developed for the financial services sector in Ghana. Much of the content is sector specific. As an internal control officer in the bank, the framework provides as ease to use tool for me”

These comments provide a clear indication on the ease of using the artefact with respect to EGIT audits in the Ghanaian Financial sector. However, it is necessary to properly communicate clearly how to use the framework and its purpose to increase the understanding of how to use it. EGIT is a broad phenomenon that has dire consequences when ignored. Making the tool ease to use is critical and important to ensure the artefact is accepted and used to prevent several financial losses. The Country Head of Internal Control for one of the case banks provided a summed-up statement that espoused the utility and the ease of use of the C5DITAF. He explained that:

“The objectives contained in the framework provide a lot of coverage. They will complement our existing audit programs. We know that IT Governance is important if we are to improve shareholder value and create wealth. However, we have turned a blind eye on it for a long time and unfortunately it has cost the industry and the country great fortunes. Sometimes, I feel professionals are the major cause of the failures and believe that to prevent future occurrences we must prove our usefulness. With the wide coverage of this framework, we can efficiently plan our audit. This is however dependent on the appropriateness and adequacy of the risk assessment done prior each audit. I think that when done appropriately, we can ensure the sanity of the industry. Looking at the content of the tool, it can complement what we have done so far and also ensure we focus our attention on the necessary stuff. The tool has been simplified in a way that makes training inexperienced staff easier. I’m happy to be part of its development.”

iii. Challenges

Despite the positive feedback on the usefulness and ease of use of the artefacts, there were few issues of concerns that were summarised as challenges with the use of the tool. Critical among the concerns raised was that the scope of the framework is wide and cannot be covered within a single financial year of operation. A detailed risk assessment needs to be done before conducting the audit with the framework. Below are comments from the audit teams visited on the field:

“I know the framework has improved my work regarding IT Governance auditing. The little concern I have is that without a clear risk assessment, an auditor might focus attention on areas that do not pose much risk. This will not add the intended value. For instance, in my bank, the activities of a steering committee are regularly monitored already. The risk that the committee is not functioning properly is low as such during our review for this year we didn’t review the steering committee as recommended. However other areas that lack attentions such as the Related Party IT transactions were a major focus for us this year. My concern is that an auditor who has not risen to the level to perform effective risk-based audits might be found wanting.”

“I appreciate the need to cover all the various areas of Governance; however, when we started the IT Governance audit, I honestly was struggling with which area to commence with. But in the end the team had a discussion and assessed the various areas that require more attention.”

From the analysis of the qualitative data presented in this section, it can be inferred that the evaluation of the C5DITAF is useful and will be easy for any knowledgeable IT auditor to use. Although the study is aware of the newly developed COBIT 2019, it was determined at this stage that the major changes in COBIT 2019 (changing the concept of enabler into components, maturity assessment based on CMM instead of PAM and the addition of three management process) would not affect the C5DITAF significantly. Perhaps, future versions of the framework can incorporate the improved changes in COBIT 2019. This notwithstanding, the CMM recommended by COBIT 2019 was adopted in the assessment of the governance maturity.

Despite the concerns raised by the participants, the researcher believed, there was no need to assemble the EFG and CFG for further evaluation. This is because the issues raised as challenges can be effectively tackled during the communication of the artefact and proper training of users. The study proceeded to the summative evaluation (presented in the next chapter) to test the efficacy of the artefact to support the theoretical proposition espoused in Chapter Four.

7.6.2 Summative Evaluation

Results of the summative evaluation of the artefact are presented in the next chapter.

7.7 Communication of the Contribution of the Design Science Study

Communication provides an opportunity for the researcher to explain the problem and its relevance, the nature of the artefact, the rigour of the design, and the efficacy of the artefact to relevance researchers and practitioners (Peppers et al., 2008). For this DSR, the purpose of this step was to communicate the importance of EGIT to the Ghanaian Financial Services Sector and how the C5DITAT provides an innovative approach to solve the problem from the auditor's perspective, the rigorous nature of the DSR, and the significance of the study's contribution to practice and the body of knowledge. This thesis is the main avenue to communicate the result of the DSR. However, the researcher intends to regularly present portions of the study to members of the local Accra Chapter of ISACA at the monthly meetings. With this approach, the researcher can create buy-in for wide acceptance of the artefact and training more practitioners in how to use the artefact. Sections of this thesis were also published in highly ranked academic conferences.

This study has contributed to knowledge by providing an integrative theoretical framework for EGIT, a phenomenon that has been criticised in past studies as lacking theoretical underpinnings. By adopting and using a clear DSR methodology that is widely accepted, the study has clearly shown the rigour used in all three cycles of DSR and also applied Hevner et al.'s (2004) seven guidelines. The table below shows how the guidelines were applied and achieved.

Table 23: Application of Hevner et al. (2004) guidelines.

GUIDELINE	HOW IT WAS APPLIED AND ACHIEVED IN THIS DSR
Guideline 1: Design as an Artefact	By developing and demonstrating a focused and innovative artefact for the audit planning and substantive testing process of EGIT audits.
Guideline 2: Problem Relevance	Recent issues within the financial services coupled with the increased investments in IT have created the need to ensure that IT delivers the required value and prevent financial and other losses. With a problem-centred approach, the study clearly explained the problem that has necessitated the need for this artefact.
Guideline 3: Design Evaluation	The DSR adopted multiple layers of evaluation. First, the CFG was used to evaluate and refine the artefact during the design and development stage. They were also utilised to assess the utility and ease of use of the

GUIDELINE	HOW IT WAS APPLIED AND ACHIEVED IN THIS DSR
Guideline 4: Research Contributions	<p>completed artefact. Audit Team members who used the artefact in a real environment also provided qualitative data that evaluates the artefact. Finally, the study adopted a summative evaluation to quantitatively assess the efficacy of the artefact to deliver value.</p> <p>This DSR makes research contributions on three main grounds. First, the study adopted a scientific approach to convert tacit knowledge (that resides in the experiences of experts) to a physical artefact that is intended to solve a real problem. Second, the evaluation of the DSR provides evidence of the conceptual framework and the hypotheses developed. Lastly, the study contributes to research with the development of a C5DITAF, an artefact that has been proven to be useful in providing solution to some of the Governance issues affecting the Financial Services sector of Ghana.</p>
Guideline 5: Research Rigour	<p>This study met this guideline by designing, demonstrating and evaluating the C5DITAF through multiple iterations and by adherence to a widely used design science research methodology.</p>
Guideline 6: Design as a Search Process	<p>To search for an effective solution to the problem, the study adapted COBIT 5 (which is a <i>de facto</i> IT Governance framework for industry) as the ‘means’ to achieve the ‘ends’. To satisfy the uncontrollable forces ‘laws’ within the environment, the study ensured compliance of the artefact to relevant laws and directives affecting the problem identified.</p>
Guideline 7: Communication of Research	<p>This study was communicated to technology-oriented and management-oriented audiences. This was done through brief training provided to the audit teams who utilised the artefact. Also, efforts are in place to expand the scope of communications to practitioners (ISACA members in Accra) to take advantage of the benefits offered by the artefact. This thesis serves as a main point of communication to academic audience. Portions of the study were presented at top-academic conferences and journals for publication.</p>

7.8 Discussion – Auditing EGIT Practices

Both researchers (De Haes & Van Grembergen, 2015; Gerke & Ridley, 2006) and practitioners (Deloitte, 2014; ISACA, 2013) have acknowledged the benefits and potential benefits of adopting and implementing governance mechanisms for IT resources. In the midst of growing IT investments in the business landscape, adopting and implementing governance mechanisms ensures IT decisions are made to create value for the enterprise in a way that will ensure value delivery for all stakeholders, effective risk management of the ever-increasing IT risk exposure, strategic alignment of business and IT objectives, compliance with legislation and proper resource management of IT assets (Weill & Ross, 2005). Nonetheless, there is an inherent risk in adopting and implementing governance practices without continuous monitoring to ensure that those practices are working as intended (Gantz, 2014b). As such, several EGIT frameworks emphasised the need for monitoring to provide regular assurance.

The core aim of any audit activity is to limit an enterprise's exposure to the inherent and control risks embedded in decision making. However, in many enterprises, auditing is considered as a "necessary evil" without intrinsic value (Merhout & Havelka, 2008). With this mindset, enough attention is not given to the need for providing assurance to EGIT practices. However, when done properly, effective EGIT auditing adds value through three dimensions of benefits; to 'Assure', to 'Advice', and to 'Anticipate' (Deloitte, 2019). The IT audit function provides timely 'Assurance' on the adequacy and efficacy of the governance mechanisms to support appropriate IT decisions. The IT audit function also supports management and executives with 'Advice' on best practices to protect IT infrastructure and operations. Relying on the three lines of defence, the IT audit function, being the third line of defence, advises the first and second lines on their assurance capabilities and helps with technology assets that can facilitate this. Furthermore, an effective IT audit function is innovative, and future-looking, focused on providing executives and management with preventive insights or emerging risks that impede on decision and curtail the achievement of objectives. While these benefits to shareholders are crucial, other explicit benefits that accrue to enterprises that conduct EGIT audits include compliance with government and international regulations, improved documentation of information systems, improved system security, and IT fraud detection (Merhout & Havelka, 2008).

To deliver these benefits, the quality of the audit process is paramount (whether conducted by external or internal auditors). Past studies (Havelka, Merhout, & Merhout, 2007; Merhout & Havelka, 2008; Stoel et al., 2012) have identified several factors that impact on the quality of audits. These factors can be broadly categorised into enterprise-controlled factors and audit team factors. Key among the enterprise-controlled factors, is the philosophy of management and the executive (“tone at the top”) to support (through the provision of adequate resources) and provide an enabling control environment. Audit team factors centre on the technical competencies of the team members, the audit process or methodology and other subtle factors such as team cohesion. This study postulates that with the C5DITAF, EGIT audit quality will be enhanced through the provision of an artefact that can guide and complement the technical competencies of the audit team.

In an empirical assessment of the attributes that impact IT audit quality, Stoel et al. (2012) found that Planning and Methodology was the most important factor to improve the quality of IT audits. However, they raised concerns that, despite a clear planning and methodology for Financial audits, the IT audit function lagged behind. With the developed framework, it is envisaged that its contents, which are relevant to the empirical situation, can be used in planning of EGIT audits and guide the audits. They also noted that another critical factor that influence the quality of the audit was the problem with the Audit Scope. The importance of scope stems from the need to reduce audit risk significantly in any audit through the reduction of the risk of detection. With a wider and relevant audit scope, the risk of non-detection is significantly reduced. The C5DITAF provides a relevant audit scope that considers a wide spread of governance mechanisms based on COBIT 5. According to Gantz, (2014b) organisations are not necessarily required to follow any formally defined framework to practise effective governance; nonetheless, frameworks such as COBIT 5 used in the design and development provide the foundational elements of IT audit baselines.

With this artefact, the study posits that, the quality of EGIT within the Ghanaian Financial Services landscape will be improved. It will also improve the responsiveness of the IT audit functions to anticipate emerging EGIT risks and ensure compliance with regulation.

7.9 Summary of Chapter

This chapter presented the COBIT 5 Driven IT Audit framework as a design artefact that was developed through a rigorous application of the DSRM Methodology. In the application of this methodology, the researcher relied on theories, methods, and industry expertise from a known knowledge base to guide and assist in the development of the design artefact. The rigorous development and design of a research artefact involves a continuous process that integrates the elements of design relevance and rigour in a cycle. The process also involves a series of iterations to ensure that issues that emerge after each evaluation are addressed in the next iteration until nothing new can be added (Tremblay et al., 2010).

In the next chapter the summative evaluation of the artefact to complement the formative evaluation is presented. A quantitative analysis of the changes that occurred after the use of the artefact is presented. The evaluation proves the efficacy of the artefact to solve the problems identified in the first phase of the DSRM.

CHAPTER EIGHT

SUMMATIVE EVALUATION – POST-AUDIT ASSESSMENT OF EGIT

8.1 Introduction

This chapter presents a discussion of the summative evaluation of the artefact as designed in the previous chapter. Based on the guidelines presented by Hevner (2007) and the process model of Peffers et al. (2008), a rigorous evaluation to assert the utility and the efficacy of the artefact was conducted. As such, the formative and summative approach to evaluation was adopted. The formative evaluation process which is embedded in the design and development chapter was used to understand the utility of the artefact.

In this chapter, the summative evaluation (henceforth referred to as "evaluation") of the efficacy of the COBIT 5-Driven IT Audit Framework is presented. The purpose of evaluation in the DSR is to demonstrate the rigour and show the scientific nature of design science. This phase of the evaluation provides evidence that the artefact can satisfy the objectives of a solution and the claims in the theoretical framework presented in Chapter Three. A quantitative approach using cluster analysis and post-hoc analysis were adopted. The summative evaluation was conducted to assess whether the developed artefact would, in a real-world setting, lead to the improvement of the maturity of the governance mechanisms presented in the conceptual framework. In this evaluation, the study presents a comparative analysis of the EGIT configurations of the entities in the study. IT auditors of the case organisations were given the final artefact of the design process to adopt and adapt in their audit process for a period. Prior to that, the researcher measured the maturity of the governance mechanisms as presented in Chapter Six. In this summative evaluation Chapter, the researcher re-measured the maturity of the governance mechanisms and the findings from this Chapter are compared to the findings from Chapter Six which was collected prior to the use of the artefact. To test the significance of the changes experienced after the use of the artefact, Post-Hoc analysis was conducted, and the results are presented here.

8.2 Research Method: Data Collection and Cleaning

The method and approach used to gather the quantitative data for this section are the same as the approach adopted in Chapter Six. All case organisations selected in Chapter Six were part of this

section as well. The questionnaire instrument as well as the targeted sample were the same as in Chapter Six.

As in the prior survey, a total of 138 questionnaires were prepared to be distributed and administered in the offices of the respondents in the presence of the contact persons of each case organisation. Respondents were again given a period of two weeks to complete the questionnaire, after which the researcher proceeded to their collection. At the end of the time set for collection, 72 respondents had completed and submitted their questionnaire, thus giving a response rate of 52.17%.

After collection, the responses were keyed in Microsoft Excel for further analysis. Responses to demographic questions were entered as nominal scales, while remaining constructs were entered as ordinal scales. After the data was coded and captured, it was screened to check for missing, incomplete or invalid responses. Missing Data is not uncommon in quantitative data collection. The researcher followed the steps recommended by Hair, Black, Babin, & Anderson (2014) to evaluate the actions required to improve the data for analysis. They recommend that, variables with 15% missing data can be deleted while cases with 75% missing data should be deleted.

8.3 Results of Post Audit Cluster Analysis

To recap, the conceptual model postulated that regular auditing of EGIT practices with the C5DITAF would improve the maturity of governance mechanisms and its coherence. In Chapter Six, the study analysed the maturity of EGIT mechanisms of the seven case organisations, the nature of the coherence among the mechanisms and the configuration that led to an effective EGIT. Cluster analysis was adopted to test the coherence among the mechanisms by grouping the cases based on the responses to the variables and deriving patterns that reflect the organisational configuration (Miller, 1989).

To evaluate the efficacy of the artefact, the same cluster analysis is used to assess the maturity of the EGIT mechanisms and the resultant configuration after usage of the artefact for a period of seven months. The *k*-means was again selected as the algorithm to ensure consistency and comparability of the results with the prior results.

To determine the appropriate number of clusters, the elbow method was used. The idea of the elbow method is to run *k*-means algorithm on the dataset for multiple times using a range of values of *k* (Purnima & Arvind, 2014; Syakur et al., 2018). For each *k*, the Within Sum of Squares (WSS) is computed and the results for all ranges are used to draw a graph. WSS is defined as the sum of the squared distance between each member of the cluster and its centroid. The elbow point on the graph shows the number of clusters beyond which the change in the WSS is insignificant (Purnima & Arvind, 2014).

Computing the elbow point, the researcher started off with a random *k* of 2, which produced an average WSS of 58.09. The number of clusters was thereafter increased by one and the subsequent three increases produced an average WSS of 49.26, 47.07, and 45.12 respectively. It was noted that at three clusters, the subsequent increase produced only a marginal drop in the average WSS. Cluster three was therefore chosen as the “elbow criterion” or the optimal number for clusters.

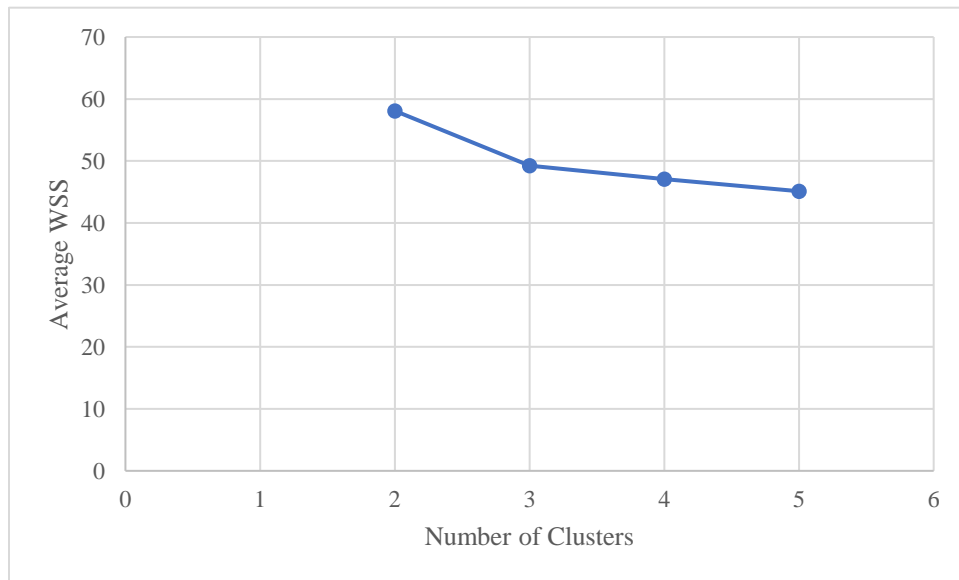


Figure 17: Elbow Point – Determining the Number of Clusters – Second Survey

8.3.1 Demographics – Second Survey

Cluster 1 (n= 22) had a fair balance of senior Business and IT managers. Most of them were females, with over 10 years of work experience in their respective fields, and were Bachelor’s degree holders with a few professional qualifications. Cluster 1 respondents were mostly from

banks with over GHs 50m investments in IT over the past five years. This cluster was matched with cluster 3 of the previous survey for the comparative analysis.

Cluster 2 (n=21) was mostly characterised by male respondents with working experience between 10 -15 years. Respondents from this cluster work with Pension Fund managers with moderate investment in IT over the past five years (between GHs 11m – 50m) and an employee size of about 500 employees. This was matched with Cluster 1 of the previous survey for the comparative analysis.

Cluster 3 (n= 29) was characterised by male respondents and had a fair balance of senior Business and IT managers. Cluster 1 respondents were mostly from Savings & Loans institutions with moderate investment (between GHs 11m – 50m) in IT over the past five years. The cluster was matched with Cluster 2 of the previous survey for the comparative analysis.

Table 24: Demographics

Characteristics	Total	Cluster 1 (n=22)		Cluster 2 (n=21)		Cluster 3 (n=29)	
		Count	%	Count	%	Count	%
Age							
25-30	3	0	0	0	0	3	10
31-35	30	8	36	14	67	8	28
36-40	28	12	55	7	33	9	31
>50+	11	2	9	0	0	9	31
Total	72	22	100	21	100	29	100
Sex							
Male	41	10	45	12	57	19	66
Female	31	12	55	9	43	10	34
Total	72	22	100	21	100	29	100
Educational Level							
Bachelor’s Degree	24	3	14	9	43	12	41
Master’s Degree	28	11	50	11	52	6	21
PhD	0	0	0	0	0	0	0
Professional Qualification	20	8	36	1	5	11	38
Total	72	22	100	21	100	29	100
Years of Experience							
Less than 1 Y	0	0	0	0	0	0	0
1 Y less than 5 Y	4	0	0	0	0	4	14
5 Y less than 10	22	4	18	6	28	12	41
10 Y less than 15 Y	30	12	55	10	48	8	28
More than 15 Y	16	6	27	5	24	5	17

Total	72	22	100	21	100	29	100
Role							
Mgr – IT Audit	11	3	14	3	14	5	17
Mgr – IT / IS	20	7	32	4	19	9	31
Mgr – Risk Mgt	11	3	14	5	24	3	10
Non-Executive Director	0	0	0	0	0	0	0
Executive Director	8	2	8	4	19	2	7
Others – Mkt /Bus Dpt/ HR Mgr	22	7	32	5	24	10	35
Total	72	22	100	21	100	29	100
Industry / Sector							
Banking	22	21	95	1	5	0	0
Savings & Loans	29	0	0	4	19	25	86
Pension Funds	21	1	5	16	76	4	14
Total	72	22	100	21	100	29	100
Number of Employees							
51 - 200	0	0	0	0	0	0	0
201 – 500	50	1	5	20	95	29	100
>500+	22	21	95	1	5	0	0
Total	72	22	100	21	100	29	100
Estimated IT Investment (GHs) in past five years							
2m – 10m	0	0	0	0	0	0	0
11m – 50m	50	1	5	20	95	29	100
>50m +	22	21	95	1	5	0	0
Total	72	22	100	21	100	29	100

8.3.2 Nature of Elements across Clusters – Second Survey

Just as done in the earlier survey, raw scores were used in the analysis without any standardisation. This is because all the variables used in the analysis were captured using an ordinal scale (1-5). The mean values presented show the mean for the cluster and not the mean for the entire sample population. In the ANOVA table below, all the variables returned significant p-value at a significance level of 0.01. The cluster solution produced clearly distinct clusters providing insights into the nature of the governance mechanisms after the use of the artefact. Satisfied with the cluster solutions produced by the *k*-means algorithm, the researcher proceeded to conduct a comparative analysis of the changes that occurred.

Table 25: Analysis of Variance and Cluster Solution – Second Survey

Variable	ANALYSIS OF VARIANCE						CLUSTER MEANS		
	BSS	df	WSS	df	F	sig.	Cluster 1	Cluster 2	Cluster 3
STRUCTURES									
Steering Committee	11.8	2.0	36.1	69.0	11.3	0.0	3.95	3.57	3.00
Reporting Lines	18.8	2.0	43.5	69.0	14.9	0.0	3.95	3.52	2.76
Roles and Responsibilities	19.6	2.0	41.3	69.0	16.4	0.0	3.91	3.48	2.69
Empowered IT personnel	43.0	2.0	42.3	69.0	35.0	0.0	4.23	3.81	2.48
Chief Information Officer	27.6	2.0	50.3	69.0	18.9	0.0	3.91	3.48	2.48
Coordination of Governance	18.8	2.0	61.8	69.0	10.5	0.0	3.41	3.29	2.31
Monitoring of KPIs	28.1	2.0	59.7	69.0	16.3	0.0	3.64	3.24	2.21
Alignment of Tasks	32.6	2.0	50.7	69.0	22.2	0.0	3.95	3.38	2.38
Chief Audit Officer	44.7	2.0	60.3	69.0	25.6	0.0	3.50	3.76	2.03
PROCESSES									
Strategic IT Planning	31.1	2.0	60.4	69.0	17.8	0.0	3.82	2.90	2.24
Budgetary Control	12.7	2.0	46.4	69.0	9.4	0.0	3.59	3.29	2.62
Chargeback	28.5	2.0	80.1	69.0	12.3	0.0	3.68	2.81	2.17
Risk Assessment	29.3	2.0	85.8	69.0	11.8	0.0	3.41	2.76	1.90
Change Management	31.9	2.0	50.6	69.0	21.7	0.0	4.18	3.29	2.59
Performance Monitoring	24.8	2.0	66.1	69.0	12.9	0.0	3.82	3.10	2.41
SLA	21.6	2.0	68.4	69.0	10.9	0.0	3.73	2.95	2.41
Benefit Monitoring	32.0	2.0	38.9	69.0	28.4	0.0	3.32	2.29	1.72
Incidence Response	45.2	2.0	29.1	69.0	53.6	0.0	3.64	3.86	2.14
Formalised Operations	53.3	2.0	29.3	69.0	62.8	0.0	3.36	2.00	1.31
LEADERSHIP									
Environment Analysis	21.2	2.0	12.1	69.0	60.4	0.0	3.95	2.95	2.69
Governance Oversight	25.8	2.0	13.7	69.0	64.7	0.0	3.95	3.86	2.69
Risk Management	26.0	2.0	25.9	69.0	34.7	0.0	3.82	2.90	2.38
Governance Disclosure	26.6	2.0	18.0	69.0	51.1	0.0	3.95	2.90	2.52
Portfolio Evaluation	36.7	2.0	43.6	69.0	29.1	0.0	4.14	2.90	2.45
Capability Monitoring	46.7	2.0	53.8	69.0	29.9	0.0	3.82	2.90	1.90
Regulatory Compliance	51.6	2.0	47.8	69.0	37.2	0.0	3.95	2.95	1.93
TECHNOLOGY									
Decision Support Systems	38.9	2.0	44.2	69.0	30.3	0.0	3.86	2.95	2.10
IT Architecture	55.6	2.0	54.4	69.0	35.2	0.0	4.09	3.14	2.00
Transparency	37.4	2.0	46.2	69.0	27.9	0.0	4.36	3.14	2.66
Stakeholders	56.2	2.0	51.6	69.0	37.6	0.0	4.05	3.81	2.14
Communication & Collaboration	49.2	2.0	47.3	69.0	35.9	0.0	4.45	3.14	2.48
Information Security	35.0	2.0	51.6	69.0	23.4	0.0	4.05	3.24	2.38
Transactional Activities	36.9	2.0	60.1	69.0	21.2	0.0	3.95	3.10	2.24
Knowledge Management	46.2	2.0	47.8	69.0	33.4	0.0	4.09	3.10	2.17

Assurance Activities	49.7	2.0	36.0	69.0	47.6	0.0	4.50	3.19	2.52
RELATIONAL MECHANISMS									
Cross Training	27.7	2.0	34.2	69.0	28.0	0.0	3.64	3.05	2.17
Job Rotation	38.3	2.0	16.7	69.0	79.3	0.0	3.95	3.05	2.21
Regular Campaigns	7.9	2.0	38.7	69.0	7.1	0.0	3.41	2.86	2.62
Informal Activities	19.2	2.0	66.3	69.0	10.0	0.0	3.82	3.00	2.59
Value Definition	22.5	2.0	39.9	69.0	19.5	0.0	3.36	2.95	2.07
EFFECTIVE EGIT (Outcome)									
<i>Strategic Business/IT Harmony</i>									
Infrastructure Harmony	29.1	2.0	41.8	69.0	24.0	0.0	3.64	2.52	2.14
Strategy Harmony	58.8	2.0	55.2	69.0	36.8	0.0	4.41	3.14	2.24
Harmony in IT Choices	71.4	2.0	33.2	69.0	74.2	0.0	4.59	2.86	2.24
<i>Value Delivery</i>									
Competitive Advantages	25.2	2.0	95.7	69.0	9.1	0.0	3.59	2.71	2.17
Operational Efficiency	64.5	2.0	56.6	69.0	39.4	0.0	4.41	3.10	2.14
Cost Reductions	21.3	2.0	73.4	69.0	10.0	0.0	3.64	2.52	2.41
<i>Risk Management</i>									
Risk Profile	20.5	2.0	62.1	69.0	11.4	0.0	3.59	2.86	2.31
IT Security	70.1	2.0	58.6	69.0	41.2	0.0	4.41	2.43	2.17
Reduces Uncertainties	57.9	2.0	25.2	69.0	79.1	0.0	4.23	2.48	2.17
<i>Performance Management</i>									
Results Oriented	38.3	2.0	67.6	69.0	19.5	0.0	4.09	3.19	2.34
Effective Delivery	34.9	2.0	73.4	69.0	16.4	0.0	3.95	3.29	2.31
Timeliness	44.5	2.0	55.4	69.0	27.7	0.0	4.23	3.05	2.34
<i>Resource Management</i>									
Value for Money	12.8	2.0	77.1	69.0	5.7	0.0	3.05	2.43	2.03
Resource Deployment	75.8	2.0	55.1	69.0	47.5	0.0	4.45	2.67	2.03
Accountability	52.4	2.0	28.2	69.0	64.1	0.0	4.05	2.81	2.00

8.4 Comparative Analysis of Clusters Means

The hypothesis being tested in this chapter is “H2: The audit of enterprise governance with C5DITAF will improve the maturity of the governance mechanisms and its coherence”. To test the statistical difference between the means, several tests can be adopted such as the t-test and Post-Hoc tests. The t-test is a type of statistical test that is used to determine the statistical significance of the differences in the means of two groups. t-Tests are usually used in experiments with either two different (or the same) groups to compare the changes in the groups. However, the problem

with t-test for this study is that it increases the overall Type I error or family wise error rate. In other words, the t-test over-estimates the significance level in the case of multiple comparisons (Hair et al., 2014). The comparative tests for the cluster mean require multiple comparisons of the cluster means for each cluster (for the first and second survey). A simple comparison of the cluster means individually using t-test might result in an overestimation of the significance level since it will not consider the entire differences in the entire sample but rely on solely the differences in the cases for each cluster. To reduce the family-wise error rate, the Post-Hoc test – Tukey honestly significant difference (HSD) test was adopted.

Tukey's test is a single-step multiple comparison procedure that works on the studentised range distribution or the Q statistics which calculates the critical value based on the number of groups and number of sample observation in the group (Winer, 1962).

This test was selected out of the several post-hoc test because of its ability to work with unequal sample sizes for the groups. In this study, the samples for the first survey (N = 67) were different for the second survey (N = 72). This analysis was done using statistica software.

For Tukey's test to reach a statistical conclusion about the differences in the sample mean, the sample needs to meet the conditions of normality and independence and must be conducted after the analysis of variance returns significant results. Prior to the analysis of the statistical differences in the cluster means, these assumptions were tested.

Independent observations: This assumption holds if the respondents in the sample groups represent different persons within the population. This holds for the data used in this study because, in gathering the data for both surveys, the researcher submitted the data collection instrument to the target population of 138 respondents. However, in each survey different respondents within the population responded. The random nature of the data collection means that the two samples for each cluster were independently sampled from the same sample population of 138.

Normality: For this assumption to be met, the dependent variable must follow a normal distribution in the population. The test of skewness or kurtosis was used to assess the normality of the data used in the analysis. Skewness is used to describe the balance of the distribution while kurtosis measures the “peakedness” or “flatness” of the distribution compared with the normal distribution.

The most commonly used threshold for kurtosis is ± 2.58 (.01 significance level) and ± 1.96 , which corresponds to a .05 error level, while ± 1.0 is used for skewness (Hair et al., 2014). Based on the results from the analysis of skewness and kurtosis (presented in Appendix 9) the data was deemed appropriate for Tukey's test analysis to be performed.

Analysis of Variance: From the analysis of the total variation in the two samples, there were statistically significant differences as such the researcher proceeded with the Tukey's test (Appendix 14).

8.5 Post-Hoc test – Tukey Honestly Significant Difference (HSD) test

To test for the differences in mean for each of the clusters, the organisational characteristics were used to match the clusters from the earlier survey to the second survey. From the demographic analysis presented in sections 6.10.1 and 8.3.1 and Cluster 1 respondents were mostly from the banks as such was compared to Cluster 3 in the earlier survey. The demographic analysis also shows that Cluster 2 respondents were mostly employees of Pension Fund Institutions and was compared with Cluster 1 of the earlier survey. Finally, Cluster 3 which represented the Savings and Loans institutions, was compared with Cluster 2 of the earlier survey. Cases within each of the clusters were filtered to produce the Tukey HSD results below:

Table 26: Cluster 1 (Banks) - Tukey HSD for Unequal Sample Size Results

Variable	Unequal N HSD; Grouping: Cluster Group 1: Cluster 3 – First Survey (C3a) Group 2: Cluster 1 – Second Survey (C1b)						
	Mean (C3a)	Mean (C1b)	Valid N - (C3a)	Valid N - (C1b)	Std. Dev.- (C3a)	Std. Dev.- (C1b)	Tukey HSD p-Value
STRUCTURES							
Steering Committee	3.85	3.95	20	22	0.37	0.58	0.99
Reporting Lines	3.85	3.95	20	22	0.49	0.65	0.99
Roles and Responsibilities	3.95	3.91	20	22	0.51	0.68	0.99
Empowered IT personnel	4.05	4.23	20	22	0.51	0.87	0.95
Chief Information Officer	3.80	3.91	20	22	0.41	1.15	0.99
Coordination of Governance	3.80	3.41	20	22	0.41	1.22	0.55
Monitoring of KPIs	3.80	3.64	20	22	0.41	1.14	0.98
Alignment of Tasks	3.70	3.95	20	22	0.47	0.95	0.85
Chief Audit Officer	3.75	3.50	20	22	0.44	1.30	0.89
PROCESSES							
Strategic IT Planning	3.55	3.82	20	22	0.69	1.05	0.89
Budgetary Control	3.20	3.59	20	22	0.70	1.10	0.52

Chargeback	3.45	3.68	20	22	0.60	1.17	0.96
Risk Assessment	3.30	3.41	20	22	0.57	1.30	0.99
Change Management	3.40	4.18	20	22	0.68	0.73	0.01
Performance Monitoring	3.50	3.82	20	22	0.83	1.10	0.83
SLA	3.25	3.73	20	22	0.72	1.03	0.48
Benefit Monitoring	3.45	3.32	20	22	0.60	0.78	0.99
Incidence Response	3.35	3.64	20	22	0.49	0.79	0.65
Formalised Operations	3.35	3.36	20	22	0.67	0.49	0.99
LEADERSHIP							
Environment Analysis	3.45	3.95	20	22	0.83	0.21	0.02
Governance Oversight	3.95	3.95	20	22	0.60	0.49	0.99
Risk Management	3.50	3.82	20	22	0.76	0.39	0.59
Governance Disclosure	3.50	3.95	20	22	0.76	0.21	0.08
Portfolio Evaluation	3.70	4.14	20	22	0.47	0.99	0.30
Capability Monitoring	3.30	3.82	20	22	0.80	1.18	0.28
Regulatory Compliance	4.00	3.95	20	22	0.97	0.95	0.99
TECHNOLOGY							
Decision Support Systems	3.45	3.86	20	22	0.51	1.17	0.44
IT Architecture	3.45	4.09	20	22	0.51	1.19	0.08
Transparency	4.35	4.36	20	22	0.59	1.00	0.99
Stakeholders	4.15	4.05	20	22	0.75	1.21	0.99
Communication & Collaboration	4.25	4.45	20	22	0.64	0.86	0.95
Information Security	3.45	4.05	20	22	0.51	1.09	0.11
Transactional Activities	3.45	3.95	20	22	0.51	1.00	0.34
Knowledge Management	4.20	4.09	20	22	0.62	0.87	0.99
Assurance Activities	3.80	4.50	20	22	0.41	0.74	0.01
RELATIONSHIPS							
Cross Training	3.30	3.64	20	22	0.92	0.85	0.57
Job Rotation	3.70	3.95	20	22	0.73	0.21	0.47
Regular Campaigns	3.35	3.41	20	22	0.88	0.59	0.99
Informal Activities	3.70	3.82	20	22	0.73	0.96	0.99
Value Definition	3.40	3.36	20	22	0.82	0.58	0.99
EFFECTIVE EGIT (Outcome)							
Strategic Business/IT Harmony							
Infrastructure Harmony	3.60	3.64	20	22	0.60	0.90	0.99
Strategy Harmony	4.00	4.41	20	22	0.92	0.80	0.98
Harmony in IT Choices	4.15	4.59	20	22	0.93	0.59	0.76
Value Delivery							
Competitive Advantages	3.60	3.59	20	22	0.60	1.37	0.99
Operational Efficiency	4.40	4.41	20	22	0.99	0.59	0.95
Cost Reductions	4.15	3.64	20	22	0.93	1.40	0.99
Risk Management							
Risk Profile	3.55	3.59	20	22	0.60	0.67	0.99

IT Security	4.45	4.41	20	22	0.76	0.50	0.99
Reduces Uncertainties	4.20	4.23	20	22	0.95	0.53	0.99
Performance Management							
Results Oriented	4.45	4.09	20	22	0.69	1.11	0.77
Effective Delivery	4.40	3.95	20	22	0.75	1.09	0.60
Timeliness	4.10	4.23	20	22	0.91	0.53	0.99
Resource Management							
Value for Money	3.45	3.05	20	22	0.69	1.21	0.70
Resource Deployment	4.40	4.45	20	22	0.68	0.51	0.99
Accountability	4.00	4.05	20	22	0.86	0.65	0.99

NB: Variables bold faced are statistically significant at 10% significance level

The results above indicate that after auditing the organisations within the cluster with the C5DITAT, there was not much significant change in the overall maturity of EGIT mechanisms in the cluster. Significant improvement was observed in five variables. There was a significant improvement in the change management processes embedded within the institutions (*from m=3.40 to m=4.18*). Under Leadership, the results show that there was significant change in the efforts undertaken by the board to monitor the environment regularly to inform IT decisions (*from m=3.45 to m=3.95*) and the maturity of the Board to ensure regular communication to the stakeholders concerning EGIT (*from m=3.50 to m=3.95*). Under Technological Mechanisms, significant improvement was observed in the maturity of the IT architecture that provides a common platform to support business and IT strategies (*from m=3.45 to m=4.09*). Similarly, it can be inferred that the internal audit's access to information for the EGIT audits has improved (*from m=3.80 to m=4.50*). There was no significant change in the overall EGIT effectiveness.

Table 27: Cluster 2 (Pension Fund) – Tukey HSD for Unequal Sample Size Results

Variable	Unequal N HSD; Grouping: Cluster						
	Group 1: Cluster 1 – First Survey (C1a) Group 2: Cluster 2 – Second Survey (C2b)						
	Mean (C1a)	Mean (C2b)	Valid N - (C1a)	Valid N - (C2b)	Std. Dev.- (C1a)	Std. Dev.- (C2b)	Tukey HSD p-Value
STRUCTURES							
Steering Committee	3.76	3.57	21	21	0.44	0.98	0.91
Reporting Lines	3.81	3.52	21	21	0.40	0.93	0.73
Roles and Responsibilities	2.95	3.48	21	21	0.22	0.93	0.10
Empowered IT personnel	2.71	3.81	21	21	0.46	0.60	0.00
Chief Information Officer	2.95	3.48	21	21	0.22	0.75	0.10
Coordination of Governance	2.90	3.29	21	21	0.30	0.78	0.55
Monitoring of KPIs	2.86	3.24	21	21	0.36	0.94	0.56

Alignment of Tasks	3.00	3.38	21	21	0.00	0.86	0.48
Chief Audit Officer	3.71	3.76	21	21	0.46	0.62	0.99
PROCESSES							
Strategic IT Planning	2.67	2.90	21	21	0.58	1.09	0.92
Budgetary Control	2.52	3.29	21	21	0.51	0.72	0.01
Chargeback	2.52	2.81	21	21	0.51	1.21	0.89
Risk Assessment	3.33	2.76	21	21	0.58	1.26	0.30
Change Management	2.57	3.29	21	21	0.51	0.96	0.02
Performance Monitoring	2.62	3.10	21	21	0.59	1.04	0.44
SLA	3.24	2.95	21	21	0.70	1.16	0.88
Benefit Monitoring	2.52	2.29	21	21	0.51	1.01	0.85
Incidence Response	2.43	3.86	21	21	0.51	0.48	0.00
Formalised Operations	2.52	2.00	21	21	0.51	0.89	0.06
LEADERSHIP							
Environment Analysis	2.71	2.95	21	21	0.46	0.22	0.65
Governance Oversight	3.81	3.86	21	21	0.40	0.36	0.99
Risk Management	2.43	2.90	21	21	0.68	0.30	0.13
Governance Disclosure	2.62	2.90	21	21	0.50	0.30	0.52
Portfolio Evaluation	2.71	2.90	21	21	0.46	0.77	0.94
Capability Monitoring	2.38	2.90	21	21	0.59	0.70	0.25
Regulatory Compliance	3.43	2.95	21	21	0.81	0.67	0.37
TECHNOLOGY							
Decision Support Systems	2.43	2.95	21	21	0.75	0.38	0.16
IT Architecture	2.33	3.14	21	21	0.66	0.57	0.01
Transparency	2.38	3.14	21	21	0.67	0.91	0.01
Stakeholders	3.76	3.81	21	21	0.44	0.40	0.99
Communication & Collaboration	2.52	3.14	21	21	0.75	0.85	0.08
Information Security	2.52	3.24	21	21	0.68	0.77	0.02
Transactional Activities	2.29	3.10	21	21	0.64	1.00	0.01
Knowledge Management	2.43	3.10	21	21	0.60	0.77	0.03
Assurance Activities	2.52	3.19	21	21	0.60	0.68	0.01
RELATIONSHIPS							
Cross Training	2.00	3.05	21	21	0.00	0.74	0.00
Job Rotation	2.00	3.05	21	21	0.00	0.59	0.00
Regular Campaigns	2.38	2.86	21	21	0.86	0.79	0.30
Informal Activities	1.86	3.00	21	21	0.36	1.14	0.00
Value Definition	1.95	2.95	21	21	0.22	0.97	0.00
EFFECTIVE EGIT (Outcome)							
<i>Strategic Business/IT Harmony</i>							
Infrastructure Harmony	2.62	2.52	21	21	0.50	0.68	0.99
Strategy Harmony	3.33	3.14	21	21	1.02	0.96	0.98
Harmony in IT Choices	2.57	2.86	21	21	0.51	0.73	0.77
<i>Value Delivery</i>							
Competitive Advantages	2.71	2.71	21	21	0.46	1.31	0.99

Operational Efficiency	3.33	3.10	21	21	1.02	1.09	0.95
Cost Reductions	2.57	2.52	21	21	0.51	0.81	0.99
Risk Management							
Risk Profile	2.62	2.86	21	21	0.50	1.28	0.93
IT Security	2.71	2.43	21	21	0.46	1.29	0.85
Reduces Uncertainties	2.62	2.48	21	21	0.50	0.81	0.98
Performance Management							
Results Oriented	3.43	3.19	21	21	0.68	1.08	0.94
Effective Delivery	3.38	3.29	21	21	0.74	1.27	0.99
Timeliness	2.67	3.05	21	21	0.48	1.16	0.64
Resource Management							
Value for Money	2.57	2.43	21	21	0.51	1.25	0.99
Resource Deployment	2.57	2.67	21	21	0.51	1.32	0.99
Accountability	2.76	2.81	21	21	0.44	0.40	0.99

NB: Variables bold faced are statistically significant at 10% significance level

Results from Cluster 2 showed significant changes in several of the variables and the governance mechanisms after the audit team conducted EGIT audits within the seven-month period. Despite the improvement in the governance mechanisms within the cluster, these mechanisms have not been fully embedded in the organisational activities to warrant a significant increase in EGIT effectiveness.

Under structural mechanisms, three variables showed significant changes. After the audit of the EGIT practices of the organisations within this cluster there has been significant improvement in the definition and communication of IT roles and responsibilities (*from $m=2.95$ to $m=3.48$*). IT personnel have been empowered and are held accountable for their actions and inactions (*from $m=2.71$ to $m=3.81$*). Similarly, the role of CIO has seen significant improvement regarding its empowerment to implement board IT decisions (*from $m=2.95$ to $m=3.48$*).

Significant changes were also observed for four process mechanisms. The respondents within this cluster indicated that the budgetary control processes for IT investments (*from $m=2.52$ to $m=3.29$*), IT change management processes (*from $m=2.57$ to $m=3.29$*), as well as incidence response processes (*from $m=2.43$ to $m=3.86$*) have improved and formalised. Interestingly, there was a decline in the coordination of IT operational procedures and activities (*from $m=2.52$ to $m=2.00$*). This is probably because of the implementation of several governance mechanisms which have not yet been fully embedded in the operations of the IT services. Over time this is expected to overturn and improve.

There was no statistically significant change in any of the leadership mechanisms; however significant change was observed in seven technological mechanisms. All the statistically significant changes in mean for the technological mechanisms moved from Level 2 to Level 3 on the maturity model. Substantial improvements were noted in the IT architecture of the organisations within this cluster to provide a common platform for business and IT strategies (*from m=2.33 to m=3.14*), systems and technologies designed to provide EGIT information to outside stakeholders and systems and technologies that support communication and collaborations (*from m=2.52 to m=3.14*). Similarly, respondents indicated that the substantial security measures have been made to ensure the protection of information and information resources (*from m=2.52 to m=3.24*). With improved systems, the Internal audit function has access to adequate information that supports EGIT auditing (*from m=2.52 to m=3.19*).

Four out of the five relational mechanisms assessed showed statistically significant improvement after the usage of the C5DITAF. Respondents within the cluster indicated that there has been a substantial effort to ensure that IT staff are trained about business and business staff are trained about IT (*from m=2.00 to m=3.05*). In a like manner, the respondents indicated a substantial improvement in job rotation (*from m=2.00 to m=3.05*) and informal meetings between business and IT managers (*from m=1.86 to m=3.00*), which has provided a clear sense of purpose, values and behaviours towards IT and Business strategies (*from m=1.95 to m=2.95*).

Table 28: Cluster 3 (Savings & Loans) – Tukey HSD for Unequal Sample Size Results

Variable	Unequal N HSD; Grouping: Cluster Group 1: Cluster 2 – First Survey (C2a) Group 2: Cluster 3 – Second Survey (C3b)						
	Mean (C2a)	Mean (C3b)	Valid N - (C2a)	Valid N - (C3b)	Std. Dev.- (C2a)	Std. Dev.- (C3b)	Tukey HSD p-Value
STRUCTURES							
Steering Committee	2.42	3.00	26	29	0.50	0.60	0.00
Reporting Lines	2.12	2.76	26	29	0.59	0.79	0.00
Roles and Responsibilities	2.12	2.69	26	29	0.65	0.71	0.02
Empowered IT personnel	2.12	2.48	26	29	0.52	0.83	0.34
Chief Information Officer	2.19	2.48	26	29	0.49	0.63	0.62
Coordination of Governance	2.42	2.31	26	29	0.50	0.81	0.99
Monitoring of KPIs	2.23	2.21	26	29	0.59	0.73	0.99
Alignment of Tasks	2.08	2.38	26	29	0.63	0.78	0.62
Chief Audit Officer	2.19	2.03	26	29	0.49	0.78	0.97
PROCESSES							
Strategic IT Planning	1.88	2.24	26	29	0.52	0.69	0.57

Budgetary Control	1.65	2.62	26	29	0.56	0.62	0.00
Chargeback	1.77	2.17	26	29	0.51	0.89	0.54
Risk Assessment	1.81	1.90	26	29	0.57	0.82	0.99
Change Management	1.85	2.59	26	29	0.54	0.87	0.00
Performance Monitoring	1.92	2.41	26	29	0.56	0.82	0.28
SLA	1.69	2.41	26	29	0.55	0.82	0.03
Benefit Monitoring	1.73	1.72	26	29	0.53	0.45	0.99
Incidence Response	1.77	2.14	26	29	0.59	0.64	0.23
Formalised Operations	1.85	1.31	26	29	0.54	0.54	0.21
LEADERSHIP							
Environment Analysis	1.96	2.69	26	29	0.45	0.60	0.00
Governance Oversight	2.08	2.69	26	29	0.48	0.47	0.00
Risk Management	1.65	2.38	26	29	0.49	0.86	0.00
Governance Disclosure	1.96	2.52	26	29	0.45	0.74	0.00
Portfolio Evaluation	2.12	2.45	26	29	0.52	0.63	0.46
Capability Monitoring	1.69	1.90	26	29	0.55	0.72	0.93
Regulatory Compliance	1.96	1.93	26	29	0.45	0.84	0.99
TECHNOLOGY							
Decision Support Systems	2.08	2.10	26	29	0.56	0.67	0.99
IT Architecture	2.00	2.00	26	29	0.57	0.80	0.99
Transparency	2.04	2.66	26	29	0.53	0.55	0.02
Stakeholders	2.12	2.14	26	29	0.59	0.79	0.99
Communication & Collaboration	2.12	2.48	26	29	0.59	0.78	0.48
Information Security	2.08	2.38	26	29	0.56	0.73	0.69
Transactional Activities	1.96	2.24	26	29	0.60	0.83	0.79
Knowledge Management	2.08	2.17	26	29	0.56	0.85	0.99
Assurance Activities	2.12	2.52	26	29	0.59	0.74	0.21
RELATIONSHIPS							
Cross Training	1.73	2.17	26	29	0.45	0.54	0.13
Job Rotation	2.00	2.21	26	29	0.00	0.56	0.56
Regular Campaigns	1.69	2.62	26	29	0.47	0.82	0.00
Informal Activities	1.81	2.59	26	29	0.40	0.87	0.01
Value Definition	1.65	2.07	26	29	0.49	0.70	0.22
EFFECTIVE EGIT (Outcome)							
<i>Strategic Business/IT Harmony</i>							
Infrastructure Harmony	2.12	2.14	26	29	0.65	0.74	0.99
Strategy Harmony	1.81	2.24	26	29	0.63	0.91	0.47
Harmony in IT Choices	1.85	2.24	26	29	0.61	0.74	0.31
<i>Value Delivery</i>							
Competitive Advantages	2.08	2.17	26	29	0.69	0.89	0.99
Operational Efficiency	1.81	2.14	26	29	0.57	0.95	0.75
Cost Reductions	1.81	2.41	26	29	0.57	0.82	0.12
<i>Risk Management</i>							
Risk Profile	2.04	2.31	26	29	0.72	0.85	0.83

IT Security	1.77	2.17	26	29	0.59	0.85	0.44
Reduces Uncertainties	1.81	2.17	26	29	0.57	0.47	0.32
Performance Management							
Results Oriented	2.08	2.34	26	29	0.69	0.81	0.87
Effective Delivery	1.81	2.31	26	29	0.57	0.76	0.31
Timeliness	1.85	2.34	26	29	0.61	0.90	0.21
Resource Management							
Value for Money	2.08	2.03	26	29	0.69	0.73	0.99
Resource Deployment	1.85	2.03	26	29	0.54	0.73	0.94
Accountability	1.77	2.00	26	29	0.65	0.76	0.79

NB: Variables bold faced are statistically significant at 10% significance level,

Cluster 3 was the lowest-performing cluster in both the first and second surveys. However, after the usage of the artefact by the internal audit team members within their organisations, respondents reported significant improvement in their EGIT maturity. In the earlier survey, several of the governance mechanisms within this cluster were either non-existent or were managed in an *ad hoc* manner. Three structural mechanisms statistically improved after the usage of the artefact. First, the respondents were of the view that the activities of the IT steering committee have substantially improved after reviews by the auditors (*from m=2.42 to m=3.00*). IT reporting lines (*from m=2.12 to m=2.69*) as well as roles and responsibilities (*from m=2.12 to m=2.76*) which have also been defined and documented but not yet in a standardised way.

In relation to the process mechanisms, the respondents reported significant changes in three mechanisms. However, none of them was beyond Level 2 on the maturity model. Respondents within the cluster reported an improvement in the IT Budgetary control process (*from m=1.65 to m=2.17*), change management processes (*from m=1.85 to m=2.59*) and the service level agreement between IT and business about IT projects and IT operations.

Some activities of the Board of directors towards EGIT improved after audit recommendations were made. The respondents indicated that the board became more proactive to monitor the environment and take decisions accordingly (*from m=1.96 to m=2.69*). The board also became more involved in the overall EGIT of these organisations (*from m=2.08 to m=2.69*) and showed some level of interest in the IT risk management (*from m=1.65 to m=2.38*) of the organisations.

For the technological mechanisms the analysis did not show much significant change. The respondents reported that, after the use of the artefact, some extra efforts were made to ensure that

systems and technologies are in place to provide EGIT information to outside stakeholders (*from m=2.04 to m=2.66*), though these efforts are done in an *ad hoc* basis.

Respondents in this cluster reported significant improvements in EGIT relationships. Relational mechanisms are established to provide a sense of purpose and bonding for both IT and Business people within the organisations. After the usage of the artefact within the seven-month period, the results show that within this cluster, there was improvement in the regular campaigns about EGIT (*from m=1.69 to m=2.62*) and informal meetings between IT and Business people (*from m=1.81 to m=2.59*). Although these improvements are statistically significant, they were still not formalised within the organisations.

8.6 Discussion of Results

It should be recalled that the objective of this part of the study was to evaluate the efficacy of the C5DITAF and test the theoretical claim that regular auditing of EGIT mechanisms will improve the governance maturity and subsequent effectiveness. Auditing is the third line of defence for risk management and control. The assurance theory postulates that regular independent assessment of any system improves the quality of information for decision makers (Ramamoorti & Siegfried, 2016). Although no obvious correlation has been established between auditing activities and financial performance, extant studies have found that IT auditors can create value by expanding their activities and become more proactive on EGIT (D'Onza, Lamboglia et al., 2015; Merhout & Havelka, 2008).

The Board and senior management are responsible for establishing the organisation's IT objectives in alignment with business strategies, implementing EGIT controls such as structures, policies and other mechanisms to accomplish set IT objectives (IIA, 2018). The increasing rate of global financial crises and high-profile information security breaches have heightened the need for IT auditors to take more proactive role in EGIT to help achieve a balance between value creation and value preservation. This can be done by providing constructive criticisms, recommendations and feedback on the adequacy and appropriateness of the control environments and control activities within an enterprise (Cohen & Sayag, 2010; Gantz, 2014b).

Several factors have been studied to impact on the efficacy of auditing including organisational setting (Mihret & Yismaw, 2007), audit team expertise (Merhout & Havelka, 2008; Mihret & Yismaw, 2007), audit scope (Merhout & Havelka, 2008), and the regulatory environment (Soh & Martinov-Bennie, 2011). For this evaluation, the C5DITAF was designed to provide an appropriate audit scope for the audit of EGIT mechanisms. Selection of the cases as show in section 6.2 was carefully done using criteria intended to reduce the impact of the other factors. For instance, the regulatory environment had been intensified during the period of the survey and companies within the sector had been put on high alert on the need to operate with sound governance. Again, all the selected organisations had well instituted audit functions reducing the risk of noncompliance with audit recommendations. With these in place the findings confirm the proposition that, regular EGIT audits will improve the maturity of governance mechanisms.

For Cluster 1, few changes were noted. This cluster already had several mechanisms operating in a formalised manner (Level 3) prior to the use of the artefact. There is the tendency for such organisations to relax on these practices overtime, making it necessary for regular EGIT auditing to ensure that they work as intended. Gantz (2014) suggests that conducting EGIT audits confirm that processes and activities executed by the organisation conform to policies and procedures to identify any areas of disagreement. Beyond providing information to management about EGIT operations, audits of this type can also offer evidence to demonstrate that the organisation's implemented processes indicate a level of maturity and validate the integrity of decision-relevant information (Ramamoorti & Siegfried, 2016).

Cluster 2 showed most significant changes in its governance practices after the audits. Governance structures and technologies mechanisms within this cluster reached Level 3 maturity. Significant changes also occurred in the relational mechanisms signalling attempts by these organisations to create the necessary awareness and bonding among the actors in the cluster. De Haes and Van Grembergen (2009) suggest the need to spend considerable time and effort on business change management and awareness at the early phases of EGIT implementation. Over time, efforts on the relational mechanisms can be reduced after the practices have been embedded into the day-to-day processes and activities. Despite the improvement in the structures, technologies and relational mechanisms above level 3 maturity, governance processes within this clusters still lagged. This confirms earlier studies which have demonstrated that it is easier to implement structures and

relational mechanisms compared to processes, nonetheless it is these processes that will transform the other mechanisms into positive outcomes (De Haes & Van Grembergen, 2009).

Cluster 3 was the lowest-performing cluster in the first survey. The majority of the governance mechanisms were either non-existent or were applied on case-by-case basis. However, based on audit recommendations, almost all of the mechanisms moved one level higher but still below the threshold of level 3. Ramamoorti and Siegfried (2016) highlighted that for underperforming entities such as observed in this cluster, there is a critically important role for IT auditors in averting governance failures as well as ensuring the effective implementation of growth-oriented strategies that lead to superior performance and value creation by advising the Board and executive management decision-making processes, providing information on best practices and offering interpretations that facilitate management decision making. With the C5DITAF, IT auditors within the cluster were empowered to provide relevant recommendations that is grounded on best practices and industry directives/legislations.

Finally, the result from this survey presented in this chapter confirms the efficacy of the C5DITAF. Although there was not massive change in all clusters, it is not expected that IT auditors can cause a massive change within a short period of time in any organisation considering the complex nature of actors and elements in each organisation. Ramamoorti and Siegfried (2016) suggest that auditors should use the “little bites” approach to address governance as part of assurance or advisory services rather than taking “big bites” of governance which will fail eventually. The small steps will pave the way and break the boardroom barriers and politics to effect meaningful change. They also recommend using the back-door approach to EGIT auditing by conducting the auditing activities as part of the other already established audits in order to gradually effect change from within.

8.7 Summary of Chapter

The chapter presented the summative evaluation of the artefact to confirm its efficacy. Based on the guidelines presented by Hevner (2007) and the process model of Peffers et al. (2008), a rigorous evaluation to assert the utility and the efficacy of an artefact is required to show the scientific nature of design science. The formative evaluation process which was embedded in the design and development chapter was used to understand the utility of the artefact.

In the chapter, empirical evidence was presented to test the claims in the theoretical framework and confirm if the artefact can satisfy the objectives of the solution. A quantitative approach using cluster analysis was adopted along with a comparative analysis of the EGIT configurations of the entities in the study.

The next chapter presents the overall conclusion of the study. It will highlight the theoretical, methodological and practical contribution of the study and indicate the limitations and directions for future research.

CHAPTER NINE

SUMMARY AND CONCLUSION

9.1 Introduction

In the introduction to this thesis, the overarching research question was identified: “*How can an IT audit tool, driven by COBIT 5, lead to effective audits of IT Governance and effective EGIT in the Financial Services industry in Ghana?*” The main research question was formulated to explore and project the strategic and proactive role of auditors to contribute to overall EGIT effectiveness and meet the expectations of executives and management described by D’Onza et al. (2015) as “below par”. In the subsequent chapters, this phenomenon was explored with a pragmatic ontology using the mixed-method approach under four research activities or studies.

While EGIT has received considerable research attention in recent years, there is little research espousing the role of auditors to provide the required assurances, especially in a developing country setting. An example of this is the case of the Ghanaian Financial Services sector which has realised huge losses due to poor governance practices. The purpose of this research was to contribute to the body of knowledge of EGIT by addressing this gap in the literature.

This chapter opens with an overview of the study in section 9.2, provides a discussion of the contributions in section 9.3, highlights the application of this study and its generalisability in section 9.4, details limitations and future research opportunities in section 9.5, and summarises it all with an overall conclusion in section 9.6.

9.2 Overview of the Study

The overview provides a brief description of how this research was planned and undertaken to espouse the reliability, validity and integrity of the conclusions reached. In Chapters Two, Three and Four, the literature review, theoretical and conceptual framework and the research methodology are discussed respectively. The overarching research question was divided into four research activities which are detailed in Chapters Five to Eight as follows:

In Chapter Five, a Delphi study was conducted with the purpose of exploring the perceived challenges faced by IT auditors with EGIT auditing in Ghana. Experts were contacted to contribute

in a three-round survey intended to reach a consensus on the list of challenges and their potential impact. A literature review was used to generate the initial list of challenges which served as an input for the first-round survey in the Delphi study. With Kendall's tau over 0.7, the experts strongly agreed on 27 challenges. Key among them was the “Lack of developed auditing tools to keep pace with changes”, which confirmed extant studies (Lovaas & Wagner, 2012; Omari et al., 2013) and triggered the need to proceed with the development of a framework that is relevant to the Financial Services sector, based on a well-established governance framework (COBIT 5) and can be adapted and adopted by any knowledgeable IT auditor to conduct EGIT audits where necessary.

Chapter Six sought to answer the sub-research question: “*What configuration of governance mechanisms will achieve an effective EGIT?*” The aim of this activity was to explore the nature of EGIT practices of seven case organisations within the context of the study, understand the configuration and coherence of the governance mechanisms that lead to positive outcomes. This was done prior to the development of the C5DITAF to assess the nature of EGIT implementations and the results were used as the basis for the summative evaluation of the artefact. A quantitative investigation using a survey was employed to elicit the responses on the maturity of the governance mechanisms within these organisations and perceptions about the extent to which the IT Governance focus areas had been achieved. Cluster analysis was then used to assess the nature of the configurations.

The study then proceeded to the design and development of an artefact that can enhance the EGIT audit scope, within the Financial Services sector. Design Science Research was considered appropriate and as such adopted using the methodology recommended by Peffers et al. (2008) and following Hevner et al.’s (2004) guidelines for design science research. To harness the industry knowledge, industry professionals with diverse background were contacted for an exploratory focus group (EFG) with the principal researcher as the moderator. COBIT 5 was adapted and used to generate audit objectives and audit testing procedures. A confirmatory focus group (CFG) was used to evaluate the first version of the artefact, which led to its refinements. After the development, the artefact was demonstrated by audit team members in the seven case organisations. Comments provided by these team members and the CFG members gave empirical evidence of the utility of the artefact in the formative evaluation.

The fourth and final research activity entailed the summative evaluation of the artefact designed and developed in the third research activity. With this study, the efficacy of the artefact to aid IT auditors to add value and contribute to EGIT effectiveness was assessed. After using the artefact for a period of seven months, the Governance maturity was assessed again, and the respondents indicated their perceptions about the EGIT focus areas. Cluster analysis was first used to understand the nature of configurations at this point; Tukey’s HSD was used to compare the means from the results in research activity two and the results in this cluster analysis. This empirical research indicated statistically significant improvements in several of the governance mechanisms for all three clusters. This proved the efficacy of the artefact and confirmed that IT auditors could effectively use their EGIT auditing activities to improve EGIT. The research questions and corresponding research findings are set out in Table 28 below.

9.2.1 Summary of Answers to Research Questions

Table 29: Summary of Answers to Research Questions

Research Questions	Findings
Main Research Question	
<p><i>How can an IT audit tool, driven by COBIT 5, lead to effective audits of IT Governance and effective EGIT in the Financial Services industry in Ghana?</i></p>	<p>From the findings of this study, the C5DITAF can lead to effective audits by providing the auditors with an appropriate audit scope that is based on Best practice (COBIT 5) and has been tailored to the regulatory environment of the Ghanaian context.</p> <p>Extant studies have shown that audit scope is a key factor influencing the quality and effectiveness of audits (Havelka et al., 2007; Havelka & Merhout, 2013; Merhout & Havelka, 2008; Mihret & Yismaw, 2007; Stoel et al., 2012). An appropriate scope guides the auditor to review the relevant areas and make meaningful contributions, thereby reducing the audit detection risk.</p> <p>Based on the auditor’s recommendations, several mechanisms can be introduced or strengthened to improve the governance maturity as seen in the Post-Hoc analysis. When the governance mechanisms have attained level 3 or above maturity level across all the major constructs, the findings in the configurational analysis show (section 6.10) that overall EGIT will improve.</p>

Sub-Questions	
RQ1: <i>What challenges do IT auditors face in the audit of enterprise governance of IT?</i>	<p>In all 27 EGIT auditing challenges were identified.</p> <p>Challenges related to the Board and its activities were noted to have much more impact and significant difficulty to address than the other governance mechanisms. The challenges related to structures and relation mechanisms were easier to address.</p> <p>The lack of audit charter/the audit charter not authorising EGIT audits was rated among the top 5 challenges having significant impact, requiring significant effort to address and hugely important to EGIT.</p> <p>The need to develop a tool that will provide scope to EGIT auditing was established through the emphasis placed on the following challenges: “Lack of developed auditing tools to keep pace with changing environment”, “Poor IT Knowledge for Board audit committee members” and “Lack of accountability for IT services”.</p>
RQ 2: <i>What configuration of governance mechanisms will achieve an effective EGIT?</i>	<p>An enterprise needs to attain a maturity Level 3 and above across all governance mechanisms to create the coherence needed and the resultant EGIT effectiveness.</p> <p>As opposed to the claim in the theoretical framework, the findings suggest that the adoption of technological mechanisms can also dominate and influence other mechanisms including the leadership. This means that with timely information, appropriate technologies can drive leaders to take good IT decisions. The findings extends the theoretical claim that only strong leadership will drive governance effectiveness and prove that in a fast-changing environment such as the financial services in Ghana, adopting the right technologies for EGIT activities can also foster and improve governance effectiveness, by providing timely information for decision-making, creating collaborative ties between individuals and stakeholders and reducing information asymmetry.</p> <p>Another finding from the study suggests that placing much emphasis on the EGIT structures without supporting them with appropriate processes and technologies exposes an enterprise to risk of operating</p>

	<p>a bureaucratic type of configuration which only thrives well within a stable environment where rational decisions are intended (Miller, 1990).</p> <p>Due to the intensity of the competition, entities may be tempted to invest considerable funds into IT in a bid to stay in competition without a clear plan for governance. Thus, their incoherent implementation effort may be as a result of unintentional implementation of the governance mechanisms. The nature of this EGIT configuration can be classified as reactors. Reactors have no coherent mechanisms to adapt to the market. They are forced by competition pressures to take strategic decisions in a bid to prevent loss of important customers and/or maintain profitability.</p>
<p>RQ 3: <i>How can a COBIT 5-Driven IT Audit framework be designed?</i></p>	<p>A COBIT 5 driven audit framework can be designed by harnessing the tacit knowledge of experts, following a proven design methodology such as recommended by Peffers et al., (2008) and the guidelines of Hevner, (2007).</p> <p>There is the need to adopt the problem-centred approach and follow a rigorous evaluation process to ensure that the artefact indeed satisfies the problem identified.</p> <p>In harnessing the knowledge of experts, focus groups can be used because it is flexible to handle a wide range of design topics and domains, and provide the researcher with direct interaction with respondents.</p> <p>The finding from the formative evaluations shows that, the developed artefact was useful, and the evaluation process enhanced the content.</p>
<p>RQ 4: <i>To what extent can regular audit of enterprise governance of IT based on a COBIT 5 driven IT audit Framework improve governance mechanisms?</i></p>	<p>From the Post-Hoc analysis several of the governance mechanisms within the case organisations improved to a one higher Level of Maturity on the Capability Maturity Model.</p> <p>The Case organisations who used the artefact improved in areas such as (section 8.5)</p> <ol style="list-style-type: none"> 1. IT Roles and Responsibilities 2. Empowerment of IT Personnel 3. IT Budgetary Control 4. IT Architecture

	<p>This is an indication of the efficacy of the framework.</p> <p>While not all mechanisms produced the expected results within the short timeframe for the PhD program, the findings still show that with an appropriate scope, IT auditors can make relevant recommendations that can lead to improvement in the governance maturity. Future research using a longitudinal approach can confirm the extent of the improvement over a long period of time.</p>
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9.3 Contributions

Any design science study is considered as a “good research” when it provides a solution to a problem in a unique and innovative way that can be implemented in a business environment (Hevner et al., 2004). One critical step in the design methodology adopted in this study is the need for communications of the effectiveness of the artefact to practitioners and researchers (Peffer et al., 2008). To communicate the effectiveness of the artefact and project the uniqueness and innovativeness of this thesis, its contributions to the existing body of knowledge are discussed in the following subsections: theoretical contribution, methodological contribution, and practical contribution.

9.3.1 Theoretical Contribution

EGIT is a complex phenomenon, that has received attentions in recent years. However, research in this area has been described as “descriptive” and “lacking in theoretical underpinning”. This study provides a better understanding of EGIT and how audits can be used to improve it, by integrating six theories. These theories operate under different, partially overlapping theoretical assumptions and thus each independent theory provides a limited comprehension of the phenomenon. The theories used are Management System Model (MSM), MIT 90s Framework, Strategic Choice Theory, Structuration Theory, Assurance Theory, Economic Theory, Social Network Theory and Value Chain Theory. These theories were integrated into a theoretical framework that guided the development of the conceptual model. In the integration process, extant literature on the EGIT were widely reviewed to identify the gaps, overlaps and contradictions. For instance, the limitation of the Management System Model lies in its inability to provide a vivid description of the nature of the interactions; however, the MIT 90s framework provides a clearer

description of the nature of the interactions among the mechanisms. Also, the Structuration Theory explains that, through the continuous use of technology within the enterprise, technology may impinge on the institutional properties reinforcing the existing structures and creating new structures, showing how structure interacts with technology. The Structuration Theory fails to account for the interactions among the other mechanisms, a problem clearly solved by the MIT 90s framework. The integrated theoretical framework provided a synthesis of the various concepts that exist within EGIT based on literature and can advance the understanding of the complex phenomena. By integrating these frameworks, the research provided a holistic view (broader picture) of the complex phenomena. Through the synthesis of these theories, the integrative framework advanced the need to incorporate technological mechanisms and decouple leadership mechanisms from structures. The integration of the theories has advanced knowledge in the following ways:

1. One main theoretical contribution of this study is the use of a configurational approach to understand the EGIT holistically. Configurational theorists postulate that organisational elements must be examined holistically and not in parts. This is based on the principle that these elements within an enterprise must be coherent to generate a pattern that can explain the performance of the enterprise. The configurational theory was therefore adopted to measure the governance mechanisms and how they aligned to produce positive outcomes. Past studies have assessed EGIT using the linear approach to understand the relationships that exists among the mechanisms. Organisational studies have, however, shown that elements within an organisation must exist in a configuration to obtain positive results (Ketchen et al., 1993; Miller, 1989; Venkatraman, 1989). The use of the configurational approach advances knowledge by proving that in the context of EGIT, the combination of the various mechanisms does influence the whole and the outcomes. The cluster solution developed in this study analysed the cases, drawing out the pattern which showed clearly the configuration of mechanisms that produced a positive outcome.
2. Extant EGIT studies have neglected the technological mechanisms and the impact they have on overall EGIT effectiveness. This study has shown the relative importance of adopting collaborative and decision-making technologies to drive other mechanisms in

a fast-changing environment. In the highest performing cluster (as shown in section 6.10.2), the organisations have adequately implemented systems and technologies that foster communication and collaboration and also provide timely information to decision makers within the organisation and outside the organisation. With these systems in place, the utility of decisions was improved because decision makers had adequate information on a timely basis. Joshi et al. (2013) reported that enterprises do not maintain a central repository of information on EGIT as such decision makers are burdened with the task of reviewing multiple public documents to gather the information they require. This study has proved that with adequate technological mechanisms, the utility of decision making is enhanced because of the ease with which information becomes readily available to decision makers.

3. Unlike past studies which have not highlighted leadership in the quantitative analysis of EGIT (De Haes & Van Grembergen, 2009; Lunardi et al., 2017), this study clearly shows the impact the Board has to influence governance decisions and also highlights the fact that, despite the regular argument that top management support (Ndlovu & Kyobe, 2014) is essential for performance outcomes, technologies can drive the board to make proactive choices for the enterprise based on the provision of timely information about the entity and its fast-changing environment.
4. Past studies in EGIT have measured the relationships between the governance mechanisms and selected performance measures, without clearly showing the dominant imperatives required to drive change. Based on Miller's (1990) claim of four imperatives, the study contributed to the EGIT body of knowledge by clearly showing that within the context of EGIT mechanisms, dominant imperatives can indeed emerge and drive the other mechanisms, albeit temporarily. The Ghanaian Financial services study is a highly dynamic sector that is driven by technology (Twum, 2018). These findings highlight the need for decision makers to constantly review the configurations to ensure the nature of configuration can create the required value. Managers can do that by regularly monitoring the environment and the nature of coherence to assess the evolved imperative.

5. Extant research on EGIT and IT auditing have mostly been based in developed countries with little insight or input from sub-Saharan Africa. As such developed governance and auditing frameworks do not consider the contextual factors. The application of this study within the Ghanaian financial sector closes this gap and clearly highlights the problems within the context that can be managed with the tool. The C5DITAF was purposely designed and developed considering the factors and regulations within the Financial Services sector of Ghana. For instance, the framework considers overlooked areas in IT such as Related Party IT transactions. Auditing of Related Party transactions is usually done by financial auditors; however, in the case of IT transactions, these auditors may not have the requisite skills to understand the IT specifications that warrant the transactions and the intended benefits. In the SSNIT scandal described in section 1.2 of Chapter One, the software acquired was intended to streamline the activities of the organisation and reduce the time it takes for pensioners to access their pension funds (Myjoyonline, 2017a). Perhaps the inappropriate assessment of the software led to the over-valuation of the price. IT auditors with the requisite knowledge can contribute in this regard to provide adequate valuation based on best practices. From the formative evaluation presented in section 7.6.1, the IT auditors confirmed the utility of the artefact within the Financial Services landscape in Ghana.

9.3.2 Practical Contribution

One practical contribution of this thesis is the provision of empirical insight into the challenges that inhibit the effective conduct of EGIT audits within the Ghanaian context. The study identifies 27 EGIT auditing challenges; the findings reveal clearly that some of the challenges have more impact and/or require more effort to address than others. Challenges related to the Board and its activities were noted to have much more impact and significant difficulty to address than the other governance mechanisms. The lack of audit charter/the audit charter not authorising EGIT audits was rated among the top five challenges that have significant impact, require significant effort to address and are hugely important to EGIT. Other leadership challenges such as, the poor IT knowledge for board audit committee members and the lack of commitment from the board were also classified as having high importance needing to be addressed. However, the findings of the configurational analysis show that, although leadership challenges may be high, the adoption of

appropriate EGIT technologies can guide the board with timely information for decision making, thereby reducing these challenges. These findings contribute significantly to practice and show the several areas that need to be addressed by enterprises if the achievement of the strategic IT objectives were to be the focus. Regulatory bodies such as the Securities and Exchange Commission (SEC) and Bank of Ghana (BoG) could obtain insight on how to direct governance policies and directives towards the protection of shareholders' interest.

Another practical contribution of this study involves the leveraging of COBIT 5 to develop an artefact. COBIT is relatively more complex than COSO or other frameworks such as ITIL and ISO, and was designed to incorporate both governance and management aspects of IT (Balijepally et al., 2011). Earlier versions of the framework were purposely designed for the audit and control of information systems. However, its constant improvements transformed it from an audit and control tool to a complete IT governance tool. With such transformation, the framework becomes broad and difficult to use as an auditing framework, as was the case before. Past studies have not harnessed the transformed COBIT to develop audit and control tools (De Haes et al., 2013). This study contributes to practice by harnessing the benefits of transformed COBIT and the tacit knowledge of experts to develop an auditing framework.

This thesis has also made a practical contribution with the development of the C5DITAF. IT auditors within the jurisdiction usually relegate governance audits amid several challenges, and this had a dire consequence on the sector and plunged the sector into series of losses. IT auditors were classified as non-proactive in issues related to EGIT and were not meeting the expectation of executives and senior managements. The C5DITAF provides an adequate scope to undertake EGIT and serves as a relevant tool to review an entity's EGIT practices and make recommendations for action. With the tool, IT auditors can develop an audit plan that provides assurance of key governance areas and reduce the audit risk of not detecting a non-existence or weak control in an organisation's EGIT practices. By providing clarity on EGIT mechanisms within the financial services sector, IT auditors may be fully empowered to conduct EGIT audits which provide optimal coverage for ensuring information governance practices have been effectively implemented. This can provide the needed assurances to managers, shareholders and regulators that the full potential of IT is being harnessed. Although, in this study, the IT auditors used were internal auditors, the C5DITAF can be used by external auditors and auditors from the Banking

supervisory departments of the central bank and other regulatory auditors. During the governance scandals that emerged in recent years, several staff of the banking supervisory department of BoG were noted to have failed in their role to review the important governance areas of the banks. Although they were conducting regular audits and supervision of the affected banks, the failure meant that their auditing activities did not cover the critical governance issues such as related party transactions (Mustapha, 2018). With the framework, the central bank can effectively provide supervisory services.

Through this study, it was proved that auditors can make meaningful contributions to EGIT if they proactively review the governance mechanisms and make recommendations based on best practices and regulations to guide management. Past studies have not found a correlation between auditing activities and performance (D’Onza, Lamboglia et al., 2015; Merhout & Havelka, 2008). With the Post-hoc analysis based on the cluster performance, the results of this study have proved that the auditor can make a valued contribution to EGIT and the creation wealth. This results also disproved the argument that auditors are a “necessary evil” and showed that IT auditors can be “critical partners” in the creation of wealth and the attainment of organisational objectives. This, therefore, highlights the need for IT auditors to focus considerable attention to the non-technical part of IT as has been given to the technical aspects. IT auditors can achieve this if they acquire soft non-technical skills in addition to their technical skills.

Another practical contribution of this study is the insights that emerged from the configurational analysis. The findings that different dominant imperatives can emerge based on the nature of the environment and the interactions among the organisational element, can guide decision makers to understand where they fall short in their EGIT implementation efforts. IT may also guide them to understand corrective actions (strategic choice) that can be taken. Regulatory bodies can use these findings to provide EGIT directives that will be beneficial to all stakeholders. For instance, the BoG and SEC can critically analyse the nature of the financial landscape and make directives that can correct the imperatives of institutions. They could also analyse entities within the sector individually to understand their peculiar needs and make relevant recommendations. This will go a long way to enhance the supervisory role provided by regulators.

9.3.3 Methodological Contribution

Answering the research question, “*How can a COBIT 5-Driven IT Audit framework be designed?*”, this study made a methodological contribution by affirming that design science methodology combined with a pragmatist philosophical stance can guide researchers in the area of accounting information systems to convert tacit knowledge of experts into a useful artefact. Although design science is popular in other disciplines such as engineering and architecture and has received recent attention in information systems in general, its application to accounting information systems has not been fully harnessed (Geerts, 2011). This study adopted the widely used design science research methodology recommended by Peffers et al. (2008) which has proven to be relevant in the development of artefacts. This study demonstrated the rigour in the application of the design science research methodology and confirmed its applicability to the field of study and in the context of a developing economies.

The study further proved the value of cluster analysis to provide a holistic synthesis of organisational elements (governance mechanisms) and their synergies to derive positive outcomes. It provides a bird-eye view of EGIT and how it should be implemented. Past studies have adopted analysis such as structural equation modelling (Lunardi et al., 2017), factor analysis (Boamah-Abu & Kyobe, 2015) and simple descriptive analysis (De Haes et al., 2017; De Haes & Van Grembergen, 2009; Joshi et al., 2013) to understand the linear relationships. This study used the cluster analysis in combination with the Post-Hoc analysis (Tukey’s HSD test) to test the theoretical framework as recommended by (Ketchen & Shook, 1996). This further advance the use of cluster analysis and shows that when used appropriately it can produce interesting findings.

One critical problem IT auditing literature involves the structuring of the collective judgments of experts to make informed decisions. Adopting the Delphi technique to understand governance challenges, the study was able to analyse the contribution of thoughts from busy experts without the need for face-to-face discussions (as shown in Chapter Five).

9.4 Generalisation and Wider Application of Research

Generalisation refers to the extent to which findings of a study can apply to different populations and empirical situations (Allen, 2017). In other words, it involves drawing inferences about the

unobserved based on the observed. Yin (2014) described two types of generalisation, namely, analytical and statistical. Analytical generalisation refers to the application of findings of a study to a theory of the phenomenon. For this study, the findings provided empirical evidence to the theoretical framework presented and expands the body of knowledge and theory of EGIT. Nonetheless, the generalisation is limited to the context of Financial Service organisations that were studied.

Statistical generalisation, on the other hand refers to the act of inferring results from a sample and applying it to a population (Mills, Durepos, & Wiebe, 2010). It is divided into two areas, internal and external generalisation. Whereas the former applies within the setting that is the subject of the research, the latter extends beyond the setting of the research. The setting of this study is EGIT in the Financial Services sector of Ghana. A cross-section of organisations was selected using defined criteria that represented a variety of entities within the sector. With internal generalisation, the ability to apply the findings of this research to other entities within the sector in Ghana is expected to be high since the researcher adopted maximum variation sampling strategies to ensure the responses represent as far as possible the entire population of study.

However, for external generalisation, this study is limited to organisations within the Financial Services sector in Ghana, which have peculiar characteristics that distinguish them from other sectors within the economy and other countries. For organisations with similar structure and characteristics in Ghana, it is probable that the findings of this research could be applied. Nonetheless, caution should be exercised in the interpretation of the findings or generalisation to other contexts.

9.5 Limitations and Future Research

As with any research activity, this study is not without limitations that might be explored in future research.

First, the relatively small sample size used for the statistical analysis in the identification of EGIT challenges, summative evaluation of the artefact and testing the theoretical claims poses a limitation. This is because of the argument that with higher sample size the confidence level in the study is increased and the margin of error is reduced. Nonetheless, the sample size adopted does

not invalidate the findings owing to the guidelines presented by Saunders et al. (2009) that a sample size of more than 30 can be used in statistical tests. Future studies could possibly focus on using relatively larger sample sizes.

In the summative evaluation of the artefact, the researcher relied on a survey using a questionnaire as the major source of data for the analysis. The downside for the use of questionnaire as a method of data gathering is that, in-depth and case-specific insights on the efficacy of the artefact were not obtained. Although the limitations relating to questionnaire surveys can be minimised by undertaking post-questionnaire interviews, this was also not possible due to the availability of diverse interviewees for a significant amount of time. Besides the IT auditors who provided feedback on the utility of the artefact in the formative evaluation, other business and IT managers did not avail themselves for further interviews after the survey due to their busy schedules. Also, content analysis of supporting documentations such as policies, audit reports, and other in-depth enquiries on governance maturity levels to substantiate assigned scores was not possible due to the nature of secrecy and confidentiality in the Financial Services sector. It was therefore not feasible to independently validate the responses using other research techniques. Accordingly, caution is essential when interpreting the questionnaire findings. Future studies that focus on other techniques for the assessment of governance maturity levels could produce interesting findings.

The study used a cross-sectional timeline in the summative evaluation of the artefact. Data was collected in one instance prior to the use of the artefact and in another instance, after the use of the artefact for the comparative analysis. The summative evaluation was conducted after a short period of use and as such, changes that might occur over time were not captured. This was because the researcher was bound by the timeline for the completion of the Ph.D. Nonetheless, the findings provided insights on the nature of EGIT auditing and can help make projections that can assist future studies. Furthermore, the use of variables from extant studies and theories also helps establish those theories and their application to EGIT. Perhaps a longitudinal approach to future research would allow for an exploration of the longer impact of regular auditing with the C5DITAF on the governance maturity levels.

One may also consider the limited number of people who participated in the formative evaluation as a limitation. It was, however, noted that to provide valuable inputs, the target participants need

to be familiar with IT auditing concepts and practices for EGIT. Also, as the COBIT 5-Driven IT Audit framework needs to be explained in detail, and participants need to have a good understanding of it, a larger group of participants could have derailed the level of understanding. To compensate for these issues, the researcher used a Confirmatory Focus Group with expertise in IT audits where the C5DITAF was evaluated through an iterative process until the group members were satisfied with the ability to implement the framework into their EGIT audit process. The subsequent summative evaluation of the artefact also compensates for these issues.

Future studies could test the theoretical framework in different contexts beyond Africa to examine EGIT in general and explore other configurations that can result in positive outcomes. This could provide new and interesting insights regarding the dynamics and complexities of EGIT in other contexts and highlight similarities or differences to the findings in this study. In the assessment of EGIT effectiveness, this study considered EGIT effectiveness as the extent to which the Governance focus areas are achieved. Future studies could possibly adopt other measurement outcomes, such as financial performance to assess the impact of EGIT configurations on the wealth of shareholders and other stakeholders.

Another study could develop a risk assessment model for EGIT for prioritising governance practices that require urgent attention. Such a model could be used to complement the C5DITAF to ensure a risk-based approach to auditing EGIT. With the current framework, the existing knowledge base of the IT auditor is relied upon to conduct a preliminary risk assessment of the entity prior to the substantive testing.

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APPENDICES

App. 1: Copyright Permission Letter from ISACA for the usage of COBIT 5



March 29, 2019

Alexander Ekow Asmah
PhD Candidate
University of Cape Town
Sent via email to asmale001@myuct.ac.za

Dear Alexander,

Thank you for your request to include the 37 processes from the COBIT 5 Framework publication ("Content") in your doctoral research. Permission is granted subject to the following limitations.

1. Such permission does not include the right to grant others permission to photocopy or otherwise use, reproduce, redistribute, sell or translate this material.
2. This permission does not include any rights to make business and/or educational presentations incorporating this material beyond the uses stated above.
3. Appropriate credit must appear anywhere the Content appears:
"Source: COBIT 5 Framework ©2012 ISACA. All rights reserved. Used by permission."
4. Should any of the above limitations be breached, this permission is automatically revoked as of the date of the breach.

If you have any questions regarding permissions, please call me at 847.660.5506 or contact me by e-mail at prandall@isaca.org.

Sincerely,

A handwritten signature in cursive script that reads "Pam Randall".

Pam Randall
Sr. Legal Coordinator
ISACA/ITGI

App. 2: Letter of Consent from ISACA Accra Chapter to survey ISACA members



P.O.Box TN1288, Teshe Nungua Estates.
No 17, 5th Crescent, Asylum Down, Accra, Ghana
Phone: +233 576-231092
Email: isaca.accra@gmail.com Website: www.isaca.org

8th December, 2017

THE PRINCIPAL RESEARCHER
UNIVERSITY OF CAPE TOWN
CAPE TOWN, SOUTH AFRICA

Dear Mr Alexander Asmah,

LETTER OF CONSENT

ISACA engages in the development, adoption and use of globally accepted, industry-leading knowledge and practices for information systems. COBIT 5, ISACA's leading business framework for governance and management of enterprise IT provides globally accepted principles, practices, analytical tools and models to help IT professionals and enterprise leaders fulfil their IT governance and management responsibilities.

ISACA's membership is characterized by its diversity. As a leader in the Information Systems & Information Technology industry, and the largest Audit, Information Security, and Governance, Risk and Control (GRC) based association in the country, the input of an ISACA professional will prove highly relevant in this area of study.

The quest to develop a COBIT 5 driven audit tool to facilitate the ease in auditing IT Governance in organisations is laudable. Consent to reach out to members of the Accra chapter in pursuance of your research is duly granted.

Thank you.

Yours faithfully,

A handwritten signature in black ink, appearing to read "Seyram Kwame Attah".

Seyram Kwame Attah, CISA, CISM
Chapter Secretary



App. 3: Letter of Invitation to Participants of the Delphi Study



Subject: Invitation to Participate in a Delphi Research

Topic: Challenges of IT Governance Audits in Ghana

Dear participant

It is with great pleasure that I invite you to participate as an expert in a Delphi Research which seeks to assess the challenges of IT Governance Audits in Ghana.

This has become necessary after the growing interest and investment in IT and the apparent lack or inadequate governance mechanisms to protect the interest of shareholders and ensure that IT decisions are made devoid of personal management interests. Several frameworks such as the Control Objective for Information and Related Objectives have been developed to guide the implementation of governance mechanisms and their continuous review to provide assurance of its effectiveness. However, studies have shown that IT auditors pay more attention to technical IT issues and very little attention on the audit of governance mechanisms due to several reasons.

To offer solution to the current challenges in auditing IT Governance mechanisms, the researchers want to understand the factors that hinder your activities as an IT expert in relation to IT governance auditing. The research team which affiliate with the Information Systems Department of the University of Cape Town is performing this empirical study with the overall intention to address the challenges in IT Governance auditing in Ghana.

Considering the professional commitment of IT expert in the Ghana to this topic, we believe that your participation in this study will prove to be interesting and rewarding. Therefore, we would encourage you to participate in this effort. We will, of course, provide you with feedback from the results when the project is completed. Any information you provide as part of this study will remain confidential in accordance with the UCT Ethics guidelines.

Please view the attached information sheet for further details on the study and how to participate. Please know that this study has been approved by the Commerce Faculty Ethics in Research Committee.

We would appreciate you providing a base level of information even though you may decide not to participate in this study. This would allow us to compute the response rate and avoid duplicate invitations. This data will also remain confidential and will be under high digital security after computing the response rate.

Thank you for considering this request.

Mr. Alexander Ekow Asmah
Researcher, PhD Candidate
Email: asmale001@myuct.ac.za
Phone: +233240247271

Professor Michael Kyobe
Supervisor

App. 4 Sample Institutional Permission Letter submitted to Case Organisations



The Managing Director,
XXXXXXXXXXXX
Accra - Ghana

Dear Madam,

Institutional Permission Letter

I am currently doing PhD in Information Systems at the University of Cape Town – South Africa. I am preparing to begin work on data gathering for my research project which is titled “**Towards the Development of a COBIT 5 Driven IT Audit Framework**”. This project is a requirement for the award of the PhD, and it is designed to improve IT governance Audits.

This research project has become necessary after the growing interest and investment in IT and the apparent lack or inadequate governance mechanisms to protect the interest of shareholders and ensure that IT decisions are made devoid of personal management interests. Several frameworks such as the Control Objective for Information and Related Objectives have been developed to guide the implementation of governance mechanisms and their continuous review to provide assurance of its effectiveness. However, studies have shown that IT auditors pay more attention to technical IT issues and very little attention on the audit of governance mechanisms due to several reasons. This research seeks to understand the challenges of IT governance audits and develop a tool to guide IT governance audits.

Research questionnaire to be answered by IT auditors, IT control officer and IT officers will solicit their perceptions on what challenges impedes the audit of IT governance mechanisms (Attached is the questionnaire). This will be followed by a design science research where I will develop the COBIT 5 driven IT audit tool and ask the participants to assess the developed tool.

This research will not require any confidential information, however all data provided by participants will be held and used with utmost confidentiality. After the thesis, the research report will be presented at International Conferences. I will not use the Banks name in my research report.

Please know that this study has been approved by the Commerce Faculty Ethics in Research Committee (Find attached).

I would appreciate it if you grant me the permission to undertake this research at United Bank for Africa.

Thank you for considering this request.

Your Faithfully

A handwritten signature in black ink, appearing to read 'Alex Asmah'.

Mr. Alexander Ekow Asmah
Researcher, PhD Candidate
Email: asmale001@myuct.ac.za
Phone: +233240247271

Professor Michael Kyobe
Supervisor

App. 5: Delphi Study – Round 1 & 2 Questionnaire



IT GOVERNANCE AUDITING CHALLENGES

Round 1 & 2 Questionnaire

Demographics

1.0 Role

<input type="checkbox"/> Manager - IT Audit	<input type="checkbox"/> Manager - Risk Management
<input type="checkbox"/> Manager - IT / IS	<input type="checkbox"/> Officer - IT Audit
<input type="checkbox"/> CIO	<input type="checkbox"/> Executive Director
<input type="checkbox"/> Non- Executive Director	<input type="checkbox"/> Others _____

1.2 Background

<input type="checkbox"/> IT Audit	<input type="checkbox"/> Risk Management
<input type="checkbox"/> Information Security	<input type="checkbox"/> Officer - IT Audit
<input type="checkbox"/> Accounting	<input type="checkbox"/> Others _____

1.3 Years of Experience

<input type="checkbox"/> < 1 year	<input type="checkbox"/> 1 - 3 years
<input type="checkbox"/> 3 - 5 years	<input type="checkbox"/> 5 - 7 years
<input type="checkbox"/> 7 - 10 years	<input type="checkbox"/> > 10 years

1.4 Qualifications

<input type="checkbox"/> Bachelor Degree	<input type="checkbox"/> Master's Degree
<input type="checkbox"/> PhD	<input type="checkbox"/> ISA Certified
<input type="checkbox"/> CGIET Certified	<input type="checkbox"/> Others _____

2.0 Instructions

The list below provides the challenges that deter IT governance auditing (based on literature). The list has been categorized using an integrative IT Governance model that incorporate all the mechanisms required for effective governance. The integrative model has five governance mechanism which are Structures, Leadership, Process, Technology, Relational Mechanisms

Review the list of proposed IT governance audit challenges for **completeness** and tick the challenges that are applicable. Add new, if needed, additional challenges or issues in one of the five categories. Include a definition if possible at the feedback section.

Instruction 1: In the column for each construct labelled C1, please identify the challenge that affect EGIT auditing by tick the appropriate statement that depict a challenge faced in EGIT auditing. You can add you own in the empty rows provided.

Instruction 2: In the column for each construct labelled C2, rate the 'perceived impact' of each challenge on EGIT auditing using a **between 0 (No impact) and 5 (High impact)**.

Instruction 3: In the column for each construct labelled C3, rate the perceived effort to address each EGIT auditing challenge using a score **between 0 (No effort) and 5 (High effort)**.

Instruction 4: In the column for each construct labelled C4, rank the challenges taken the previous attributes (impact – efforts) and your professional experience into consideration and provide your personal view of the top 10 EGIT auditing challenges. Give the most important challenge score of 1, the second score of 2 and 10th most important 10.

2.1 Important Notice

An IT governance auditing is the "process of collecting and evaluating evidence to determine whether information

		C1	C2	C3	C4
Structural Challenges	S1	Weak Reporting Lines (e.g. IT auditor report to CIO)			
	S2	Inadequate Top Management support for extensive IT governance auditing programs.			
	S3	Ill-established internal audits units			
	S4	Lack of accountability for IT services			
	S5	(Add new if required)			
	S6	(Add new if required)			
	S7	(Add new if required)			
Leadership Challenges	L1	Reduced influence of audit committees			
	L2	Lack of board commitment to IT governance			
	L3	Poor Control environment (i.e. the philosophy of Leadership does not favour governance audit)			
	L4	Audit charter does clearly authorise IT Governance audits / No Audit charter			
	L5	(Add new if required)			
	L6	(Add new if required)			
	L7	(Add new if required)			
Relational Challenges	R1	Poor training arrangements for IT auditors			
	R2	Lack of necessary skills and competencies to undertake effective IT governance audits			
	R3	Lack of cooperation from both business and IT functions			
	R4	Expectation gap between perceptions of IT Governance audit and actual ITG audit practices			
	R5	(Add new if required)			
	R6	(Add new if required)			
	R7	(Add new if required)			
Process Challenges	P1	No regulatory requirement for IT Governance Audits from the company code, stock exchange requirements, etc.			
	P2	Lack of formalised IT Processes within the organisation			
	P3	Lack of IT Governance policies			
	P4	Non-compliance with known Governance frameworks COBIT, and ISO			
	P5	Inadequate budget support for IT Governance audits			
	P6	(Add new if required)			
	P7	(Add new if required)			
	P8	(Add new if required)			
Technological Challenges	T1	Fast emerging technology and infrastructure changes			
	T2	Lack of developed auditing tools to keep pace with changes			
	T3	Lack of electronic audit evidence			
	T4	(Add new if required)			
	T5	(Add new if required)			
	T6	(Add new if required)			
Feedback: Instructions:					
Provide any additional feedback/ comments. You can also use this section to clearly define any new challenges added					
<i>Thank you for assisting with this study.</i>					

App. 6: Delphi Study – Round 3 Questionnaire



IT GOVERNANCE AUDITING CHALLENGES Round 3 Questionnaire

		Instruction 1: Considering the group's average, re-evaluate your rating for the 'perceived Impact' of each challenge on EGIT Challenges between 0 (no-impact) – 5 (high impact)			Instruction 2: Considering the group's average, re-evaluate your rating for the 'perceived effort to address' each challenge on EGIT Challenges between 0 (no-effort) – 5 (high effort)			Instruction 3: Considering the group's average, re-evaluate your ranking of the 'Relative Importance' of each challenge on EGIT Challenges between 1 - 27		
		Your Rating	Group Mean	New Rating	Your Rating	Group Mean	New Rating	Your Rating	Group Mean	New Rating
Structural Challenges	S1	Weak Reporting Lines (e.g. IT auditor report to CIO)	2.33			1.39			10	
	S2	Inadequate Top Management support for extensive IT governance auditing programs.	2.39			1.89			7	
	S3	Ill-established internal audits units	0.67			1.50			15	
	S4	Lack of accountability for IT services	0.78			0.89			14	
	S5	No IT steering committee to ensure effective implementation of audit recommendations.	2.44			1.67			5	
	S6	Reduced influence of audit committees	3.00			3.72			12	
Leadership Challenges	L1	Lack of board commitment to IT governance	2.78			3.33			6	
	L2	Poor Control environment (i.e. the philosophy of Leadership does not favour governance audit)	1.44			3.44			11	
	L3	Audit charter does not clearly authorise IT Governance audits / No Audit charter	2.94			3.17			7	
	L4	Poor IT Knowledge for Board audit committee members	3.06			2.78			2	
	L5	Board activities only a rubber stamp on management actions (Very little due diligence on management activities)	2.39			3.78			1	
	L6	Board members do not devote much attention to audit reports	3.22			3.00			4	
	L7	Poor training arrangements for IT auditors	2.17			1.94			18	
Rational Challenges	R1	Lack of necessary skills and competencies to undertake effective IT governance audits	0.78			1.22			13	
	R2	Lack of cooperation from both business and IT functions	2.89			1.78			19	
	R3	Expectation gap between perceptions of IT Governance audit and actual ITG audit practices	0.39			1.39			17	
	R4	Lack of independence and Objectivity due to familiarity with Top Management.	2.00			2.11			9	
	R5	No regulatory requirement for IT Governance Audits from the company code, stock exchange requirements, etc.	2.56			3.33			16	
Process Challenges	P1	Lack of formalised IT Processes within the organisation	2.11			2.56			22	
	P2	Lack of IT Governance policies	1.50			2.22			20	
	P3	Non-compliance with known Governance frameworks COBIT, and ISO	2.83			3.72			23	
	P4	Inadequate budget support for IT Governance audits	2.44			2.00			25	
	P5	Poor access to vital information	2.61			2.67			26	
	P6	Lack of proper risk assessment	3.06			2.94			21	
Technological Challenges	T1	Fast emerging technology and infrastructure changes	3.06			1.33			24	
	T2	Lack of developed auditing tools to keep pace with changes	3.11			3.39			3	
	T3	Lack of electronic audit evidence	0.72			0.56			27	

Feedback: Instructions:

Provide any additional feedback/ comments. You can also use this section to clearly define any new challenges added

Thank you for assisting with this study.

App. 7: Participant Information Sheet and Consent



PARTICIPANT INFORMATION AND CONSENT

You are invited to participate in a research project entitled “Towards the development of a COBIT 5 driven IT Audit Framework.” It is essential that you carefully read this form, feel free to contact Mr. Alexander Ekow Asmah anytime during your participation in this study should you require further clarification.

RESEARCH TEAM (Department of Information Systems, Faculty of Commerce – University of Cape Town)

Researcher: Mr. Alexander Ekow Asmah – PhD Candidate

Research Supervisor: Prof. Michael Kyobe

DESCRIPTION

The purpose of this study is to identify and assess the challenges IT expert face in auditing IT governance mechanism in Ghana. This study is part of a large study which seeks to develop a COBIT 5 driven IT audit framework for use as an auditing tool. You are invited to participate in this study as an expert panellist because you have been identified as a proficient information technology professional in Ghana.

PARTICIPATION

Your participation in this project is entirely voluntary. If you do not agree to participate, you can withdraw from the study at any time without comment or penalty. Any identifiable information already obtained from you will be destroyed at your request. Your decision to participate or not to participate will in no way impact upon your current or future relationship with UCT or the principal researcher.

This questionnaire does not seek the official views of your organisation, but only own personal views.

If you agree to participate, you do not have to complete any question(s) that you are uncomfortable answering. However, your commitment in completing all three questionnaires would be highly appreciated.

EXPECTED BENEFITS

There are no direct physical benefits from your participation in this study. We will provide you with a summary of our findings once the data collection has completed and analysed.

RISKS

There are no physical or intellectual risks associated with your participation in this study.

PRIVACY AND CONFIDENTIALITY

All information obtained relating to this study and that can be associated with you will be treated confidentially and will not be disclosed to other persons without your permission, or except as required by law.

It is anticipated that the results of the project will be published in respected scientific journals. In any publication, information will be provided in such a way that you cannot be identified. The data published will only be aggregated results of the research and in no way, identify any specific individuals in the project.

ETHICS AND APPROVAL

This research has been approved by the Commerce Faculty Ethics in Research Committee.

CONSENT TO PARTICIPATE

The submission of the completed online questionnaire will be accepted as an indicator of your consent to participate in this project.

QUESTIONS/FURTHER INFORMATION ABOUT STUDY

If you have any questions or require any further information, please contact one of these research team members below.

Mr. Alexander Ekow Asmah

Researcher, PhD Candidate

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Professor Michael Kyobe

Supervisor

Email: Michael.kyobe@uct.ac.za

CONCERNS / COMPLAINTS REGARDING THE CONDUCT OF THE STUDY

UCT requires high ethical standards and integrity in the conduct of empirical research. If you do have any concerns or complaints about the ethical conduct of the project you may contact the supervisor Professor Mike Kyobe (michael.kyobe@uct.ac.za) or the UCT Ethics in Research Committee.

Thank you for helping with this research project. Please keep this sheet for your information.

App. 8: IT Governance Assessment Questionnaire



IT GOVERNANCE ASSESSMENT QUESTIONNAIRE

Section A: Demographic characteristics

1. **Age?** 18-24 [] 25-30[] 31-35[] 36-40[] >50+[]
2. **Sex?** Male [] Female [] Refuse to Say []
3. **Educational Level?** HND [] Bachelor's Degree [] Master's Degree [] PHD [] Professional Qualification []
Others please specify.....
4. **Role?** Manager – IT Audit [] Officer – IT Audit [] Mgr – IT / IS [] Mgr – Risk Management []
Non- Executive Director [] Executive Director [] Other, Please specify.....
5. **Years of Experience?** Less than 1 Y [] 1 Y less than 5 Y [] 5 Y less than 10 [] 10 Y less than 15 Y [] More than 15 Y []

Section B: About the Organisation

6. **Industry or Sector?** Banking [] Savings & Loans [] Insurance [] Pension Fund [] Others Please Specify _____
7. **Number of Employees?** 0 – 50 [] 51 - 200 [] 201 – 500 [] >500+[]
8. **Estimated IT Investment (GHs) in past five years?** <1 m [] 2m – 10m [] 11m – 50m [] >50m+[]

Section C

Levels of Governance maturity (Based on Generic Maturity Model)

Level 1- Non-existent or Initial/Ad Hoc: Complete lack of the control element or there is evidence that the enterprise has recognised that the control element needs to be addressed. However, no standardised approach exists; instead there are ad hoc approaches that tend to be applied on an individual or case-by-case basis. The overall approach to management is disorganised.

Level 2 - Repeatable but Intuitive: Controls are implemented but not documented, since they depend on the knowledge and motivation of individuals. There is no formal training or communication of the control, and responsibility is left to the individual. There is a high degree of reliance on the knowledge of individuals and, therefore, errors are likely.

Level 3 - Defined Process: Control element have been standardised, documented, and communicated. It is mandated that these controls should be adhered to; however, it is unlikely that deviations will be detected. The controls themselves are not sophisticated but are the formalisation of existing practices.

Level 4 - Managed and Measurable: Management monitors and measures compliance with the control and act where control element appears not to be working effectively. Controls are under constant improvement and provide good practice. Automation and tools are used in a limited or fragmented way.

Level 5 – Optimised: Controls have been refined to a level of good practice, based on the results of continuous improvement and maturity modelling with other enterprises. IT is used in an integrated way to automate the workflow, providing tools to improve quality and effectiveness, making the enterprise quick to adapt.

Section C – 1: The following statements seek to ascertain respondent's perception the about design and operational effectiveness of IT governance structures. Kindly rate the following control elements based on the levels of maturity indicated above.

9. Structures

S/N	Control Elements (Al Qassimi & Rusu, 2015; De Haes & Van Grembergen, 2015; IIA, 2018; Ko & Fink, 2010)	Level of Control Design and Operating effectiveness				
		1	2	3	4	5
S1	The organisation has an IT steering committee					
S2	Appropriate IT Decisions Reporting Lines have been clearly defined, documented, communicated					
S3	Roles and responsibilities for IT are clearly defined and communicated					
S4	Responsible persons for IT resources are empowered and held accountable for results					
S5	There is a CIO who has been empowered to oversee the implementation board IT decisions					
S6	The IT governance activities of the organisation are properly coordinated by a designated function with an approved charter					
S7	Performance of responsible persons are continuously monitored against set KPIs					

S8	Documented roles & responsibilities include governance/alignment tasks for business and IT people					
S9	The Chief Audit Officer has been empowered to ensure the effectiveness of IT governances and ensure accountability of responsible persons					
S10	The organisation has an IT Project committee which manages all IT projects					

Section C – 2: The following statements seek to ascertain respondent’s perception about the design and operational effectiveness of IT governance processes. Kindly rate the following control elements based on the levels of maturity indicated above.

10. Processes

S/N	Control Elements (De Haes & Van Grembergen, 2015; Ko & Fink, 2010; Mohamed & Kaur, 2012)	Level of Control Design and Operating effectiveness				
		1	2	3	4	5
P1	There is a formalised Strategic IT Planning process					
P2	There is a formalised process to control and report IT investment and project budgets					
P3	There is a formalised process to chargeback IT cost to business unit					
P4	There is a formalised process for IT risk assessment and management					
P5	There is a formalised processes of IT change management					
P6	There is a formalised process to monitor the performance of IT resources					
P7	There is a formalised agreement between business and IT about IT development projects or IT operations process					
P8	There is a formalised process to monitor the business benefits of IT projects and investments					
P9	There is a formalised process to enable business and IT to respond to incidents and disruptions to continue operation of critical business processes					
P10	There is a formalised approach to co-ordinate and execute operational procedures and activities required to deliver internal and outsourced IT services					

Section C – 3: The following statements seek to ascertain respondent’s perception about the design and operational effectiveness of IT governance Leadership mechanisms. Kindly rate the following control elements based on the levels of maturity indicated above.

11. Leadership

S/N	Control Elements (Coertze & Von Solms, 2013, 2014; De Haes & Van Grembergen, 2015; Jewer & Mckay, 2012)	Level of Control Design and Operating effectiveness				
		1	2	3	4	5
L1	Members of the board of directors have expertise and experience regarding the value and risk of IT					
L2	There is the IT strategy committee at level of board to ensure IT is regular agenda item and reporting issue for the of board of directors					
L3	The board of directors regularly monitors the environment to inform IT and business strategies					
L4	The board of directors regularly monitor the effectiveness and performance of the enterprise’s governance of IT					
L5	The board regular direct IT risk management practices and monitor key risk metrics					
L6	The board of directors ensure regular communication with stakeholders concerning IT performance					
L7	The board of directors continually evaluate the portfolio of IT-enabled investments, services and assets to determine the likelihood of achieving enterprise objectives					
L8	The board regularly ensure the adequacy and sufficiency of IT-related capabilities					
L9	The board ensure compliance with relevant IT laws and regulations					

Section C – 4: The following statements seek to ascertain respondent’s perception about the design and operational effectiveness of IT governance technological mechanisms. Kindly rate the following control elements based on the levels of maturity indicated above.

12. Technology

S/N	Control Elements (Bin-Abbas & Bakry, 2014; Brandas, 2011; IIA, 2018)	Level of Control Design and Operating effectiveness				
		1	2	3	4	5
T1	There are established systems to support IT decision-making process					
T2	The organisations IT architecture provides a common platform to support business and IT strategies					
T3	The organisation has established systems and technologies that offer an active support for presenting IT governance information to outside stakeholders					
T4	Shareholders and other stakeholders have access to IT information to influence their decisions					
T5	The organisation has established systems for supporting communication and collaboration					
T6	Adequate security measures have been implemented to ensure the protection of information and information resources					
T7	The organisation has established systems for supporting transactional processes and the tactical and operational management					
T8	There are adequate systems (e.g. Intranet) to share and distribute knowledge about IT governance framework, responsibilities, tasks etc					
T9	Internal audit function has access to adequate information to support regularly auditing of governance activities					
T10	IT systems are configured to ensure compliance with applicable laws and regulations					

Section C – 5: The following statements seek to ascertain respondent’s perception about the design and operational effectiveness of IT governance relational mechanisms. Kindly rate the following control elements based on the levels of maturity indicated above.

13. Relational Mechanisms

S/N	Control Elements (Al Qassimi & Rusu, 2015; De Haes & Van Grembergen, 2015; Ko & Fink, 2010; Winkler, 2013)	Level of Control Design and Operating effectiveness				
		1	2	3	4	5
R1	There are adequate measures in place to train business people about IT and/or train IT people about business					
R2	There’s regular job rotation among business and IT staff					
R3	The enterprise is organised in teams to foster close relation between IT and business function					
R4	Internal corporate communication regularly addresses general IT issues.					
R5	There are regular campaigns to explain to business and IT people the need for IT governance					
R6	Informal meetings and activities between IT and Business manager are regularly held					
R7	The decision-making committees have representation from both Business and IT management					
R8	The control environment is conducive for knowledge sharing					
R9	There is a clear definition of purpose, values and behaviours toward IT and Business strategies					

Section D: The following statements seek to ascertain respondent’s perception about the overall effectiveness of EGIT. Kindly rate the following statements based on your level of agreement. (Strongly Disagree – 1, Disagree – 2, Neutral – 3, Agree – 4, Strongly Agree)

14. Overall EGIT Effectiveness

	<i>Strategic Alignment</i>	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
E1	The organisational internal processes are in line with the IS infrastructure and processes (Henderson & Venkatraman, 1993)	1	2	3	4	5
E2	The business strategies are in line with the IS strategies (Henderson & Venkatraman, 1993)	1	2	3	4	5

E3	IT choices are in harmony with business strategies, goals, and needs (Kyobe, 2008)	1	2	3	4	5
	Value Delivery	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
E4	IT helps the company to achieve competitive advantages (Van Grembergen, 2004)	1	2	3	4	5
E5	IT improves operational efficiency (Lunardi, Maçada, Becker, & Grembergen, 2017)	1	2	3	4	5
E6	IT helps the company to reduce costs (Van Grembergen, 2004)	1	2	3	4	5
	Risk Management	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
E7	IT risk profile of the organisation has improved (Calder, 2005)	1	2	3	4	5
E8	IT infrastructure are safe guarded from unauthorised assess (Calder, 2005)	1	2	3	4	5
E9	Uncertainties in relation to IT projects and investments have reduced (Calder, 2005)	1	2	3	4	5
	Performance Management	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
E10	IT projects achieve desired business results (Van Grembergen, 2004)	1	2	3	4	5
E11	IT services and solutions are delivered without failures (Lunardi et al., 2017)	1	2	3	4	5
E12	IT projects are delivered on time (Van Grembergen, 2004)	1	2	3	4	5
	Resource Management	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
E13	IT resources are acquired to gain value for money (Lunardi et al., 2017)	1	2	3	4	5
E14	IT resources are properly deployed to needed areas of the business (Bradley et al., 2012)	1	2	3	4	5
E15	IT resources are properly accounted for (De Haes & Van Grembergen, 2015)	1	2	3	4	5

App. 9: Normality Test for Post-Hoc Data

Variable	Test of Normality						
	Valid N	Mean	Minimum	Maximum	Std.Dev.	Skewness	Kurtosis
STRUCTURES							
Steering committee	139	3.37	2.00	5.00	0.82	- 0.29	- 0.74
Reporting Lines	139	3.26	1.00	5.00	0.96	- 0.54	- 0.41
Roles and responsibilities	139	3.12	1.00	5.00	0.93	- 0.18	- 0.06
Empowered IT personnel	139	3.15	1.00	5.00	1.06	- 0.04	- 0.68
Chief Information Officer	139	3.06	1.00	5.00	0.93	0.25	- 0.41
Coordination of Governance	139	2.96	1.00	5.00	0.91	0.03	- 0.07
Monitoring of KPIs	139	2.92	1.00	5.00	0.97	0.02	- 0.46
Alignment of Tasks	139	3.01	1.00	5.00	0.97	- 0.11	- 0.35
Chief Audit Officer	139	2.87	1.00	5.00	1.10	0.03	- 0.81
PROCESSES							
Strategic IT Planning	139	2.78	1.00	5.00	1.04	0.18	- 0.52
Budgetary Control	139	2.76	1.00	5.00	0.96	0.05	- 0.17
Chargeback	139	2.67	1.00	5.00	1.09	0.24	- 0.62
Risk Assessment	139	2.67	1.00	5.00	1.12	0.09	- 0.81
Change management	139	2.92	1.00	5.00	1.04	- 0.07	- 0.62
Performance Monitoring	139	2.83	1.00	5.00	1.05	0.15	- 0.61
SLA	139	2.81	1.00	5.00	1.07	- 0.12	- 0.63
Benefit Monitoring	139	2.43	1.00	4.00	0.95	0.17	- 0.86
Incidence Response	139	2.78	1.00	4.00	0.99	- 0.05	- 1.26
Formalized Operations	139	2.32	1.00	4.00	0.99	0.11	- 1.05
LEADERSHIP							
Environment Analysis	139	2.91	1.00	4.00	0.81	- 0.33	- 0.39
Governance Oversight	139	3.17	1.00	5.00	0.86	- 0.19	- 0.66
Risk Management	139	2.72	1.00	4.00	0.96	- 0.37	- 0.75
Governance Disclosure	139	2.86	1.00	4.00	0.85	- 0.30	- 0.55
Portfolio Evaluation	139	2.94	1.00	5.00	0.96	0.36	- 0.27
Capability Monitoring	139	2.59	1.00	5.00	1.08	0.39	- 0.37
Regulatory Compliance	139	2.94	1.00	5.00	1.17	0.02	- 0.85
TECHNOLOGY							
Decision Support Systems	139	2.75	1.00	5.00	0.98	0.34	0.01
IT architecture	139	2.76	1.00	5.00	1.09	0.31	- 0.40
Transparency	139	3.09	1.00	5.00	1.15	0.18	- 0.77
Stakeholders	139	3.10	1.00	5.00	1.18	- 0.09	- 0.93
Communication & Collaboratio	139	3.09	1.00	5.00	1.16	0.11	- 0.73
Information Security	139	2.89	1.00	5.00	1.00	0.18	- 0.15
Transactional Activities	139	2.77	1.00	5.00	1.06	0.25	- 0.43
Knowledge Management	139	2.93	1.00	5.00	1.12	0.21	- 0.59
Assurance Activities	139	3.04	1.00	5.00	1.04	0.19	- 0.37
RELATIONSHIPS							
Cross Training	139	2.59	1.00	4.00	0.95	0.35	- 1.08
Job Rotation	139	2.76	1.00	4.00	0.91	0.45	- 1.54
Regular Campaigns	139	2.68	1.00	5.00	0.94	- 0.15	- 0.64
Informal activities	139	2.75	1.00	5.00	1.10	0.35	- 0.88
Value Definition	139	2.50	1.00	5.00	0.96	0.24	- 0.71
EFFECTIVE EGIT							
Strategic Alignment							
Infrastructure Alignment	139	2.71	1.00	5.00	0.93	0.22	0.03
Strategy Alignment	139	3.06	1.00	5.00	1.27	- 0.09	- 1.04
Harmony in IT Choices	139	2.96	1.00	5.00	1.21	0.33	- 0.78
Value Delivery							
Competitive Advantages	139	2.75	1.00	5.00	1.11	0.26	- 0.59
Operational efficiency	139	3.09	1.00	5.00	1.34	- 0.10	- 1.20
Cost Reductions	139	2.78	1.00	5.00	1.17	0.71	- 0.37
Risk Management							
Risk Profile	139	2.77	1.00	5.00	0.99	- 0.21	- 0.67
IT Security	139	2.90	1.00	5.00	1.30	0.21	- 1.13
Reduces Uncertainties	139	2.83	1.00	5.00	1.14	0.54	- 0.71
Performance Measurement							
Results Oriented	139	3.17	1.00	5.00	1.21	- 0.10	- 0.99
Effective Delivery	139	3.09	1.00	5.00	1.25	0.06	- 1.12
Timeliness	139	2.96	1.00	5.00	1.18	0.11	- 0.94
Resource Management							
Value for Money	139	2.55	1.00	4.00	1.00	0.09	- 1.08
Resource Deployment	139	2.90	1.00	5.00	1.29	0.21	- 1.11
Accountability	139	2.73	1.00	5.00	1.13	0.28	- 0.59

App 10: Complete List of Audit Objectives in the First Iteration

	Auditable Areas	Audit Objectives
Structures	IT Steering Committee	To ensure the existence of IT Steering Committee
	IT Steering Committee	To assess the appropriateness of the membership composition of the Committee.
	IT Steering Committee	To ensure the effective performance of duties by the IT Steering Committee
	IT Decisions Reporting Lines	To ensure the appropriateness of the roles and the reporting lines to support IT decisions
	Accountability of IT Services	To ensure the transparency of IT cost, processes, project, and Services
	IT Project Steering Committee	To ensure that the committee exists and operates effectively to ensure the successful completion of IT projects.
	IT Portfolio Office	To ensure the Existence and the effective functioning of the portfolio office.
	Chief Information Officer (CIO)	To ensure that the CIO is a full member of the executive and is empowered to implement Board decisions
	The Chief Audit Executive (CAE)	To ensure the existence of the role of CAE, with adequate capability and empowerment to perform effectively
	IT Roles and Responsibilities	To ensure that roles, and responsibilities of IT personnel are defined, documented, and communicated
	IT Governance function	To ensure the existence of a function to coordinate, integrate and drive IT governance activities.
	Internal Audit Unit	To ensure the existence of Internal audit unit with the capacities and competencies to review overall IT process and governance
	Quality Assurance (QA) control standards	To ensure Quality assurance review of IT activities
Processes	Strategic information systems Planning	Ensure existence of the SIS plan and its effective implementation
	IT Performance Management	Ensure the adequacy of the data collection tools, roles and responsibilities, data collection plans/schedules and practices in place within the organisation.
	Portfolio Management	To ensure that IT-enabled investment programs are managed utilising portfolio management methodologies to ensure achievement of specific strategic business objectives by identifying, defining, evaluating, prioritising, selecting, initiating, managing and controlling programs.
	Charge back arrangements - total cost of ownership (e.g. activity-based costing) Service	Ensure the existence and adequacy of charge back arrangement
	Service Level Agreements IT	Ensure that Service Level Agreement between IT and Business Units are defined and reviewed periodically as well as authorised by appropriate authority
	Service Level Agreements IT	Ensure that adequate Roles & responsibilities defined in SLA
	Service Level Agreements IT	Ensure proper Oversight and regular monitoring of compliance with SLA by both IT and Business units
	Project Governance / Management Methodologies	To ensure conformance with project management framework to undertake major projects
	IT Budget Control and Reporting	Ensure that budget definition process is all inclusive to allow chargebacks to Business Units Successfully
	IT Budget Control and Reporting	Ensure Maker & checker control with segregation of duty exist to ensure the accuracy & completeness of the reporting work. The report is reviewed by the leaders of both Business and IT Units before sending to Executive management and subsequently to Board for approval

	Auditable Areas	Audit Objectives
	IT Budget Control and Reporting	Ensure that IT Budget revisions are approved with proper justification. Project expenditure should be approved within proper threshold and in line with the payment pre-defined terms.
	Benefits Management and Reporting	Ensure that the benefits of IT to the various Business Units are assessing to influence the chargebacks
	IT Risk Management and Control	Ensure that Risk Metrics (Key Risk Indicators, Key Performance Indicators and Hotspots) are used by risk teams to monitor risk areas and identify Information and Technology risk exposures
	IT Risk Management and Control	To ensure that risk committees are governed through approved Terms of Reference
	IT Risk Management and Control	Ensure that regulatory risk has been identified and is appropriately mitigated to ensure that the entity's strategic objectives are not adversely affected.
	IT Risk Management and Control	To ensure accurate risk profiling
	IT Assets Management	To ensure that Standards, policy and procedures for IT Asset Management are in place and reviewed regularly for all asset types
	Maker Checker Controls	Ensure that Segregation of duties are place within IT unit to facilitate maker checker control
	Business Continuity Plan & Disaster Recovery Plan	Ensure that Business Continuity Planning is in place with updated information, including recovery strategy, contact list, critical business process, key personnel and IT services
	IT Vendor Management	Ensure that detailed review is conducted and approved before procuring the services of a Vendor
	IT Vendor Management	To ensure that Vendor management effectively manages vendor risks
	IT Vendor Management	To ensure that IT vendor activities are regularly monitored, and consecutive actions taken timely
	Change Management	Ensure that A formal change management process exists to review the changes. .
Leadership	IT Strategy Committee	To ensure the existence and effectiveness of the IT Strategy Committee
	IT expertise at level of Board of Directors	To ensure that at least two members of the Board have In-depth IT knowledge and expertise
	IT Audit Committee	To ensure the existence of IT audit Committee or IT experts in the Audit Committee to review the overall IT controls
	IT Strategy	To ensure that IT Strategies aligns with Business Strategies.
	Directors Responsibility to IT Governance	Ensure that Board of Directors IT Governance responsibilities are required to be clearly described
	Board of Directors oversight over the IT risk process	Ensure the Board of directors approve the Risk Management framework, committee structures and get regular updates organisation's control environment.
	IT Governance Disclosure	To ensure that Board adequately provide IT governance information to external stakeholders
Technology	Executive Support System (ESS)	Ensure the effective functioning of the ESS
	Decision Support System (DSS)	Ensure the effective functioning of the DSS
	IT Architecture	To ensure that a holistic information Technology model has been established and implemented to establish IT information flow and enable applications development and decision-supporting activities, consistent with IT strategic plans.
	IT Architecture	Ensure the adequacy of the governance support systems with regards to their abilities
	IT Architecture	To ensure that Data classification schemes and security levels have been established.
	IT Architecture	Ensure the adequacy of the physical infrastructure and systems component
Relational	Cross-training	Ensure that adequate measures are in place to train business staff with IT skills and IT staff with Business Skills
	Knowledge management	To ensure that systems to create and disseminate IT knowledge about IT governance framework, responsibilities, tasks, etc.
	Informal relations between business and IT management	To ensure that adequate measures are implemented to foster closer bonding relations between IT and Business Management

	Auditable Areas	Audit Objectives
	Corporate communications for IT issues	Ensure adequate communications are made to internal stakeholders concerning IT issues
	IT Governance awareness campaigns	To ensure that adequate campaigns are conducted to create awareness
	Staff Succession Plan and Management of staff attrition	HR checks that successors to key roles in are identified and succession plans put in place for such roles and reviewed regularly. Attrition level is monitored, and strategy is in place to address the attrition level and fill in key vacancies.
	Ongoing Training and Development for Board Directors	Ensure that ongoing training and development programs are tailored to individual knowledge and experience

App 11: Additional objectives included in the version two

Auditable Area	Audit Objectives
Cybersecurity and Data Protection Committee	To Ensure the Existence and the effective functioning of the cybersecurity and Data Protection Committee.
Chief information security officer - CISO	To ensure that the CISO is a full member of the executive
IT regulatory Compliance function	To ensure the existence of a function to monitor the regular compliance with IT regulations
Information Security and Data Protection	To ensure that adequate measures have been put in place to protect the Organisation's information assets as well as personal and sensitive data in compliance with regulations
Data Protection Program	Ensure the existence of effectiveness of a Data Protection Program in compliance with Data Protection Act
Director and Shareholders "Fits and Proper"	Ensure the Shareholders, directors and Key management personnel passes the "fits and Proper" Test Requirements
IT Competence of Directors	Review annual IT certification of Directors by the National Banking College
Related Party IT Transactions	To ensure that all related party IT transactions are at 'arm's length'
Board IT Risk Committee	To ensure the existence and effective functioning of an IT Risk Committee at Board Level
Collaborative Technologies	Ensure the existence and effective functioning of technologies that facilities collaborations between IT and Business people

App 12: Snapshots of Version two of the Artefact

File Home Insert Draw Page Layout Formulas Data Review View Help Foxit Reader PDF Tell me what you want to do								
G3 To assess the existence of IT Steering Committee								
A	B	C	D	E	F	G	H	I
1 Overall Objectives: To ensure Clear organizational structures and accountability of IT to deliver value and enable the organization to meet its strategic objectives								
2	Mechanisms	COBIT 5 Process	Process ID	Auditable Area	Description	Scope	Audit Objectives	Independent Testing Procedures
3	Structures	Ensure Governance Framework Setting and Maintenance	EDM01	IT Steering Committee	A group of senior executives appointed by the board to ensure that the board is involved in and kept informed of major IT-related matters and decisions. The steering committee exist to monitor the implementation of Board IT decisions and to ensure that IT deliver value to the enterprise.	IT Strategic Alignment	To assess the existence of IT Steering Committee	<ol style="list-style-type: none"> 1. Check for the existence of the IT steering committee charter. 2. Review the charter to see requirement for the creation of IT steering Committee 2. Review Management Nomination for the membership of committee 3. Review Board approval for the creation of the committee. 4. Review terms of reference to evidence of the committee.
4	Structures	Ensure Governance Framework Setting and Maintenance	EDM01	IT Steering Committee	The steering committee exist to monitor the implementation of Board IT decisions and to ensure that IT deliver value to the enterprise	IT Strategic Alignment	To assess the appropriateness of membership composition of the Committee.	<ol style="list-style-type: none"> 1. Review the membership composition mix recommended for the IT Steering Committee Charter to ensure that there is diversity of functions within the committee. 2. Review members' biographies to understand and assess the skills and experiences they bring. This is to ensure adequate representation of persons with IT knowledge and
	Structures	Ensure Governance Framework Setting and Maintenance	EDM01	IT Steering Committee	The steering committee exist to monitor the implementation of Board IT decisions and to ensure that IT deliver value to the enterprise	IT Strategic Alignment	To assess the effective performance of duties by the IT Steering Committee	<ol style="list-style-type: none"> 1. Read the duties espoused in the IT Steering Committee Charter. 2. Assess that the committee is fully empowered to effectively function 3. Review the recommended meeting period for the committee and review meeting minutes to evidence that the committee meets regularly. 4. Review the KPI's espoused in the terms of reference or the Charter. 5. Review sampled minute to assess the attendance level of members for committee meetings. 6. Inquire from members on their performance target for the period and their self assessment. 7. Based on the review of the minutes, assess the performance of the committee against the KPI's espoused in the terms of reference. 8. Carry out a survey or conduct interviews with committee members to provide a qualitative dimension to the assessment e.g. asking for opinions and requesting examples of recent
STRUCTURES PROCESS LEADERSHIP TECHNOLOGY RELATIONS								

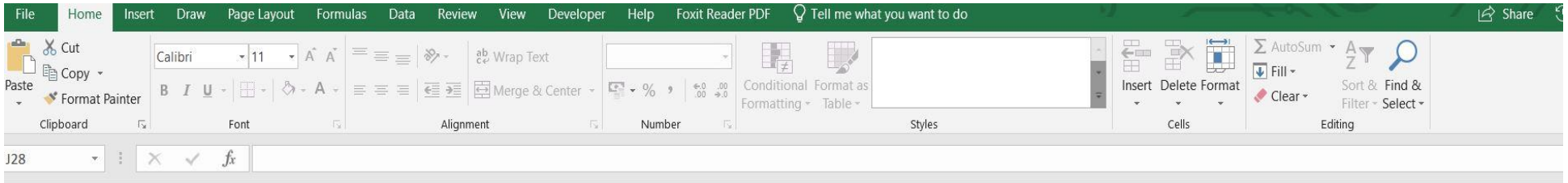
G26 To ensure that adequate measures have been put in place to protect the Organisation's information assets as well as personal and sensitive data in compliance with regulations								
A	B	C	D	E	F	G	H	I
1 Overall Objectives: To ensure the formalization of strategic IT decision making and monitoring procedures in accordance with laid down policies, regulations and other guidelines organization to meet its strategic objectives								
2	Mechanisms	COBIT 5 Process	Process ID	Auditable Area	Description	Scope	Audit Objectives	Independent Testing Procedures
3	Processes	Manage Strategy	APO02	Strategic information systems Planning	Formal process to define and update the IT strategy	Resource Management, Value Creation, IT Strategic Alignment	Ensure existence of the SIS plan and it effective implementation	<ol style="list-style-type: none"> 1. Enquire about the existence of a strategic Information system plan 2. Gain understanding of the planning methodologies adopted to develop the plan to ensure that it facilitates the alignment of business strategy with IT strategy. 3. Conduct a Walkthrough of the planning process and its controls to verify and validate understanding on the IT and Business Strategy. 4. Ensure that the plan focuses on both Internal and External Environment 5. Confirm the participant and involvement of both executive management and middle management in the process 6. Confirm the approval of executive management and subsequent approval of Board 7. Review the action plan for implementation to ensure that its exhaustive
4	Processes	Ensure Benefits Delivery	EDM02	IT Performance Management	IT performance measurement in domains of corporate contribution, user orientation, operational excellence and future orientation Portfolio	Value Creation & Resource Management	Assess the adequacy of the data collection tools, roles and responsibilities, data collection plans/schedules and practices in place within the organization.	<ol style="list-style-type: none"> 1. Review the IT Performance Management policies to ensure that procedures have been formalized within the organization. 2. Enquire into the performance management practices to assess whether they are in line with the policy 3. Assess the various data collection tools employed for their effectiveness 4. Ensure that Performance management processes are undertaking in accordance with pre-determined schedules
5	Processes	Manage Portfolio	APO05	Portfolio Management	Prioritization process for IT investments and projects in which business and IT is involved	IT Strategic Alignment	To ensure that IT-enabled investment programs are managed utilizing portfolio management methodologies to ensure achievement of specific strategic business objectives by identifying, defining, evaluating, prioritizing, selecting, initiating, managing and controlling programs.	<ol style="list-style-type: none"> 1. Determine that the portfolio management procedures use appropriate criteria to define and prioritize the different projects and programs. 2. Verify whether business goals and expected business outcomes are documented and reasonable and whether sufficient information related to budget and effort is present. 3. Verify the effectiveness of communication of program/project outcomes to all stakeholders in a message that is appropriate to the business unit and its level of responsibility.
	Processes	Manage Service	APO09	Charge back arrangements - total	Methodology to charge back IT	IT Strategic Alignment	Assess the existence and	<ol style="list-style-type: none"> 1. Review a formalized IT chargeback/Show back policy or

Overall Objectives: To ensure that information technologies and systems are effectively used in governance to support decision making and reduce information asymmetry								
Mechanisms	COBIT 5 Process	Process ID	Auditable Area	Description	Scope	Audit Objectives	Independent Testing Procedures	
Technology	Ensure Resource Optimisation	EDM04	Executive Support System (ESS)	A type of management support system that facilitates and supports senior executive information and decision-making needs.	Value Delivery	Ensure the effective functioning of the ESS	<ol style="list-style-type: none"> 1. Ensure the existence of a system to provide Top management with required information (Both internal and external relevant information) 2. Review the system (Hardware, Software and other Data and Communication Networks) to ensure that the systems will continue to provide a satisfactory level of performance in both the short and longer term. 3. Review monitoring procedures to ensure that performance monitoring is conducted as part of the day to day performance of the system in terms of measures such as response time etc. 4. Review the system of data capturing and inputting to ensure the accuracy and integrity of data captured. 5. Review the maintenance procedures for both hardware and software to ensure that the Network Monitoring and Administration is conducted regularly to ensure that communication links are maintained. 6. Review Back ups procedures to ensure that backups of data and software are carried out by IT operations staff on a regular basis. 7. Review Problem Management procedures to ensure that adequate 	
Technology	Ensure Resource Optimisation	EDM04	Decision Support System (DSS)	An information system that supports business or organizational decision-making activities.	Value Delivery	Ensure the effective functioning of the DSS	<ol style="list-style-type: none"> 1. Review the system (Hardware, Software and other Data and Communication Networks) to ensure that the systems will continue to provide a satisfactory level of performance in both the short and longer term. 2. Review monitoring procedures to ensure that performance monitoring is conducted as part of the day to day performance of the system in terms of measures such as response time etc. 3. Review the system of data capturing and inputting to ensure the accuracy and integrity of data captured. 4. Review the maintenance procedures for both hardware and software to ensure that the Network Monitoring and Administration is conducted regularly to ensure that communication links are maintained. 5. Review Back ups procedures to ensure that backups of data and software are carried out by IT operations staff on a regular basis. 6. Review Problem Management procedures to ensure that adequate 	
Technology	Manage Enterprise Architecture	APO03	IT Architecture	The structural design of information technology to support business strategies and goals.	Value Delivery	To ensure that a holistic information Technology model has been established and implemented to	<ol style="list-style-type: none"> 1. Using the defined business goals and objectives, <ul style="list-style-type: none"> - Identify existing IT and systems infrastructure environment - Review and Identify gaps between architecture characteristics / attributes and business requirements 2. Review the logical function requirements of the architecture to ensure its 	

Overall Objectives: To ensure that informational and collaborative relationships exist between IT and business functions to facilitate their active participation in EGIT							
Mechanisms	COBIT 5 Process	Process ID	Auditable Area	Description	Scope	Audit Objectives	Independent Testing Procedures
Relations	Manage Human Resources	APO07	Cross-training	This involves teaching employees who were hired to perform business function the skills required to perform IT functions and Vice Versa.	Value Delivery	Ensure that adequate measures are in place to train business staff with IT skills and IT staff with Business Skills	<ol style="list-style-type: none"> 1. Check that there is an Individual Learning Development Plans in place for each IT and Business management on a yearly basis. 2. Assess the frequency and quality of the trainings and determine the control objective is achieved. 3. Confirm that there is a training tracker maintained to check for completeness of training. 4. Select sample directors and review training records and confirm that ongoing training is taking place. 5. Review the training tracker and confirm that there are no instances where training due has not been conducted. 6. Confirm that the Policy and regulatory requirement on training and development is being complied with.
Relations	Manage Knowledge	BAI08	Knowledge management	The process of creating, sharing, and managing IT Governance knowledge in the organization	Value Delivery	To ensure that systems to create and disseminate IT knowledge about IT governance framework, responsibilities, tasks, etc.	<ol style="list-style-type: none"> 1. Enquire from Knowledge actors about the Knowledge management strategy on IT Governance. 2. Identify knowledge management processes, practices and systems. 3. Assess systems established to capture Explicit and Implicit knowledge on IT Governance 4. Assess systems (such as workshops, informal meetings etc.) to disseminate Explicit and Implicit knowledge on IT Governance
Relations	Ensure Stakeholder Transparency	EDM05	IT Governance awareness campaigns	Campaigns to explain to business and IT people the need for IT governance	Value Delivery	To ensure that adequate campaigns are conducted to create awareness	<ol style="list-style-type: none"> 1. Review all programs geared towards creating IT Governance awareness. 2. Interview sample employees to ascertain knowledge about the organization's IT Governance efforts
Relations	Manage Human Resources	APO07	Staff Succession Plan and Management of staff attrition	A Plan for identifying and developing new leaders who can replace existing ones.	Value Delivery	HR checks that successors to key roles in the Bank are identified and succession plans put in place for such roles and reviewed regularly. Attrition level is monitored and strategy is in place to address the attrition level and fill in key	<ol style="list-style-type: none"> 1. Confirm that there is a succession plan in place for all staff and is reviewed regularly. 2. Confirm if the HR department has a retention strategy and this is adequate in retaining the talent. 3. Review all succession plans of key roles in the IT function and verify that succession plans are in place, the plan is current and is reviewed regularly.
Relations	Manage Human Resources	APO07	Ongoing Training and Development For Board Directors	Regular IT training for directors	Value Delivery	Ensure that ongoing training and development programs are tailored to individual knowledge and experience	<ol style="list-style-type: none"> 1. Check that there is an Individual Learning Development Plans in place for each director on a yearly basis. 2. Assess the frequency and quality of the trainings and determine the control objective is achieved. 3. Confirm that there is a training tracker maintained to check for completeness of training. 4. Select sample directors and review training records and confirm

To ensure that Board adequately provide IT governance information to external stakeholders								
	A	B	C	D	E	F	G	H
1	Overall Objectives: To ensure that oversight duties of boards have been formalized to improve involvement in EGIT							
2	Mechanisms	COBIT 5 Process	Process ID	Auditable Area	Description	Scope	Audit Objectives	Independent Testing Procedures
3	Leadership	Ensure Governance Framework Setting and Maintenance	EDM01	IT Strategy Committee	IT Strategy committee generally consists of board members and specialized non-board members mandated to advise board on IT initiative.	Strategic Alignment	To ensure the existence and effectiveness of the IT Strategy Committee	<ol style="list-style-type: none"> 1. Check for the existence of the IT Strategy committee. 2. Review the membership to ensure that It has a balance of top IT and Business Experts 3. Check their attendance to committee meetings. 4. Review Terms of Reference to ensure responsibilities adequate. 5. Make recommendation regarding the membership and regular attendance.
4	Leadership	Ensure Governance Framework Setting and Maintenance	EDM01	IT expertise at level of Board of Directors	Members of the board need requisite IT expertise to review the activities of management and executive Directors	Value Creation, Resource Management & IT Strategic Alignment	To ensure that at least two members of the Board have In-depth IT knowledge and expertise	<ol style="list-style-type: none"> 1. Evaluate the policy and specific procedure to ensure it provides adequate guidance on evaluating skills and competencies for Board members. Ensure the policy is up to date. 2. Ensure any local regulations are adequately addressed in the procedure. 3. Evaluate that capabilities and competencies of IT identified experts on the Board. 4. Test to confirm if Effectiveness and Capability Assessment is being conducted annually / frequently. 5. Review the competency assessments for directors and Independent Non Executive Directors and use of the results.
5	Leadership	Ensure Governance Framework Setting and Maintenance	EDM01	IT Audit Committee	The audit committee fulfils an oversight role regarding risks, internal controls, fraud risk as it relates to information technology.	Risk Management	To ensure the existence of IT audit Committee or IT experts in the Audit Committee to review the overall IT controls	<ol style="list-style-type: none"> 1. Check for the existence of the IT Audit committee or Audit Committee (with IT expertise). 2. Review the membership to ensure that It has a capacity to undertake responsibility. 3. Check their attendance to committee meetings. 4. Review Terms of Reference to ensure responsibilities are adequate to review IT controls. 5. Make recommendation regarding the membership and regular attendance.
6	Leadership	Ensure Governance Framework Setting and Maintenance	EDM01	IT Strategy	IT Strategy of the organization is maintained, updated and approved by the Board	Strategic Alignment	To ensure that IT Strategies aligns with Business Strategies.	<ol style="list-style-type: none"> 1. Check that IT Strategy document is approved by the Board of Directors (BoD). 2. Review that the approved IT Strategy has been assessed against the overall business strategy.
	Leadership	Ensure Governance Framework Setting	EDM01	Directors Responsibility to IT Governance	The Board's role is to oversee the management and	Value Delivery & Performance Management	Ensure that Board of Directors IT Governance	<ol style="list-style-type: none"> 1. Obtain Board of Director's terms of reference and confirm that IT Governance responsibility is included therein.

App 13: Snapshots of the Final version of the artefact Dashboard



Welcome to the COBIT 5 Driven IT Audit Framework

Version number Version 1
Last updated

[Instructions](#)

[Go to STRUCTURES](#)

[Go to PROCESSES](#)

[Go to LEADERSHIPS](#)

[Go to TECHNOLOGY](#)

[Go to RELATIONSHIPS](#)

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OR email: asmale001@myuct.ac.za

App 14: Analysis of Variance – Post-Hoc

Variable	Analysis of Variance (Post_hoc)Marked effects are significant at p < .05000							
	SS	df	MS	SS	df	MS	F	p
STRUCTURES								
Steering committee	43.48	5	8.70	48.80	133	0.37	23.70	0.00
Reporting Lines	66.73	5	13.35	59.94	133	0.45	29.61	0.00
Roles and responsibilities	62.34	5	12.47	57.82	133	0.43	28.68	0.00
Empowered IT personnel	95.59	5	19.12	58.23	133	0.44	43.67	0.00
Chief Information Officer	59.93	5	11.99	60.49	133	0.45	26.35	0.00
Coordination of Governance	40.57	5	8.11	73.17	133	0.55	14.75	0.00
Monitoring of KPIs	56.08	5	11.22	74.05	133	0.56	20.15	0.00
Alignment of Tasks	66.21	5	13.24	64.78	133	0.49	27.19	0.00
Chief Audit Officer	83.19	5	16.64	74.35	133	0.56	29.76	0.00
PROCESSES								
Strategic IT Planning	65.42	5	13.08	82.66	133	0.62	21.05	0.00
Budgetary Control	58.41	5	11.68	68.75	133	0.52	22.60	0.00
Chargeback	63.82	5	12.76	98.95	133	0.74	17.16	0.00
Risk Assessment	66.05	5	13.21	106.72	133	0.80	16.46	0.00
Change management	78.21	5	15.64	71.92	133	0.54	28.93	0.00
Performance Monitoring	59.28	5	11.86	93.92	133	0.71	16.79	0.00
SLA	63.69	5	12.74	95.45	133	0.72	17.75	0.00
Benefit Monitoring	65.95	5	13.19	58.16	133	0.44	30.16	0.00
Incidence Response	88.11	5	17.62	47.42	133	0.36	49.42	0.00
Formalized Operations	83.60	5	16.72	50.47	133	0.38	44.06	0.00
LEADERSHIP								
Environment Analysis	55.47	5	11.09	34.31	133	0.26	43.01	0.00
Governance Oversight	79.54	5	15.91	29.77	133	0.22	71.08	-
Risk Management	74.12	5	14.82	51.94	133	0.39	37.96	0.00
Governance Disclosure	60.20	5	12.04	38.92	133	0.29	41.15	0.00
Portfolio Evaluation	68.83	5	13.77	58.71	133	0.44	31.18	0.00
Capability Monitoring	81.16	5	16.23	80.46	133	0.60	26.83	0.00
Regulatory Compliance	104.54	5	20.91	83.87	133	0.63	33.16	0.00
TECHNOLOGY								
Decision Support Systems	64.02	5	12.80	68.17	133	0.51	24.98	0.00
IT architecture	87.16	5	17.43	76.01	133	0.57	30.50	0.00
Transparency	112.29	5	22.46	68.68	133	0.52	43.49	0.00
Stakeholders	111.43	5	22.29	74.65	133	0.56	39.70	0.00
Communication & Collaboration	110.05	5	22.01	74.91	133	0.56	39.08	0.00
Information Security	65.76	5	13.15	73.63	133	0.55	23.76	0.00
Transactional Activities	72.36	5	14.47	82.27	133	0.62	23.40	0.00
Knowledge Management	103.33	5	20.67	69.95	133	0.53	39.29	0.00
Assurance Activities	94.67	5	18.93	55.07	133	0.41	45.73	0.00
RELATIONSHIPS								
Cross Training	70.13	5	14.03	55.50	133	0.42	33.61	0.00
Job Rotation	86.82	5	17.36	26.87	133	0.20	85.96	-
Regular Campaigns	48.67	5	9.73	73.76	133	0.55	17.55	0.00
Informal activities	85.07	5	17.01	83.12	133	0.62	27.22	0.00
Value Definition	67.21	5	13.44	59.54	133	0.45	30.02	0.00
EFFECTIVE EGIT (Outcome)								
Strategic Business/IT Harmony								
Infrastructure Harmony	54.31	5	10.86	64.18	133	0.48	22.51	0.00
Strategy Harmony	119.63	5	23.93	101.91	133	0.77	31.23	0.00
Harmony in IT Choices	137.46	5	27.49	64.28	133	0.48	56.89	-
Value Delivery								
Competitive Advantages	51.51	5	10.30	118.67	133	0.89	11.55	0.00
Operational efficiency	142.88	5	28.58	104.08	133	0.78	36.52	0.00
Cost Reductions	84.43	5	16.89	103.09	133	0.78	21.78	0.00
Risk Management								
Risk Profile	47.67	5	9.53	86.96	133	0.65	14.58	0.00
IT Security	152.14	5	30.43	82.45	133	0.62	49.08	0.00
Reduces Uncertainties	123.76	5	24.75	55.43	133	0.42	59.39	-
Performance Management								
Results Oriented	103.65	5	20.73	97.55	133	0.73	28.26	0.00
Effective Delivery	113.73	5	22.75	103.24	133	0.78	29.30	0.00
Timeliness	106.52	5	21.30	85.22	133	0.64	33.25	0.00
Resource Management								
Value for Money	35.44	5	7.09	103.00	133	0.77	9.15	0.00
Resource Deployment	152.18	5	30.44	76.41	133	0.57	52.97	0.00
Accountability	109.14	5	21.83	56.62	133	0.43	51.28	0.00

App 15: Ethics Approval Letter



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UCT Commerce Faculty Office

05/01/2018

Mr Alexander Asmah
Department of Information Systems
University of Cape Town

REF: REC2018/001/007

Dear Alexander Asmah

**Project : TOWARDS THE DEVELOPMENT OF A COBIT 5 DRIVEN IT AUDIT
FRAMEWORK.**

It is a pleasure to inform you that the EIRC has **formally approved** the above-mentioned study.

Approval is granted for the period of 12 months. Should you require an extension or make any substantial changes to the research methodology which could affect the experiences of participants, you must submit a revised protocol to the Committee for approval.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Your sincerely

Litha Tyulu
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