Towards t-Government: An Interoperability Model for e-Government in Saudi Arabia

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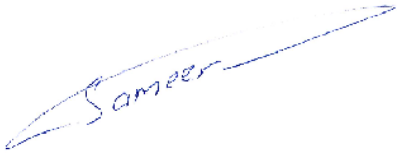
DECLARATION

This work has not been previously submitted for a degree or diploma in any university. To the best of my knowledge and belief, this thesis contains no material previously published or written by another person except where due reference is made in the thesis itself.



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ABSTRACT

Governments around the world have invested significant sums of money on e-Government to improve the efficiency and effectiveness of services provided to their citizens. Accordingly, identifying the structural changes and greater benefits has increased government interest in shifting from the original concept of e-Government. This shift has been towards a more transformational approach that encompasses the entire relationship between different government organisations and users of public services, to a new stage of e-Government that can be termed 'transformational government' or t-Government. However, governments have not achieved their desired results due the lack of interoperability between different government entities. Interoperability refers to the ability to exchange information across organisational borders. It relates to technology as well as business aspects. t-Government implementation requires a high level of interoperability between government organisations. A strong need exists for coordination regarding the way in which interoperability is implemented, and governments are still very far from having a comprehensive set of interoperability frameworks or models. Therefore, this research attempts to develop a model that explores and investigates the key factors influencing e-Government interoperability and the consequent implementation of t-Government in the Saudi Arabian context. This model will examine these factors from four key areas— technological, organisational, political and social—using institutional theory as a lens.

To achieve the research's aims, an exploratory study consisting of two phases (first, qualitative [interviews and documentation] and second, quantitative [survey]) validated and tested this model empirically. Thematic analysis was conducted through interviews with e-Government officials and top managers, with documentation analysis refining this model. Structural equation modelling was then used to analyse the questionnaire (survey) distributed to information and communication technology and e-Government specialists to test this model. The qualitative and quantitative findings were triangulated to investigate the factors influencing interoperability for t-Government implementation.

The empirical results reveal that technological compatibility, organisational compatibility, governance readiness, citizen centricity and the e-Government program (Yesser) have a positive impact on the level of interoperability required for t-Government implementation in this particular context. A direct and positive impact from the e-Government program (Yesser) is also evident on technological compatibility, along with an impact of citizen centricity on the e-Government program (Yesser). Unexpectedly, the results indicate that the e-Government program (Yesser) does not affect organisational compatibility and governance readiness. Moreover, the results show that organisation size and the number of government-to-government (G2G) services as moderating factors are not supported in this research sample.

This thesis contributes to e-Government research through generating numerous implications for theorists and practitioners, especially for governments seeking to create interoperability between organisations and to implement t-Government.

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LIST OF ABBREVIATIONS

AGFI	Adjusted Goodness-of-Fit Index
AMOS	Analysis of Moment Structures
AVE	Average Variance Extracted
BPR	Business Process Re-Engineering
BPM	Business Process Management
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CIO	Chief Information Officer
CR	Composite Reliability
EA	Enterprise Architecture
EAI	Enterprise Application Integration
EFA	Exploratory Factor Analysis
EG	Electronic Government (e-Government)
EGDI	Electronic Government Development Index
GSB	Government Secured Bus
GSN	Government Secured Network
GFI	Goodness-of-Fit Index
GOF	Goodness-of-Fit
G2B	Government-to-Businesses
G2C	Government-to-Citizens
G2E	Government-to-Employees
G2G	Government-to-Governments
GSB	Government Service Bus
GSN	Government Security Network
IOP	Interoperability
ICT	Information and Communications Technology
IT	Information Technology
KMO	Kaiser-Meyer-Olkin
MI	Modification Index
MCIT	Ministry of Communication and Information Technology
ML	Maximum Likelihood
NEA	National Enterprise Architecture
OECD	Organisation for Economic Cooperation and Development
RMR	Root Mean Square Residual
RMSEA	Root Mean Square Error of Approximation
ROI	Return on Investment
SAMA	Saudi Arabian Monetary Agency
SD	Standard Deviation
SE	Standard Error
SEM	Structural Equation Modelling
SOA	Service-Oriented Architecture
SSO	Single Sign On
SEM	Structural Equation Modelling
SMS	Short Messaging Service
SRMR	Standardised Root Mean Square Residual
TLI	Tucker-Lewis Index
TG	Transformation Government (t-Government)

PUBLICATIONS

1. Alshetewi, S., Goodwin, R., & de Vries, D. (2012). Organisational, technological and governance factors influencing t-Government. *International Journal of Advanced Research in Computer Science & Technology*, *1*(1), 7–14.

2. Alshetewi, S., Goodwin, R., Karim, F., & de Vries, D. (2015). A structural equation model (SEM) of governing factors influencing the implementation of t-Government, *International Journal of Advanced Computer Science and Applications*, *6*(11), 119–125.

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CHAPTER 1: INTRODUCTION

1.1 Introduction

Governments around the world are currently investing significant sums of money on technology to modernise and improve the quality of their services. Many nations seek to adopt electronic government (e-Government) platforms, using information and communication technology (ICT) to enhance service effectiveness for citizens as well as other government agencies (Pardo, Nam, & Burke, 2011). As such, an increasing range of public services is being offered over the internet. Many countries have reached a plateau regarding the delivery of new services. Instead, the current focus seems to be on obtaining improvements by integrating governmental processes through the internet. In other words, the focus is no longer on increasing the range of services; instead, the focus is on existing services' interoperability (interoperability) for easy access and service improvements (Pardo et al., 2011; Weerakkody & Dhillon, 2008). Recent United Nations (UN) e-Government survey (UN, 2012, 2014) results suggest that many nations have established e-Government applications to enhance public sector efficiency and streamline government systems. In addition, these reports highlight the importance of placing greater emphasis on creating connections between different government departments to create further efficiencies; the reports state that this should be the goal of transformation governments (t-Government).

The above discussion raises that current concept of t-Government need to be perceived globally. To facilitate more centrally connected and citizen-centric e-Government services, and prioritise the needs of individuals and businesses in online processes, many governments have begun to shift from the concept of e-Government towards a more transformational approach regarding the entire relationship between different government organisations and the users of public services (Al-Khouri, 2011; Alshetewi, Goodwin, Karim, & de Vries, 2015).

The t-Government concept is replacing that of e-Government as the highest level of online government program. t-Government was introduced recently as a more developed stage of e-Government directed at perceiving structural changes and greater benefits (Irani et al., 2007; Weerakkody & Dhillon, 2008; Van Veenstra, Klievink, & Janssen, 2011). This later (t-Government) stage is often viewed as the highest stage of e-Government progression, in which information systems are integrated across various functions. This results in real customer-oriented government (Janssen & Shu, 2008). t-Government remains in its early stages. This is also the most challenging phase to comprehend fully. It is a complex endeavour, requiring the interrelation of information systems, public e-Services, departments and organisations, policy constraints and regulations (Klievink & Janssen, 2010; Su et al., 2011). This exercise is known as 'interoperability'. Interoperability is recognised as a key determinant and principle for e-Government maturity and development (Pardo et al., 2011; Sarantis, Charalabidis, & Psarras, 2008). However, governments

are far from achieving interoperability. They face difficulties in attaining interoperability in their information systems (Landsbergen Jr & Wolken Jr, 2001; Tambouris & Tarabanis, 2005). The lack of interoperability has been a major challenge to realising e-Government maturity (Gottschalk, 2009a; Lam, 2005a; UN, 2014). According to Pardo et al. (2011), interoperability is a means and not an end in itself. It is centrally important regarding e-Government efforts to improve government operations and provide services. A novel approach is clearly required, such as using e-Government interoperability within government organisations to attain t-Government (Irani et al., 2007). As Watmore (Irani et al., 2007) says, 't-Government is an end in itself and not a means to an end'. This current research has developed a model that explores the key factors affecting interoperability between government organisations and facilitating t-Government implementation within the Saudi Arabian context.

This chapter provides a background to the research problem in Section 1.2. It then presents an overview of the research's context and scope in Sections 1.3 and 1.4. It also discusses the research's significance in Section 1.5. Sections 1.6 and 1.7 describe the research's aim, objectives and the research questions, respectively. Section 1.8 describes the methodology used. Finally, Section 1.9 gives a thesis outline and chapter overview.

1.2 Research Problem Background

Many countries have invested billions of dollars to implement e-Government systems, using technology to modernise services and enhance front line delivery to improve service quality. Governments face huge pressure to provide more online services at lower costs. Responding to these challenges adequately means that governments must be capable of delivering transformational and not just incremental change. Clearly, ICT is no panacea; the efficiencies gained through ICT are limited (Pardo et al., 2011; Tripathi, Gupta, & Bhattacharya, 2013). ICT has not always delivered the gains expected. This has resulted in unnecessary expenditure, wasted resources, and a failure to produce a critical mass of users for online services. To achieve the gains desired, many governments are now turning towards a wider range of strategies and a more integrated approach to the e-Government integration of back-office systems in striving for public sector interoperability. This change is occurring in many government organisations (John, 2012; Mohammed, 2010; H. J. Scholl & Klischewski, 2007). This t-Government stage is the highest level of service that can provide customers with full online interactions. It is also the most difficult level to reach. t-Government is a new phenomenon; thus, exploratory research is needed to realise this and to provide the required interoperability level between e-Government systems (Irani et al., 2007). According to Gouscos, Kalikakis, Legal and Papadopoulou (2007), Pardo et al. (2011), Tripathi et al. (2013) and Weerakkody and Dhillon (2008), t-Government is traditionally based on interoperability. Interoperability is vital; it leads to extensive information sharing among and between governmental entities (Scholl, 2005). Improved interoperability between government organisations

is critical for digital government success (Gottschalk, 2009b). Interoperability among government organisations has been identified as an enabling strategy for achieving t-Government (Tripathi, Gupta, & Bhattacharya, 2012a; 2012b).

To understand the impact of interoperability in relation to t-Government, different research perspectives have resulted in many attempts to develop frameworks and models involving information sharing, integration, interoperation, interoperability and t-Government (Akbulut, 2003; Dawes, 1996; Gil-Garcia, Schneider, Pardo, & Cresswell, 2005; Gottschalk, 2009a, 2009b; Irani, 2007; Lam, 2005; Landsbergen Jr & Wolken Jr, 2001; T. Pardo, Cresswell, Dawes, & Burke, 2004; Pardo et al., 2011; Scholl & Klischewski, 2007; Tripathi, Gupta, & Bhattacharya, 2013). Some models and frameworks only focus on technical aspects, while others focus on administrative and organisational aspects, not emphasising technical factors. Other models and frameworks are distinctly citizen centric, with a one-stop-service-delivery perspective that can downplay the significant obstacles to back-end interoperation. Other projects take a technology-centric perspective, disregarding the numerous non-technical challenges that exist. So far many, if not most, models and frameworks have failed to reflect the complex grid of interwoven technical, organisational, political and social issues and constraints involved (Scholl & Klischewski, 2007). This is problematic, as a strong emphasis on one aspect without considering others could result in resource failure and waste (Klischewski & Abubakr, 2010). An over-reliance on technical aspects at the expense of organisational, political and social aspects is recognised as a substantial barrier to e-Government interoperability (Gottschalk, 2009a; Pardo et al., 2011). Interoperability is perceived broadly as including organisational, political and social perspectives along with technology. Research must be conducted to examine the critical technical, organisational, political and social factors that affect interoperability for t-Government (Stamati, 2011). In a broader sense, technical, organisational, political and social factors influencing systems and systems performance must also be considered (Gottschalk, 2009b; Janssen & Scholl, 2007). Determining critical factors at the interoperability level for government organisations is an emerging and important research element (Sarantis et al., 2008). The issues are complex and must address social, political and organisational factors, as well as technology, as t-Government enablers (Irani et al., 2007; Janssen & Scholl, 2007). No studies have yet conducted comprehensive research addressing the critical factors in implementing interoperability between government organisations by involving technical, organisational, political and social aspects. Additionally, no general model for t-Government implementation exists that can generate success in all countries, especially developing and Gulf Cooperation Countries (GCC).

The purpose of this thesis research is to fill this gap by addressing the critical factors when implementing interoperability between government organisations involving technical, organisational, political and social aspects based on an institutional theory lens in a Saudi Arabian context. This will

assist e-Government officials and policy makers to understand the factors that affect the interoperability level required for t-Government implementation.

1.3 Research Context

This thesis investigates the critical factors that affect interoperability for implementing t-Government in Saudi Arabia. Saudi Arabia meets the research requirements, as it has been classified as a developing country (World Bank [WB], 2004). Saudi Arabia has invested millions of dollars to adopt and implement e-Government public sector services and applications. It has allocated more than $US 800 million to implement e-Government services (Yesser, 2015). This investment is intended to improve public sector productivity and efficiency, provide better and more easily used services for individuals and business customers, increase the return on investment, and provide required information in a timely and accurate manner (Yesser, 2015). However, the e-Government success rate is not high. Saudi Arabia has not reached the advanced stage of e-Government (UN, 2014). Many studies conducted in Saudi Arabia by various researchers have focused on different perspectives. Some have concentrated on e-Government adoption (Al-Shehey et al., 2006; Alateyah, Crowder, & Wills, 2013), implementation and readiness from a citizen's perspective (demand-side) (Abanumy & Mayhew, 2007; Chatfield & AlAnazi, 2015), while others have conducted research from government perspectives (supply-side) (Bawazir, 2006; Alfarraj, Alhussain, & Abugabah, 2013). A literature search uncovered no rigorous focus on t-Government implementation in Saudi Arabia since the e-Government initiative was launched. The purpose of this thesis is to explore the critical factors that affect interoperability between government organisations for the implementation of t-Government in Saudi Arabia, from a government-to-government (G2G) perspective (supply-side).

1.4 Research Scope

Much research has examined e-Government from different angles. Therefore, it is necessary to define the boundaries and scope of this thesis so it is focused and efficient, easy to understand and insightful. The study's boundaries are based on the following factors:

- An analysis of relevant models and frameworks involving information sharing, integration, interoperation, interoperability and t-Government.
- An analysis of the factors found in the literature that might influence the interoperability required for implementing t-Government, based on institutional theory.
- An analysis of e-Government program (Yesser) rules, initiatives and strategies developed to facilitate e-Government implementation among government organisations in Saudi Arabia.

- The supply-side perspective (on G2G relationships), which examines the internal factors that influence the interoperability required for implementing t-Government in Saudi Arabia (Reddick, 2005).

1.5 Research Significance

Despite the large number of studies that have addressed e-Government, a limited amount of research has focused on interoperability and t-Government implementation making particular reference to developing countries, or within a Saudi Arabian context. This research highlights the importance of creating interoperability between government organisations to facilitate t-Government implementation. In this context, the research here identifies the critical factors affecting interoperability in relation to t-Government implementation. It classifies the main technological, organisational, political and social issues that might influence the interoperability required for implementing t-Government.

This research presents a number of significant contributions to the field of e-Government. It provides a guideline to researchers regarding the effect of these identified factors on t-Government implementation. Each factor is explored in depth, along with its effects on government organisations. This will enable e-Government officials and policy makers to identify the key factors affecting the interoperability required for t-Government implementation, examining how these issues may be treated in practice. Without an understanding of how these factors interact, it is difficult to establish and maintain t-Government implementation. Developing such an understanding will help officials avoid problems when implementing t-Government projects. In addition, the research findings will help central government agencies (such as e-Government program Yesser) to better use resources and elevate their t-Government level.

1.6 Research Aim and Objectives

This research's main aim is to develop an integrated model that will assist government organisations in Saudi Arabia increase their interoperability level to that required for t-Government implementation. The following objectives have been formulated to achieve this:

- Identify the factors that influence the level of interoperability required for t-Government implementation and understand current e-Government initiatives in Saudi Arabia by reviewing and analysing the existing literature.
- Develop a model based on previous and related frameworks and models. This will be done by identifying the major critical technical, organisational, political and social factors influencing the interoperability level required for t-Government implementation in the Saudi Arabian context. This model, based on institutional theory, will critically review and analyse

the existing frameworks and models in the areas of information sharing, information integration, G2G, interoperability and t-Government.

- Undertake empirical examination regarding the effects of these factors and the relationships between them.
- Help and guide e-Government officials and policy makers to facilitate t-Government implementation within a Saudi Arabian context.

1.7 Research Questions

To achieve the thesis's aim and objectives, one main research question has been formulated:

How can Saudi Arabian organisations implement t-Government through enacting interoperability between government organisations?

To answer this primary research question, the study also considered further sub-research questions:

1. What is the current e-Government situation in Saudi Arabia?
2. What are the key factors that might influence the interoperability required between government organisations for t-Government implementation in Saudi Arabia?
3. How could these factors influence the interoperability required between government organisations for t-Government implementation in Saudi Arabia?
4. What is the relative importance of these factors and the relationships between them?
5. What is the appropriate model for creating the interoperability required between government organisations for t-Government implementation in Saudi Arabia?

1.8 Research Methodology

This thesis uses a mixed-methods approach that combines qualitative and quantitative methods to answer the research questions. Using a combination of research methods enables more robust data collection and increases the research result's validity. The benefits of both qualitative and quantitative methods are gained, and empirical observations can guide and improve the survey stage. Examining a research problem through a mixed-methods design provides deeper insights as a problem is approached from differing perspectives. This allows researchers to develop accurate explanations of phenomena (Clark & Creswell, 2011; Creswell, 2013). This thesis involved two phases: a qualitative one incorporating interviews with e-Government officials and top managers, along with documentation analysis to refine the developed model and hypotheses. A quantitative phase was then conducted using a survey questionnaire to test and analysis the proposed model.

1.9 Thesis Outline

The outline of this thesis follows the PhD methodology described by Phillips and Pugh (2010) and consists of four elements: (a) background theory; (b) focal theory; (c) data theory and (d) contribution. The standard way of demonstrating background theory is through discussing the research area in Chapter 1 and identifying the problem domain in the literature review (presented in Chapters 2 and 3). The second element—focal theory—generates and develops a conceptual model; this is presented in Chapter 4. The third element—data theory—addresses issues such as (a) developing an appropriate research approach and strategy for this thesis, (b) selecting an appropriate research method, (c) developing a research protocol and (d) collecting and analysing data. These issues are discussed in Chapters 5, 6 and 7. The thesis's novel contribution is the final element. This consists of the results, which are presented in Chapters 8 and 9. The thesis outline is illustrated in Figure 1.1, and this is followed by brief descriptions of each chapter.

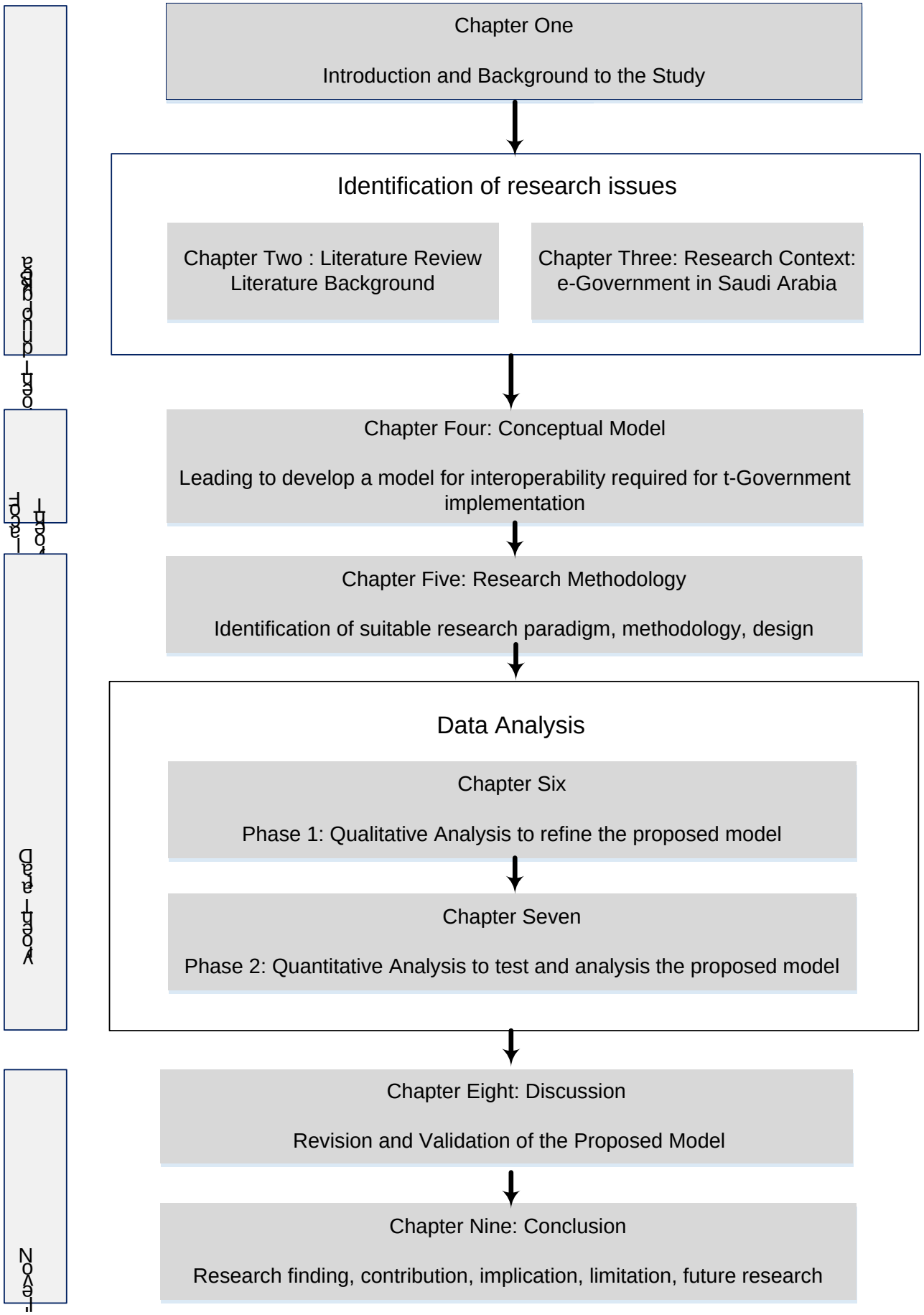

Figure 1.1: Thesis Outline

Chapter 1: Introduction. This chapter is the introduction. It focuses on the background to the research problem, the research's context, scope, significance, aims, objectives, questions, methodology, aims, objectives, questions and methodology. It also details the thesis outline.

Chapter 2: Literature Review (background theory). This chapter presents a literature review in relation to e-Government. It discusses the different definitions of e-Government from several perspectives. It then presents the main issues in e-Government, such as e-Government categories and stages. It highlights the motivations for implementing t-Government and then analyses the different models and frameworks related to information sharing, information integration, G2G, interoperability and t-Government. Moreover, it justifies why this thesis uses institutional theory as the basis of its perspective.

Chapter 3: Research Context (background theory). This chapter focuses on the research context. It provides an overview of e-Government in Saudi Arabia, and an e-Government program (Yesser). It also reviews previous e-Government studies conducted in Saudi Arabia.

Chapter 4: Conceptual Model (focal theory). This chapter proposes an interoperability conceptual model for t-Government implementation by discussing the key factors found in the literature that may influence interoperability required for t-Government implementation. It assigns these factors into four thematic classifications based on an institutional theory lens: technological, organisational, political and social. It also presents a number of formulated hypotheses and proposes a research model.

Chapter 5: Research Methodology (data theory). This chapter introduces the research methodology by presenting an overview of different paradigms and approaches to select a suitable research methodology. The mixed-methods approach is discussed, emphasising the exploratory-sequential-methods methodology selected for this research to answer the research questions. The chapter also presents the data collection methods, procedures and analysis, as well as reliability and validity verifications.

Chapter 6: Qualitative Analysis (data theory). This chapter presents an analysis of the qualitative data obtained using interviews, along with documentation. It aims to refine the proposed model and the hypotheses developed from the literature review. The qualitative data are then analysed using thematic analysis procedures.

Chapter 7 Quantitative Analysis (data theory). This chapter presents the results and analysis of the quantitative data. It discusses the procedures undertaken to analyse the quantitative data and reports the quantitative study results. The chapter begins with an overview of the data analysis procedures conducted in this research and the scale reliability and validity tests. The chapter then explains how the raw quantitative data were prepared for structural equation modelling (SEM) analysis. The chapter also demonstrates how the data were analysed using exploratory factor

analysis (EFA), confirmatory factor analysis (CFA) and SEM. Finally, the effects of moderators on the relationships among the proposed model elements are presented.

Chapter 8: Discussion (novel contribution). This chapter outlines the research questions and how the answers were determined. It also presents a revised model for factors influencing the interoperability level required for t-Government implementation in the Saudi Arabian context by merging the quantitative and qualitative data findings with the literature review findings.

Chapter 9: Conclusion (novel contribution). This chapter summarises the research findings, discusses how the aims and objectives have been met, examines the research's contribution to the body of e-Government research and discusses the research's implications and the limitations. Possible directions for further research are also presented.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter will present and identify the important issues existing in e-Government interoperability and t-Government implementation. It will review the literature on t-Government from academics and researchers. Section 2.2 outlines the background of e-Government concepts and definitions. Sections 2.3 and 2.4 examine e-Government categories, also discussing e-Government stages. Sections 2.5 to 2.7 continue with a literature review of the issues related to achieving t-Government, along with existing international interoperability and other frameworks, related theories and models, to identify the most appropriate theoretical approach. Sections 2.8 and 2.9 discuss the proposed conceptual model using a combination of relevant theories and models. Finally, Section 2.10 presents a summary of this chapter.

2.2 e-Government Concepts and Definitions

The term 'e-Government' emerged in the late 1990s (Grönlund & Horan, 2005). e-Government is vital for increasing the effectiveness of government processes and services. Many definitions of e-Government exist, due to different expert opinions regarding the concept; no common definition enjoys broad acceptance (Gottschalk, 2009a). For example, the OECD (2003) defines e-Government from a technological perspective, as making use of ICT, particularly the internet, to achieve better government. The UN (2008) defines e-Government as using the internet and the world-wide-web to deliver government information and services to citizens. From a political perspective, Seifert and Petersen (2002) define e-Government as a solution for increasing citizens' communication with government organisations, so they can achieve political trust. From organisational perspective, the WB (2011) defines e-Government as using ICT to increase government efficiency, effectiveness, transparency and accountability. From a social perspective, Margetts and Dunleavy (2002) define e-Government as making government activities, internal processes, policy development and services available electronically to citizens. However, this research uses this definition of e-Government: it is the use of ICT in the public sector to provide a citizen centric, single-entry point for all government services (Pardo & Tayi, 2007). This definition incorporates technical, organisational, political and social aspects, rather than focusing on one aspect alone. Governments must challenge traditional cooperation strategies, and improve their technical, semantic and governance capabilities, as well as develop organisational interoperability within the political and social context to achieve efficient operations and services (Solli-Sather, 2011).

Building on from this definition (Pardo & Tayi, 2007), we can draw the conceptual rule for this research. It must address the entire interoperability challenge for implementing t-Government. It must also consider technical factors such as data semantics and process standardisation, as well

as non-technical factors such as organisational, legal, political and social issues (Novakouski & Lewis, 2012).

2.3 e-Government Categories

Many studies have explored the various types of e-Government activity and the interactions between different sectors of government, business, citizens and government employees (Evans & Yen, 2006; Heeks, 1999; Kaaya, 2010; Seifert, 2003). Different interactional dimensions—such as government-to-citizen (G2C), government-to-business (G2B), government-to-employee (G2E), and government –to-government (G2G)—have been researched. All these dimensions enable e-Government transformation as a whole (Bonham, Seifert, & Thorson, 2001; Hermana & Silfianti, 2011; Reynolds, 2001; Seifert, 2003; Seifert & Petersen, 2002; Shan, Wang, Wang, Hao, & Hua, 2011; Siau & Long, 2009). To understand the role of e-Government implementation process, e-Government categories are discussed in the following sub-sections.

2.3.1 Government to Citizen

Government to Citizen (G2C) encompasses the interaction between a government and its citizens (Evans & Yen, 2006; Lee, 2005; Torres, Pina, & Acerete, 2005). G2C establishes online public services, using electronic service delivery for information and communication (Fang, 2002); some observers see this as the primary goal of e-Government (Al-Khouri & Bal, 2007; Sandoval-Almazan & Gil-Garcia, 2012; Siau & Long, 2009). One example of services offered by a government can be found at the Saudi Arabian e-Government website (http://www.saudi.gov.sa/). G2C includes not only public services delivery, but also citizens' participation in the government decision-making process (Kaaya, 2010). e-Services should be citizen- and not agency-focused. An example of this is the facility that allows citizens to express their opinions on public policies using online tools. By implementing G2C interaction, citizens can locate information quickly and easily.

2.3.2 Government to Business

Government to Business (G2B) involves government and business interaction. G2B initiatives focus on improving the efficiency and effectiveness of service delivery to businesses by providing convenient methods such as e-procurement and developing an e-marketplace for government purchases. G2B initiatives also conduct government procurement tenders electronically for exchanging information and commodities (Fang, 2002). G2B improves business sector quality by reducing costs through improved procurement practices or using ICT to offer a number of services, such as sales and procurement (Evans & Yen, 2006; Seifert, 2003; Siau & Long, 2009). According to Seifert (2003), two primary forces drive the G2B sector. First is the business community, which uses electronic methods to conduct various activities such as procurement, sales and hiring. Second is the growing demand by policy makers for cost cutting and more efficient procurement methods. One example of the services offered by governments is the Saudi Arabian commerce ministry's

commercial register renewal facility. This allows private sector operators to apply for an electronically reserved trade name renewal without having to visit the ministry building. This service benefits clients in different ways: it improves efficiency, speeds up order processing and reduces paper work.

2.3.3 Government to Employee

Government to Employee (G2E) involves interactions between government and its employees. G2E facilitates internal communication with governmental employees, enabling them to lodge e-applications for employment positions and use paperless processing systems in an 'e-office' (Fang, 2002). G2E provides self-training for employees. This empowers employees to gain any information they require to simplify internal government processes so that citizens experience faster and more effective services (Carbo & Williams, 2004; Sharma & Gupta, 2004; Siau & Long, 2009). One example of G2E is the intranet used to provide information to employees. Another is the online transaction system through which employees can apply for leave, if their government organisation has incorporated the correct technological architecture (Belanger, 2006a; Turban & King, 2011).

2.3.4 Government to Government

Government to Government (G2G) involves the interaction between two government organisations (Scholl & Klischewski, 2007). G2G is vital, and is the backbone of e-Government projects (Seifert, 2003). It provides cooperation and communication between government organisations using a large database, which affects efficiency and effectiveness (Fung, 2002). G2G initiatives allow a government to eliminate redundancy and duplication (Evans & Yen, 2006; UN, 2008; Siau & Long, 2009; Suh, Park, & Jeon, 2010). This is done by delivering services to each other, sharing databases and resources to enhance e-service efficiency and effectiveness (Hamza, Sehl, Egide, & Diane, 2011; Lee, 2005; Torres et al., 2005). Government organisations use G2G initiatives to extract and share useful knowledge, thus reducing costs, speeding up communication and improving strategic decision-making processes (Al-Rashidi, 2013; Klischewski, 2011). Examples of G2G capabilities used in e-Government include e-identity, e-security services, e-document management and process management services (Alsaghier, Ford, Nguyen, & Hexel, 2011).

This section has examined the four types of e-Government initiative: G2C, G2B, G2E and G2G. These types can be further categorised as external (G2C and G2B) and internal (G2E and G2G). External services are important to increase e-Government adoption, while internal services are vital to understand the implementation process (Al-Shafi, 2009). Reddick (2005) notes that two perspectives demonstrate the implementation and adoption of e-Government. These are the supply-side, which examines e-Government offerings (internal factors), and the demand-side, which examines citizen interaction with e-Government (external factors). The supply-side includes factors related to public service sources at all levels: local, state and national (G2G). It includes factors that influence government organisations' implementation of e-Government services and applications (Holden, Norris, & Fletcher, 2003; Moon, 2002). Conversely, the demand-side includes factors

related to the end users of public services: citizens or companies (G2C, G2B) (Reddick, 2005). It includes factors that influence end users' adoption and use of e-Government services and applications (Carter & Belanger, 2004). Al-Rashidi (2013) argues that implementation frameworks are required for e-Government at all stages to identify internal factors. He also states that few studies exist in the literature examining e-Government implementation. Elsheikh (2012) also notes that e-Government service implementation has not yet reached an advanced level, despite the widespread implementation of e-Government at local and national levels. Governments around the world still face the problem of how to reach the appropriate development level. As such, many researchers and practitioners in this field focus on the supply-side of e-Government implementation. Therefore (as discussed in Chapter 1), this thesis is concerned with implementing interoperability between government organisations to achieve t-Government. It focuses only on the factors affecting interoperability between government organisations, on internal categories and in particular, on G2G interaction. This represents the relationship between governments collaborating to achieve t-Government, and includes central G2G elements that represent the relationship between a central coordinating or consultative body (Lam, 2005a). Figure 2.1 details the internal and external categories of e-Government initiatives.

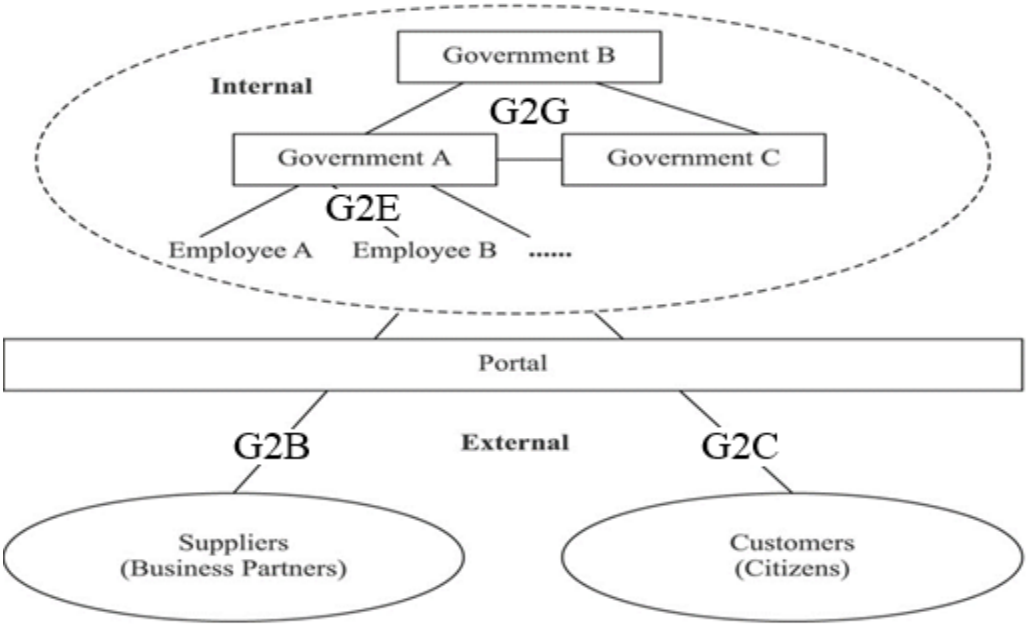

Figure 2.1: e-Government Interaction Dimensions (Siau and Long (2009))

2.4 e-Government Stages

Many governments around the world have adopted e-Government to provide better services for their citizens. Models have been used as tools to describe and evaluate e-Government. Models of e-Government stages in the literature describe how e-Government should be implemented, either from

individual academic researchers or institutions. Researchers argue that e-Government usually develops through a number of stages before providing improved interaction and online services. These models approach e-Government from different angles and foci. Some researchers claim that only three stages are necessary (Howard, 2001); others four (Baum & Di Maio, 2000; Chandler & Emanuels, 2002; Coursey & Norris, 2008; Layne & Lee, 2001; Murphy, 2005; UN, 2008). Still others claim five or even six stages are required (Belanger, 2006b; Deloitte, 2000; Hiller & Belanger, 2001; Moon, 2002). No agreement exists regarding the number of stages required to develop e-Government during its lifecycle of moving from one to another stage (Siau & Long, 2005). e-Government stages begin with a basic web-based service, developing to a more advanced integrated web presence and t-Government. The e-Government development stages in these models can differ in terms of the approach and aspects of development, including technological, organisational, political and social aspects.

Howard (2001) proposes a three-stage model—publish, interact and transact—focusing on the technological aspect of internet capabilities and characteristics to move government from one stage to another. Layne and Lee (2001) propose the most commonly and widely known model. This consists of four stages: cataloguing, transaction, vertical integration and horizontal integration. The cataloguing stage provides a basic and static website offering online information. The transaction stage enables users to conduct simple transactions online, such as paying fines or renewing licences. The vertical integration stage provides common information about each citizen to reduce information redundancies by integrating local and central agencies with the same function. Horizontal integration provides the 'one-stop portal' that completes the e-Government project by integrating various functions from different isolated systems. Chandler and Emanuels (2002) similarly propose a four-stage model that incorporates information, interaction, transaction and integration. Moon (2002) extends Layne and Lee's (2001) model by adding a new stage, known as 'political participation'. Hiller and Belanger (2001) have also extended Layne and Lee's (2001) model by adding the fifth stage of a fully integrated web presence.

A UN (2008) report proposes four e-Government development stages: emerging information services, enhanced information services, transactional services and connected services. Emerging information services provide online static information for the public. Enhanced information services provide online dynamic and specialised data, with information updated systematically. The transactional service provides two-way communication and interaction with citizens, such as downloading and uploading forms, filing taxes online or applying for certificates, licences and permits. Connected services provide a coherent seamless service to users through integration across the different levels and functions of government systems.

Baum and Di Maio (2000) report on the Gartner Group's proposed four-stage model for e-Government: web presence, interaction, transaction and transformation. The web presence stage

involves a website containing basic information for the public. The interaction stage allows users to communicate and interact with government through web pages, send emails and download documents. In the transaction stage, customers and businesses can complete entire transactions through the internet, such as licence applications. The transformation stage provides a more efficient, integrated, unified and personalised service that differs from current operational processes. Similarly, Balutis (2001), Coursey and Norris (2008) and Murphy (2005) propose four e-Government model stages: the web presence, interactivity, transaction and transformation stages.

Siau and Long (2005) have developed an e-Government model with the following five stages: web presence, interaction, transaction, transformation and e-democracy. The first three stages automate and digitalise current operational processes, while the other two stages transform the way that governments provide services. Lee (2010) has also extended Siau and Long's (2005) model. Lee's (2010) extended model consists of five stages: presenting, assimilating, reforming, morphing and e-governance. This can be further divided into two perspectives—citizen/service and operation/technology—highlighting the different aspects inherent in each stage.

Deloitte (2000) proposes a six-stage model that incorporates information publishing, official two-way transactions, multi-purpose portals, portal personalisation, clustering of common services, and full integration and enterprise transformation.

These models of e-Government stages share similarities. Each model begins with an early stage that requires government organisations to place basic information for citizens online and in a one-way manner that means it does not need any interaction from the customer, such as publishing instructions to complete a specific service or provide an address (Reddick, 2005). Citizens cannot obtain full service in this stage (Al-Rashidi, 2013). However, government organisations can determine how successful their services actually are, and this can assist governments reach the final stage of t-Government (Al-Sebie & Irani, 2005; Moon, 2002; West, 2004). In this final stage, users can obtain government services and information online from a single access point (Gupta and Jana, 2003; Layne and Lee, 2001). Reaching this stage is difficult, as e-Government is a significant project requiring all governments to work together when providing any single e-service (Ebrahim & Irani, 2005; Irani, Al-Sebie, & Elliman, 2006).

This current study is not concerned with identifying the number of e-Government evolutionary stages. Instead, it is interested in how the final stage can be implemented. Many researchers, such as Al-Rashidi (2013), Holden et al. (2003), Tat-Kei Ho (2002), argue that e-Government progress is not necessarily linear; some governments may transition directly to the advanced stages of integration and transformation. Governments do not think there is a need to remain in the early stages for long, or they think that certain stages may be avoided in development. Siau and Long (2005) also argue that each country has its own e-Government strategy and specifications, and do not necessarily take

the same path as others. Governments also argue that some stages might be avoided (Andersen & Henriksen, 2006).

Another point evident from the discussion on e-Government stages is that different models use different names for the stages. According to Weerakkody and Dhillon (2008), many academics and researchers refer to the final e-Government stage as connected services (UN, 2008), horizontal integration (Layne & Lee, 2001), transforming government (Balutis, 2001; Murphy, 2005), fully integrated (Alsaghier et al., 2011), single point of access (Irani, Al-Sebie, & Elliman, 2006) and transformational (Baum & Di Maio, 2000; Coursey & Norris, 2008; UN, 2008). However, most researchers agree on this final stage's purpose: that it leads to integrated government services and information from a single access point (Al-Sebie & Irani, 2005). This thesis follows the interpretation of e-Government evolution used by Balutis (2001), Baum and Di Maio (2000), Coursey and Norris (2008) and Murphy (2005), who describe the final stage as 'transformation and transforming government'. Additionally, Layne and Lee (2001) refine 'transform' into two further stages: 'vertical integration' and 'horizontal integration'. The name 'transformational government' relates particularly well to the Saudi e-Government program (Yesser) agenda (Yesser, 2015).

The purpose of this thesis is to determine how this final stage can be implemented and how government organisations can work together, function with interoperability and achieve t-Government. Table 2.1 shows the different e-Government development stages and locates the transformation stage within the different models.

Table 2.1: Different Stages of e-Government Development

Stage1	Stage 2	Stage 3	Stage4	References
Web presence	Interaction	Transaction	Transformation	Baum & Di Maio (2000)
Web presence	Interactivity	Transactional	Transformation	Coursey & Norris (2008)
Emerging	Enhanced	Transaction	Transforming	Balutis (2001)
Web presence	Interactivity	Transactional	Transforming	Murphy (2005)

2.5 Motivation for interoperability and t-Government Implementation

As discussed earlier, the transformational, or t-Government, phase of providing online government services is the most advanced level; thus, it is also the most difficult to achieve. t-Government is perceived as a dramatic change in the way government services are provided, both internally and externally. John (2012) states that t-Government can be defined as a managed process of ICT-enabled change, which places the needs of citizens and companies at the centre of the process and achieves significant improvements in government efficiency and effectiveness. This transformational stage involves re-engineering the provision of government services to create a single point of contact

for citizens and businesses, ensuring government operations are transparent and increasingly efficient (Affisco & Soliman, 2006; Duggan, 2008; Weerakkody & Dhillon, 2008; Irani et al., 2007).

As discussed earlier, to realise the aforementioned situation and to implement t-Government, government organisations must create interoperability between e-Government systems. This implementation is defined as the final stage in the innovation process (Andersen & Henriksen, 2006). According to Gouscos et al. (2007), t-Government has traditionally been based on interoperability. Pardo et al. (2011) also mention that interoperability is a means and not an end in itself. In contrast, Watmore (Irani et al., p. 2007) says,'t-Government is an end in itself and not a means to an end'.

Government activities and systems must be integrated seamlessly and reliably; all kinds of interoperability should be considered (Soares, 2010). Interoperability is necessary to improve efficiency, reduce costs and enable government departments to respond to public policy developments. Interoperability contributes to the availability and accessibility of government information and to transactions with the government. To create interoperability, data must flow through networks beyond the limits of a single government department, as well as through public organisations, citizens and businesses, providing a number of specific benefits (Australian Government Information Management Office [AGIMO], 2006). See Figure 2.2.

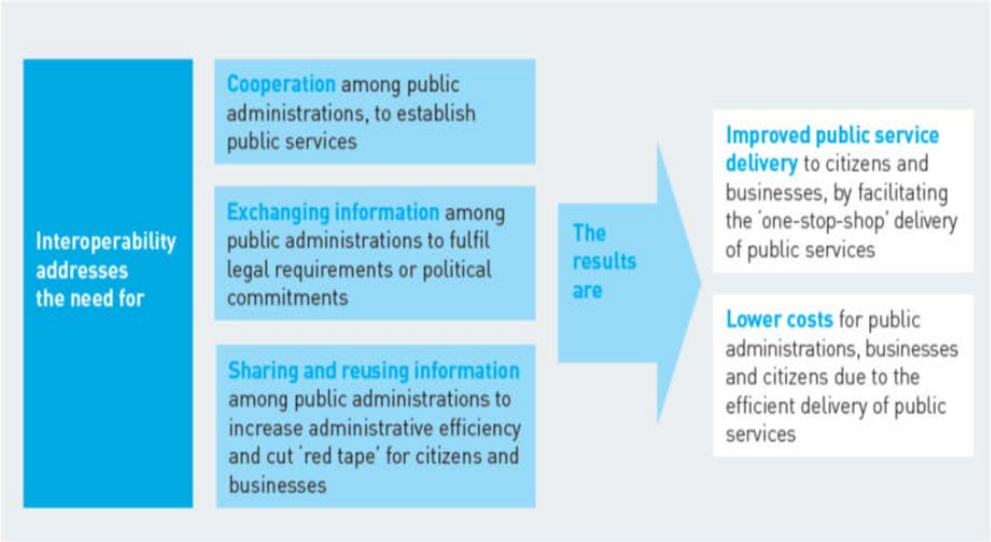

Figure 2.2: Towards Interoperability for European Public Services (ISA (2011))

Interoperability enables systems to share information and functionality with other systems, based on common standards. It creates a level playing field for predictable and efficient integration, but is itself insufficient to create system integration. Interoperability is better suited to environments that are multi-jurisdictional, require cross-boundary connectivity, and are open to external inputs and actions. Government interoperability provides horizontal and vertical cross-service providers. It results in a single government perspective presented to citizens, instead of fragmented departments, and allows

citizens to access government services from single access points (Lallana, 2008; Silva, 2009; Van Veenstra et al., 2011). Clearly, interoperability is a key feature of t-Government implementation. Table 2.2 provides definitions of interoperability from various sources.

Table 2.2: Different Definitions of Interoperability

Definition	Source	interoperability Type and Origin
'To be interoperable, one should actively be engaged in the ongoing process of ensuring that the systems, procedures and culture of an organisation are managed in such a way as to maximise opportunities for exchange and re-use of information, whether internally or externally'.	Miller (2000)	Technical, Organisational, Semantic, Academic
Interoperability is more than getting bits and bytes to flow properly– fundamentally, the goal of interoperability is the more difficult problem of getting people and organisations to share information in an information technology environment.	Landsbergen & Wolken (2001)	Academic, e-Government, Technical, Organisational.
Interoperability means the ability of ICT systems and of the business processes they support to exchange data and to enable the sharing of information and knowledge.	IDABC (2004)	Technical, Organisational, Semantic
Interoperability describes the ability of all different pieces of equipment to work together to deliver seamless services in a, standardised and efficient manner across different IT systems.	AGIMO (2006)	Technical, Information, Organisational
Interoperability is the capability for direct machine-to-machine interaction in business-to-government (B2G) as well as government-to-government (G2G).	Scholl and Klischewski (2007)	Technical, Organisational, Semantic
Interoperability is the ability of government organisations to share information and integrate information and businesses by use of common standards	SSO (2008)	Technical, Semantic, e-Government

Interoperability's main advantages include the cost savings. It induces by allowing the reuse of existing resources and capabilities. In addition, it creates systems that are easier to use by integrating them. It increases flexibility by allowing the interchange of components, and it assists in developing new capabilities by creating new functions out of existing ones (Alshetewi et al., 2012;

Jeff, 2008). The next section discusses some national interoperability frameworks and their dimensions.

2.6 International Interoperability Frameworks and Enterprise Architectures

e-Government interoperability is the most important issue of advanced e-Government; achieving interoperability usually requires adopting a Government Interoperability Framework (GIF) or National Enterprise Architecture (NEA) (Lallana, 2008). These are standards and guidelines through which a government can advise its agencies, citizens and partners on how to interact with each other.

2.6.1 Government Interoperability Frameworks

GIF includes the basic technical specifications that all agencies relevant to e-Government strategy implementation should adopt (UN, 2008). According to Botterman (2008), the interoperability framework is a set of principles, policies, criteria, specifications, standards, protocols and procedures that assist the e-Government program developers to design, acquire and implement systems, data, semantics, business processes and policies. These are interconnected seamlessly and flexibly, enabling government departments to provide services to their citizens, businesses and other government departments both efficiently and effectively.

To deliver government interoperability, three distinct interoperability aspects must be considered. The first is organisational interoperability, which is primarily concerned with defining business goals, modelling business processes, and considering the best way of encouraging collaboration between government departments (that often have different processes and internal structures) needing to exchange information. The second is semantic or information interoperability. This is concerned with understanding the precise meaning of information exchanged by any application. In essence, the information from one system must make sense if it is used by another system. Finally, technical interoperability requires consideration of the technical issues involved in linking hardware, software and operating systems to transfer information (IDABC, 2004; AGIMO, 2006; Scholl & Klischewski, 2007; SSO, 2008). These three aspects are illustrated in Figure 2.3 below.

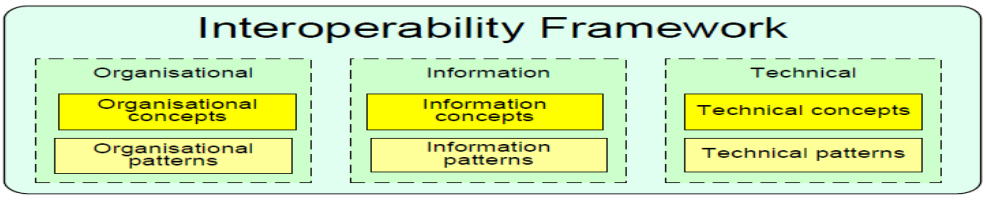

Figure 2.3: The Interoperability Framework (Nehta (2007))

Governments in different countries are establishing different frameworks and enterprise architecture to implement interoperability between departments. This section will examine the effort made by

different countries in different areas, including: the United Kingdom (UK) e-Government interoperability framework (e-GIF); the Australian government technical interoperability framework (AGIF); the European interoperability framework for pan-European e-Government services (EIF); the Estonian interoperability framework (EstIF); the Hong Kong interoperability framework (HKSARG); the Danish interoperability framework (DIF); and the New Zealand e-Government interoperability framework (e-GIF).

2.6.1.1 UK e-Government Interoperability Framework

The UK's interoperability framework was one of the first to emerge. The five main outcomes of this project include the framework itself, a technical standards catalogue, e-Government metadata standards (e-GMS), long-term initiatives such as guides, toolkits, working groups and related activities, and a centrally agreed information schema repository supported through the GovTalk website 'www.gov.uk'. The UK government's e-GIF defines the technical policies and specifications governing information flows across different UK government departments. These cover interconnectivity, data integration, content management metadata and services access (Cabinet Office, 2005).

2.6.1.2 Australian Government Interoperability Framework

The Australian government interoperability framework addresses interoperability information (AGIMO, 2006), business processes (AGIMO, 2007) and technical dimensions (AGIMO, 2005). The information dimension comprises information and process elements that convey business meaning. The elements of this dimension include reference taxonomies and processes, code lists, data dictionaries and industry-specific libraries (AGIMO, 2006). The business process dimension comprises legal, commercial, business and political bodies, along with organisational concerns that facilitate interaction between government agencies (AGIMO, 2007). The technical dimension comprises technology standards such as transport and messaging protocols, security standards, registry and discovery standards, extensible mark-up language (XML), syntax libraries, and service and process description languages to deliver content across the communication and ICT infrastructure (AGIMO, 2005).

2.6.1.3 European Interoperability Framework for Pan-European e-Government Services

The EIF for European public services was published in 2004. It establishes an interoperability framework for the European Union (EU), based on the French, German and UK frameworks (The Interoperable Delivery of European e-Government Services to Public Administrations, Businesses and Citizens [IDABC], 2004). Instead of delivering interoperability, the EIP enables a pan-European interoperability. It supports e-Government service delivery across the EU through standardising information content, as well as technical policies and specifications (Ray, 2009). The framework defines three interoperability domains: organisational, semantic and technical. Organisational

interoperability deals with defining business goals, modelling business processes and instigating the collaboration of administrations wishing to exchange information, but who may have different internal structures and processes. Semantic interoperability is concerned with ensuring that the precise meaning of exchanged information is comprehensible when accessed through applications not initially developed for this purpose. Technical interoperability covers the technical issues of linking computer systems and services. A second, updated version of the EIF adds legal interoperability and political context layers. Legal interoperability deals with relevant legislation relating to data exchange, including data protection legislation when establishing a European public service. The political context aspect relates to compatible visions, aligned priorities and focused objectives (IDABC, 2010).

2.6.1.4 The Estonian IT Interoperability Framework

The EstIF framework is a set of standards and guidelines that ensures service provision for public administration institutions, enterprises and citizens, both in the national and European contexts. The EstIF also reflects the EU's interoperability strategy and framework principles. It discusses legal, organisational, semantic and technical interoperability (RICO, 2011).

2.6.1.5 The Hong Kong Interoperability Framework

The HKSARG framework supports the government's strategy of providing Citizen Centricity combined services by facilitating interoperability in technical systems between government departments, as well as between government systems and those used by the public (including citizens and businesses). The HKSARG framework covers both business and technical aspects. Business aspects cover interaction modalities between the entities, the legal consequences of such interactions, the information exchanged in such interactions and the semantic aspects of that information. Technical aspects cover application integration, interaction and security. The framework helps two parties determine specifications more effectively. The framework provides a set of technical and data standards that define the interface across different systems, guidelines for project teams to determine business-oriented specifications and standards documents that define infrastructure architecture, conventions and procedures (OGCIO, 2015).

2.6.1.6 Danish Interoperability Framework

The DIF is intended for public agencies as they develop IT plans and projects. It provides three standards categories to be followed by government departments: technical, data and process. Process standards are concerned with how and where information is sent and processed—and how it is handled. Technical standards comprise technical aspects such as data integration, interconnectivity and user interfaces. Data standards are concerned with unambiguous definition of the terms exchanged between IT systems and their components. The DIF has been compiled in accordance with the EIF and is seen to supplement this initiative. It offers a set of policies, technical standards and guidelines that outlines the Danish government's policy on how to achieve

interoperability at any level of public administration, including authorities that request interoperability with other national authorities, or within the EU (NITAC, 2006).

2.6.1.7 New Zealand e-Government Interoperability Framework

The e-GIF provides a rigorous standards compliance model that manages the development and application of e-GIF standards over time. This framework categorises standards using a 'layer model'. The layers are network, data integration, business services, and access and presentation. The framework also contains standards related to security, web services, best practice, and e-Government services, which according to the framework, is applicable to all of the model's elements (SSO, 2008).

2.6.2 Enterprise Architecture

Enterprise Architecture (EA) is another approach used to achieve e-Government interoperability. It supports planning and decision making through documentation and information that provides an abstracted view of an enterprise at various levels of scope and detail. It includes principles to help agencies eliminate waste and duplication, increase shared services, close performance gaps and promote engagement among government, industry and citizens (Charalabidis, Lampathaki, Askounis, & Stassis, 2007). Two examples of this approach include the German Standards and Architectures for e-Government Applications (SAGA) and the United States of America's (US) Federal Enterprise Architecture (FEA).

2.6.2.1 The German Standards and Architectures for e-Government Applications

The German SAGA uses a framework that specifies the various architectures and standards for national government use. This framework allows citizens, businesses and governments to handle matters more quickly and efficiently, enabling many different applications to integrate in the future and remain accessible for all stakeholders (KBSt, 2011).

2.6.2.2 US Federal Enterprise Architecture

The US FEA is an EA rather than an interoperability framework, as implied by its name. FEAs consist of reference models that develop a common taxonomy and ontology for describing IT resources for the US Federal Government. These models include the performance reference, business reference, service component reference, data reference and technical reference models. An FEA facilitates cross-agency analysis and identifies duplicated investments, gaps and opportunities for collaboration within and across agencies. It also accelerates agency business transformation and new technology enablement by providing standardisation, analysis and reporting tools, an enterprise roadmap, and a repeatable architecture project method that is more agile and useful. It produces authoritative information for policy makers, planners, decision makers and management (OMB, 2013).

2.6.3 Analysis of International Interoperability Frameworks and Enterprise Architectures

To summarise, several governments have declared that e-Government interoperability is important, developing several frameworks to encourage interoperability between government organisations. These frameworks differ from country to country. Some countries propose frameworks that operate with three layers, such as organisational, information and technical. Some have developed frameworks based on two aspects: business and technical. Some frameworks define a set of standards and guidelines that establish a common language to ensure the coherent flow of information across systems. Other countries have adopted architecture frameworks for achieving e-Government interoperability by stressing the planning and management features of all information system assets and their architecture, together with organisational structures and processes (Zachman, 1987, 1999).

However, governments still do not have a comprehensive set of interoperability frameworks (CSTransform, 2009; Ramaswamy, 2009). Adopting GIFs and EAs would be insufficient, as many factors are involved in the success of e-Government interoperability, such as organisational, technological, political and social factors. In fact, the successful implementation of e-Government interoperability needs a more practical and readily implemented approach to investigate factors critical to interoperability (Saekow, 2009). Malinauskienė (2013) notes that both EA and interoperability frameworks are complex endeavours that face various bureaucratic challenges. Resistance to compliance with recommended standards and guidelines often exist. In addition, Nilsson (2008) argues that national interoperability frameworks require strategic alignment; further research into the handling of interoperability implementation is needed.

Therefore, this thesis will analyse the factors that affect e-Government interoperability and develop a conceptual model for implementing t-Government by providing a more detailed and descriptive level of analysis of the relevant capabilities (technical, organisational, political and social factors). Novakouski & Lewis (2012) argue for the need to consider technical factors such as data semantics and process standardisation, as well as non-technical factors such as legal, political and social issues.

Al-Khouri (2013) states that governments must agree to and follow an EIF that facilitates business across national borders. Governments must design and maintain their own e-GIF, one that considers cultural, political and other technical contexts. Due to its logical and universal structure, an EIF will be used as the baseline for the discussions developed in this research. This thesis endorses the first version of EIF.

The framework defines three domains of interoperability: organisational, semantic and technical. Organisational interoperability deals with defining business goals, modelling business processes and instigating the collaboration of administrations that wish to exchange information, but who may have

different internal structures and processes. It addresses user-community requirements by making services available, easily identifiable, accessible and user-oriented. Semantic interoperability is concerned with ensuring that the precise meaning of exchanged information is understandable by an application initially developed for this purpose. It enables systems to combine received information with other information resources and to process it meaningfully. Therefore, it is a prerequisite for the front-end multi-lingual delivery of services to users. Technical interoperability covers the technical issues of linking computer systems and services. It includes key aspects such as open interfaces, interconnection services and data (IDABC, 2004) (see Figure 2.4).

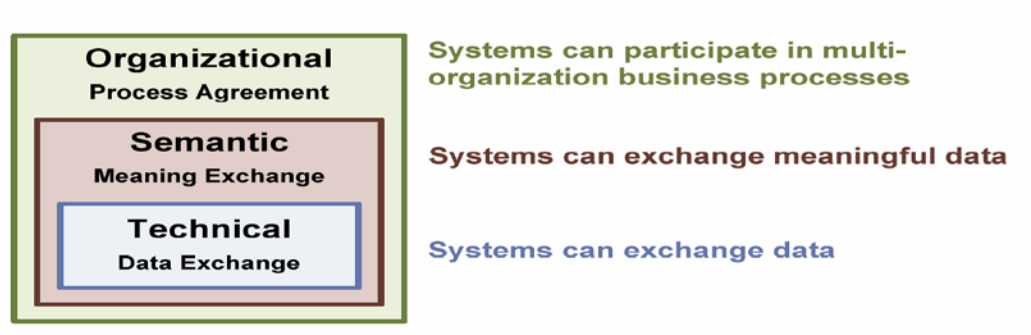

Figure 2.4: e-Government Interoperability Layers (IDABC (2004))

2.7 Information Sharing, Information Integration, Government to Government, interoperability and t-Government Models

As discussed earlier, e-Government interoperability is an increasingly global phenomenon. It is a highly beneficial endeavour that has engaged the attention of many government organisations (including e-Government officials, policy makers, politicians and citizens) around the world. To understand interoperability implementation in the public sector, it is essential to review e-Government's evolution and development. Therefore, it is essential to focus on reviewing the e-Government interoperability-related literature on integration, interoperation, interoperability and information sharing for four primary strands. These strands are Enterprise Architecture (EA), capability maturity, information sharing and information systems (Pardo et al., 2011).

As discussed earlier, EA is an approach that aims to achieve e-Government interoperability. It refers to aligning IT with business processes and an organisation's goals with the enterprise's applications and systems by developing a comprehensive description of the enterprise (Schekkerman, 2004). EA is related to large organisations with large portfolios of applications and that deal with complexity across organisations and applications (Lam, 2005a; Pardo et al., 2011).

The capability maturity model provides a common framework within which policy developers and implementation planners can identify and describe the capability required for an organisation to deliver services (AGIMO, 2009a). Maturity models help organisations understand what capability

must be created to achieve their goals. The technical maturity models reveal the increasing demand to develop organisational, political and social aspects in addition to basic technical capabilities, assisting government organisations with decision-making processes, management, implementation and evaluation (Pardo et al., 2011).

Information systems interoperability is also gaining support from an information systems perspective. Ray, Gulla, Gupta and Dash (2009) argue that the interoperability of information systems is essential to provide integrated government services. Research is increasingly identifying interoperability problems across information systems, not only from technological constraints, but also from organisational, social and political constraints (Gottschalk & Solli-Sæther, 2008b; Scholl & Klischewski, 2007). Therefore, the interoperability of information systems and the processes supported by these systems is essential (Klischewski, 2004). Further, information sharing across organisational boundaries is recognised as a core capability of modern information and ICT management in governments (Gil-Garcia, Schneider, Pardo, & Cresswell, 2005).

Information-sharing projects are becoming increasingly important in public organisations. They help governments move from the e-Government presence stage through to the service provision and representative democracy e-Government stage, to the final stage of t-Government (Laskaridis et al., 2007). They improve technical infrastructure, as well as data management. Information-sharing projects can only happen effectively with streamlining. In other words, the more information to be shared, the better the infrastructure needs to be, and vice versa (Scholl, 2005). According to Gil-Garcia et al. (2005), creating ability in and success at information sharing and integration efforts rests in part on organisational and technological compatibility. Numerous studies of e-Government interoperability from the literature are discussed in the following paragraphs.

Dawes (1996) proposes a theoretical model for interagency information sharing through understanding how policy, practice and attitudes interact. He suggests two policy principles—stewardship and usefulness—to promote the benefits and mitigate the risks of information sharing. He argues that due to participation in information-sharing initiatives, organisations recognise how the possible benefits and risks involved will affect their performance in future information-sharing initiatives. Every new sharing participation initiative generates new benefits and risks. These new lessons could be used in the future for a general policy and management framework (see Figure 2.5).

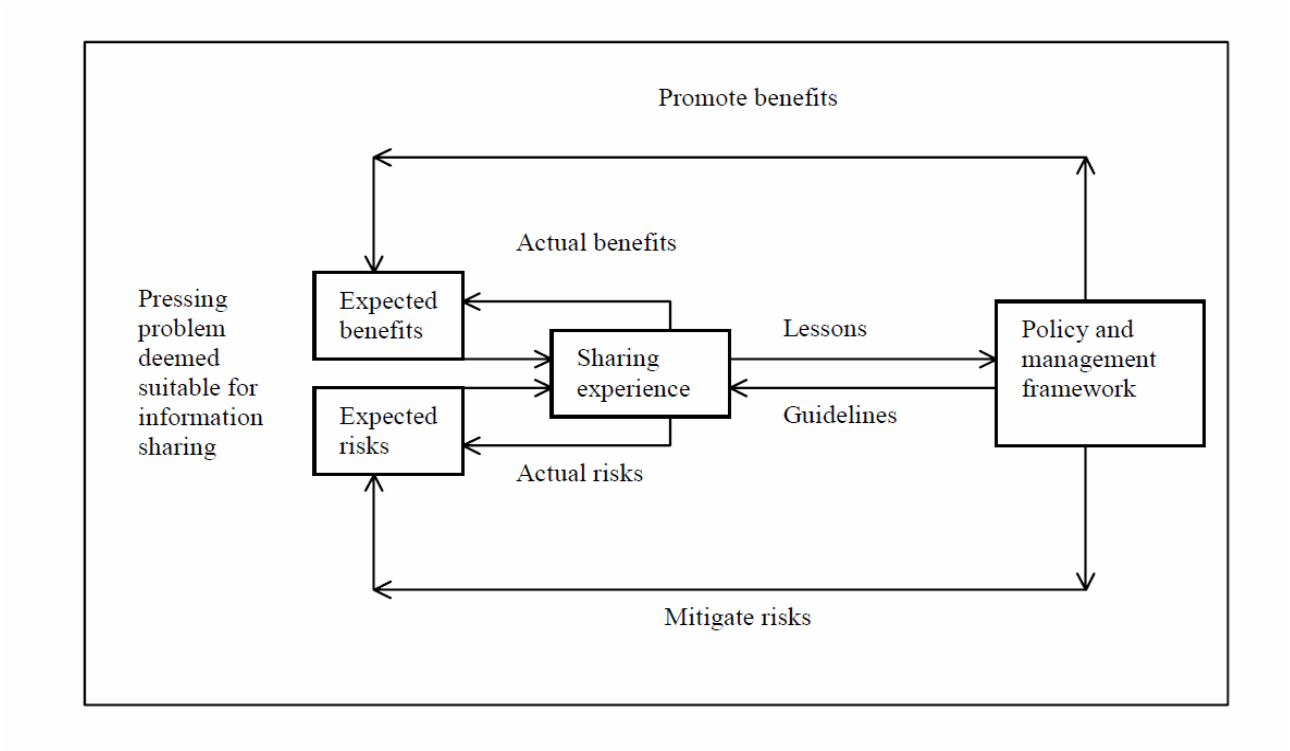

Figure 2.5: Theoretical Model of Interagency Information Sharing (Dawes (1996))

In their three-stages model, Landsbergen Jr and Wolken Jr (2001) extend Dawes's model and use the term 'interoperability'. Their work's fundamental contribution is that it reviews and updates Dawes's model at the interagency information-sharing level. It consists of a theoretical model for information sharing between agencies: this includes infrastructure (technical, metadata, plans for best practice sharing) and synthesising a legal, managerial and policy approach to interoperability. They conclude that governments have not yet achieved the desired result from using ICT. This is due to the lack of interoperability relating to information systems. They classify interoperability barriers into four categories: (1) political, (2) organisational, (3) economic and (4) technical (see Figure 2.6).

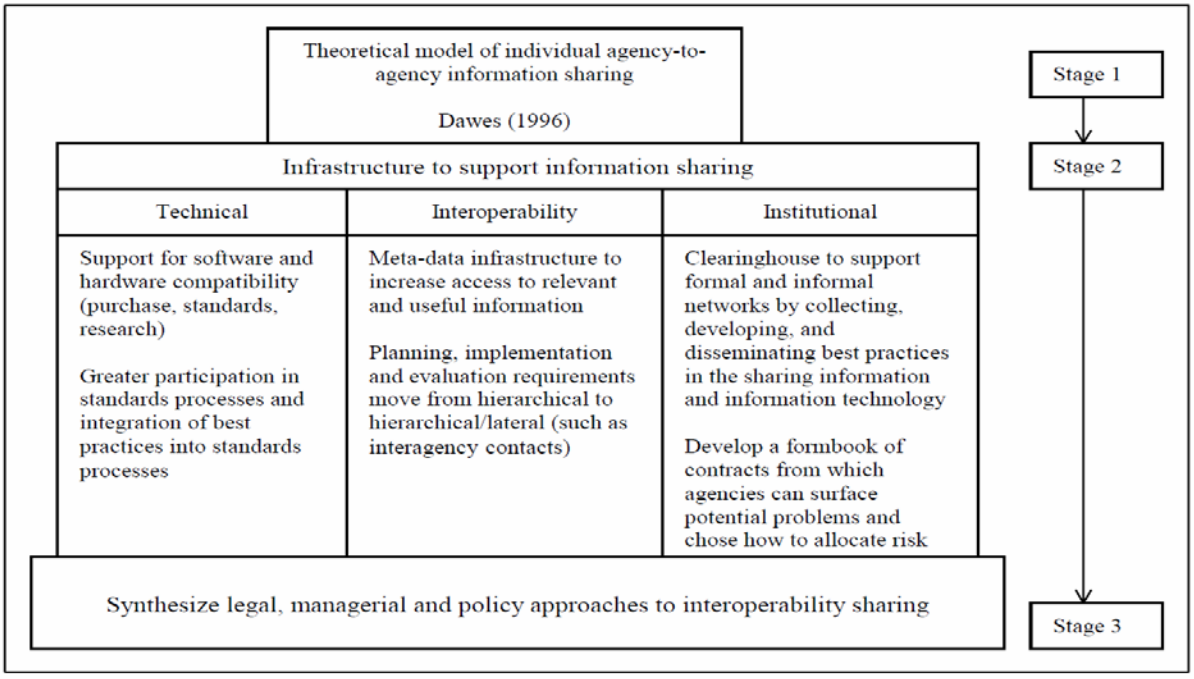

Figure 2.6: Extended Theoretical Model of Interagency Information Sharing (Landsbergen Jr and Wolken Jr (2001))

Akbulut (2003) has extended Dawes's (1996), Landsbergen Jr and Wolken Jr's (2001) studies by synthesising well-established theories, such as diffusion of innovation, critical mass and social exchange. He proposes a framework that includes 14 factors influencing electronic information sharing between government organisations. He classifies these factors into three sharing dimensions: agency, environmental and electronic. He concludes that a number of technological, organisational and environmental factors affect government organisations in electronic information-sharing initiatives (see Figure 2.7).

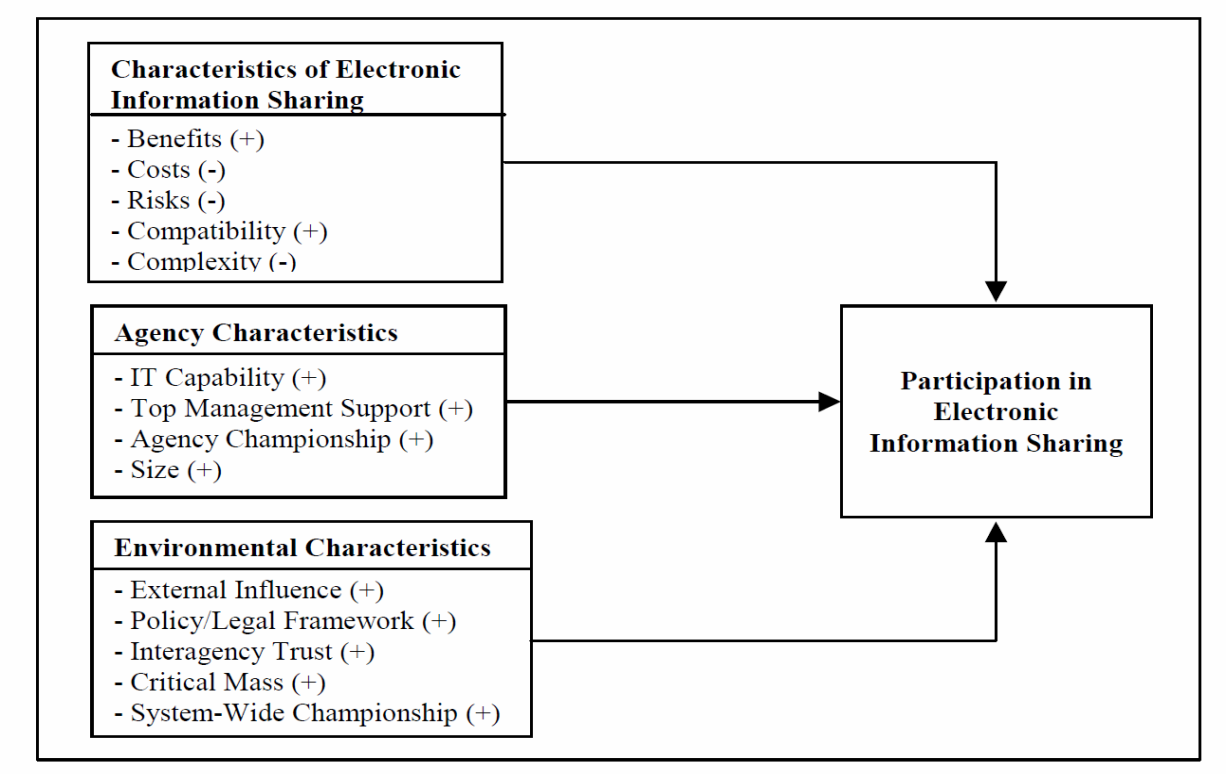

Figure 2.7: Factors Influencing Local Agency Participation in Electronic Information Sharing (Akbulut (2003))

Joia (2004) proposes a framework to implement G2G endeavours successfully by identifying three key success factors (security, organisational culture and training) for this process in public administration agencies (see Figure 2.8).

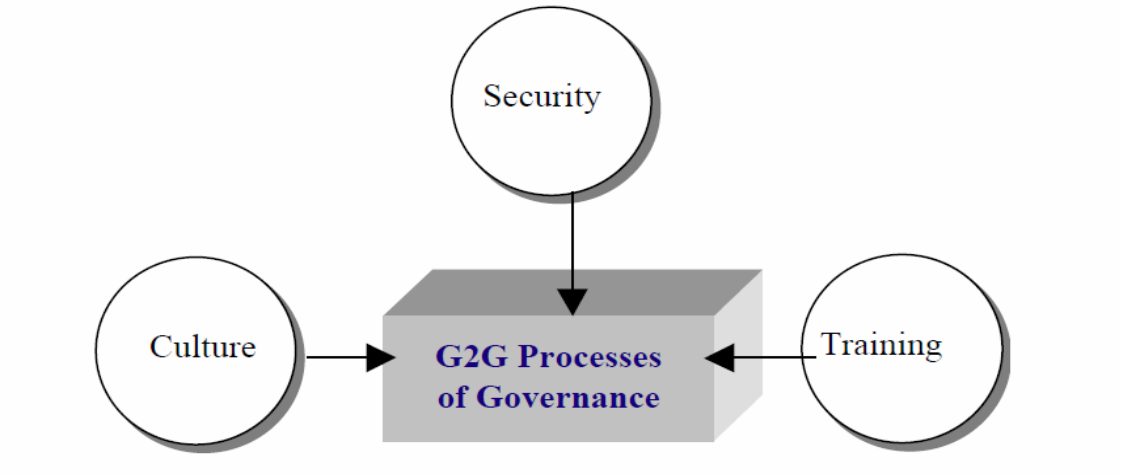

Figure 2.8: Heuristic Framework to Successfully Implement G2G (Joia (2004))

Joia also presents eight barriers that could arise during G2G projects and affect their success, clustering these barriers into three main categories, as shown in Table 2.3.

Table 2.3: Barriers to G2G Project Implementation

Structural	Human	Technical
Focus only on direct labour and indices	Unwillingness to take risk Resistance	Incompatibility of systems
Failure to perceive the actual benefits	Unplanned decisions and fear of being made redundant	
High risk for the managers		
Lack of coordination and cooperation		
High expectation and hidden costs		

Pardo, Cresswell, Dawes and Burke (2004) propose a model that includes the social and technical processes of inter-organisational information integration to increase understanding of inter-organisational collaboration. This model contains a list of 32 main components relating to information integration. These components are clustered in four categories: social process, resources, organisational and technology, as depicted in Table 2.4.

Table 2.4: The Main Components of Information Integration

Social process	Resources	Organisational	Technology
• information and knowledge sharing • collaboration in work processes • trust building • negotiating • decision making	• leadership and authority • skills, materials and facilities • interorganisational policies • resource allocation mechanisms • political will	• goal alignment • policies •management structures and decisions • interpersonal relationships • contracts and other agreements • trust • incentives • norms • social translation techniques • shared understandings • life-cycle/ budget cycle alignment • integrated work rules and procedures	• physical networks • integrated system architecture • interoperable hardware • protocols • standards and data definitions • integrated applications • process maps and models • integrated databases and data warehouses • analytical and decision support tools • technical reports and analyses

Gil-Garcia et al. (2005) identify four key categories of barriers to information integration: turf and resistance to change, IT and data incompatibility, organisational diversity and multiple goals, and

environmental and institutional complexity. They also propose a set of strategies to deal with the key barriers, aimed at helping government organisations achieve information integration by retaining organisational autonomy, establishing a governance structure, building secure strategic partnerships, establishing comprehensive planning, managing business processes, managing adequate financial resources, and obtaining leadership and legislative support.

Bekkers (2005) presents the results from comparing four case studies. He notes that back-office integration is an important issue for integration between government organisations. The major lessons determined from his comparison relate to managing multi-rationality in different arenas, on-going recognition of interdependency, unification from content, trust and external pressure as motivating factors, managing the political agenda, the dynamic allocation of costs and benefits, and the balance between project and process management.

In his e-Government integration (EGI) framework, Lam (2005a) identifies four basic categories of barriers: strategic, policy, organisational and technological. He argues that EGI does not just relate to the technical matter of ensuring that IT systems integrate with government organisations. Other important issues are also relevant, such as strategic planning, goals and objectives, ownership, guidelines and financial support, and significant change management. Common EGI barriers to integration projects exist in the public sector, such as poor ICT infrastructure, a lack of interoperability architecture, incompatible data standards, a lack of relevant integration expertise, the existence of legacy processes, citizen privacy, data ownership across government agencies and e-Government policy evolution. Table 2.5 below provides a detailed description of the four barrier categories.

Table 2.5: e-Government Integration Barriers

Integration aspect	Barrier
Strategy	Lack of shared e-Government goals and objectives Over-ambitious e-Government milestones Lack of ownership and governance Absence of implementation guidance Funding issues
Technology	Lack of architecture interoperability Incompatible data standards Different security models Inflexibility of legacy systems Incompatible technical standards
Policy	Concerns over citizen privacy Data ownership e-Government policy evolution
Organisation	Lack of agency readiness Slow pace of government reform Absence of an e-Government champion Legacy government processes

Integration aspect	Barrier
	Lack of relevant in-house management and technical expertise

Ebrahim and Irani (2005) provide an integrated architecture framework for e-Government in public organisations by aligning IT infrastructure with business process management. They categorise the barriers that might hinder implementation of the proposed architecture into five dimensions: (1) IT infrastructure, (2) security and privacy, (3) IT skills, (4) organisational and (5) operational costs.

Peristeras, Loutas, Goudos and Tarabanis (2007) propose an interoperability framework based on some well-defined linguistic concepts. The framework has four interoperability types, organised into three demarcated areas. The interoperability types are (1) connection, (2) communication, (3) consolidation and (4) collaboration. The connection layer corresponds to channels for exchanging signals. The communication and consolidation layers correspond to informational aspects of interoperability (such as data format, syntax and semantics). The collaboration layer corresponds to functions and actions to be performed on the data (such as processes).

Tambouris's (2007) study on local and regional interoperability addresses four main objectives: the status of local and regional interoperability in European member states, the key success factors of local and regional interoperability, the key barriers of local and regional interoperability, recommendations for e-Government interoperability. Tambouris et al. (2007) identify a list of 39 key factors for e-Government interoperability at local and regional levels. These factors are organised into four different categories: Technical interoperability, Semantic interoperability, Organisational interoperability, and Governance interoperability.

In their study on the impediments to and benefits of e-Government information-sharing projects, Gil-Garcia, Chengalur-Smith and Duchessi (2007) group impediments into four categories. These are (1) technological, (2) organisational, (3) political and (4) legal. Technological impediments cover problems associated with hardware, software and communications networks. Organisational impediments relate to staff, the organisation, and implementation characteristics, including the project length, strategic goal understandings, the extent of business process changes, the project management approach, and the lack of implementation guidelines. Political and legal impediments include laws and regulations, the lack of executive and legislative support for information-sharing projects and requirements to ensure the confidentiality of important data and information.

Irani et al. (2007) identify three main t-Government dimensions: (1) it is citizen centric, (2) it has shared services, and (3) it exhibits professionalism. Citizen centric relates to transforming public services according to citizen needs. Shared services maximise the value added for clients. It includes the efficiency of corporate services and government infrastructure to support the delivery of frontline

resources. Professionalism enables the effective delivery of technology for government organisations by managing resources and skills within government. It includes planning, delivery, management, skills and governance (see Figure 2.9).

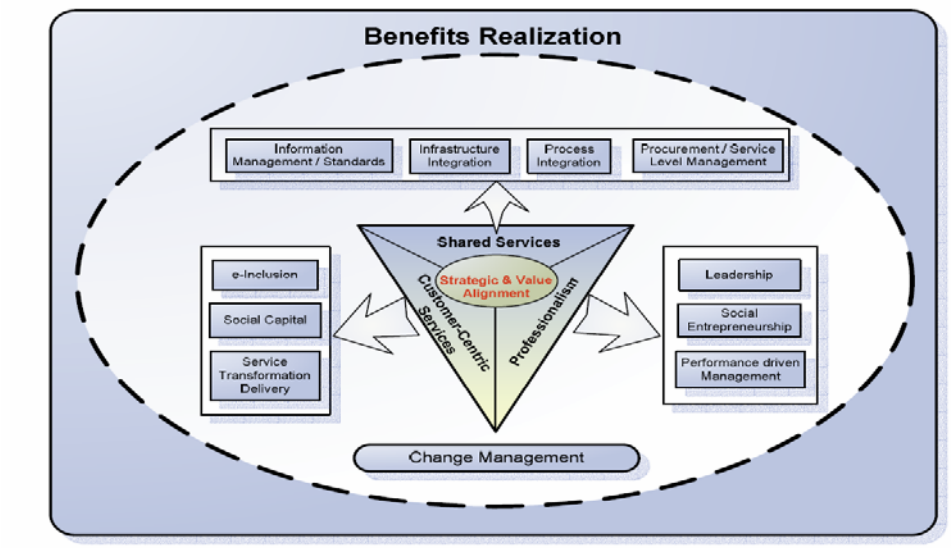

Figure 2.9: t-Government Dimensions (Irani (2007))

Gouscos et al. (2007) propose a conceptual framework for establishing indicators and metrics to assess the quality and performance of a one-stop e-Government service. They focus on the key quality and performance benefits identified for one-stop e-Government service providers and end-users, as well as on the indicators and metrics specified to assess the extent to which these key benefits are actually derived from the service.

Scholl and Klischewski (2007) note that organisational and legal issues must be considered to ensure public sector interoperability. They list nine constraints that influence interoperability. These constraints are classified as constitutional and legal, jurisdictional, collaborative, organisational, informational, managerial, cost, technological and performance-related (see Figure 2.10). Each of these nine constraints affects e-Government integration and interoperability. While several of these constraints can be addressed easily, others must be considered in their full complexity when identifying e-Government interoperability.

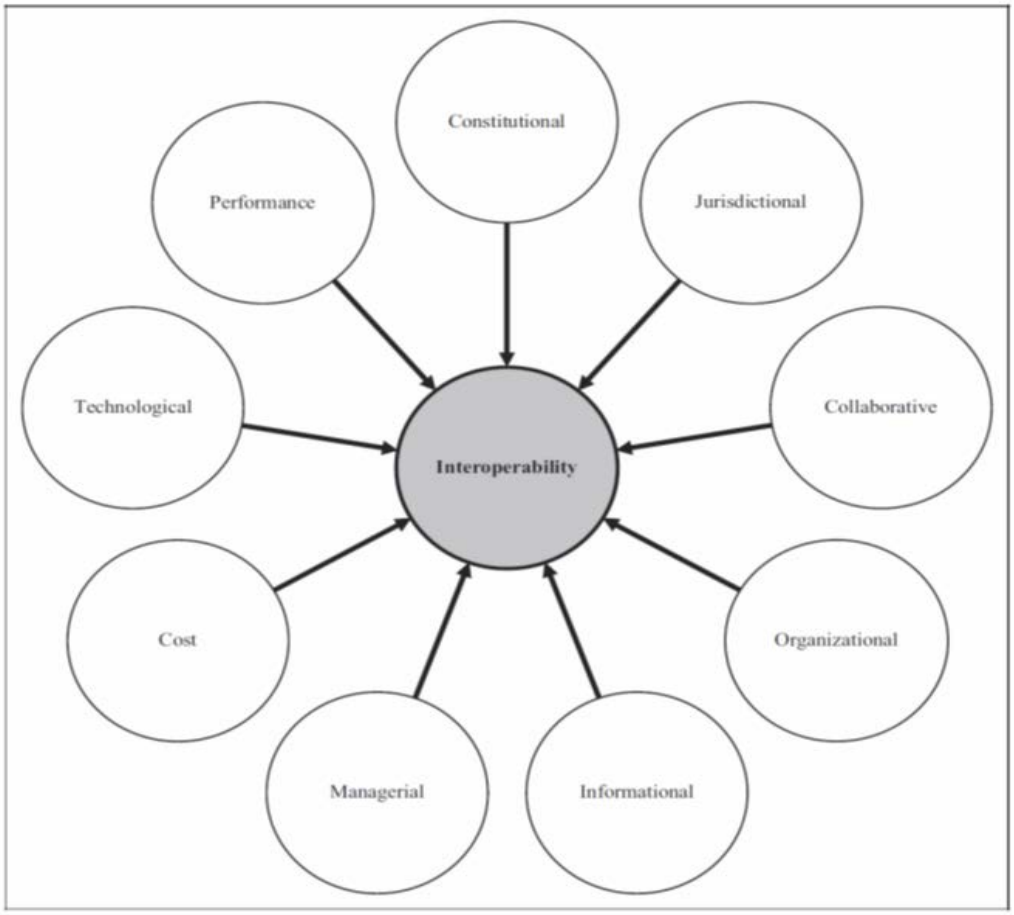

Figure 2.10: Constraints That Affect Interoperability (Scholl and Klischewski (2007))

Gottschalk and Solli-Sæther (2008b) propose a framework for improving interoperability between public organisations that depends on the stage growth model (see Figure 2.11). This framework identifies the development stages through which public organisations can diagnose their current situation and plan for future interoperability improvements. These include the following: the work-process, knowledge-sharing, value-creation and strategy-alignment stages.

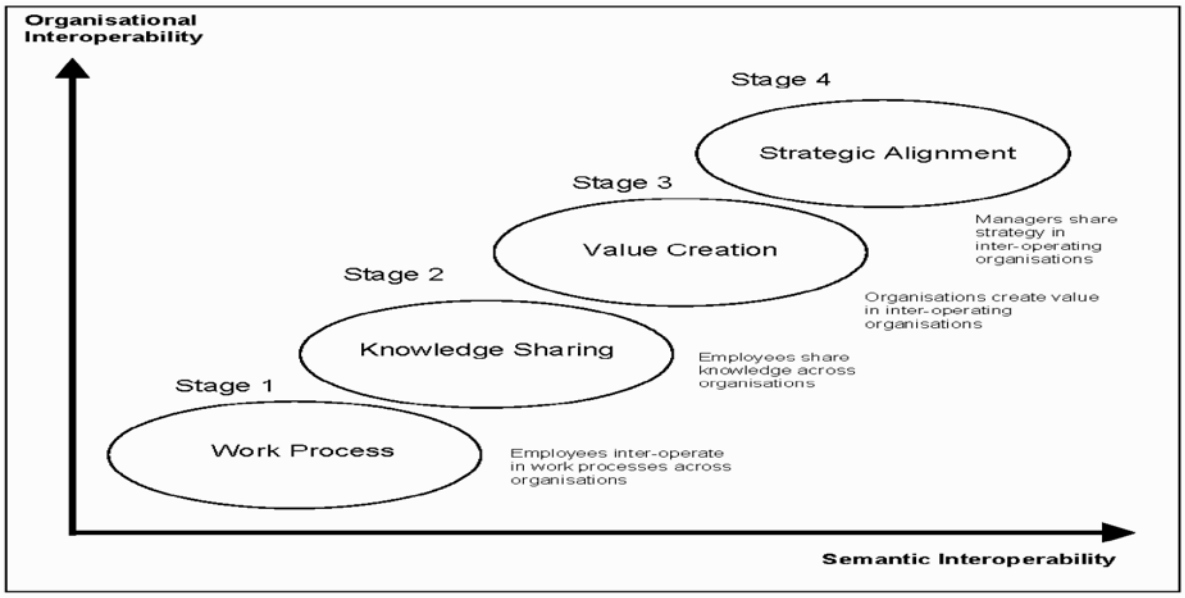

Figure 2.11: Framework for improving Interoperability (Gottschalk and Solli-Sæther (2008b))

In 2009, Gottschalk (2009b) stated that these nine constraints represent a complex environment for e-Government interoperability. He proposes five levels of maturity for digital government to identify the current interoperability status and the future interoperability direction between public organisations, as well as between public and private organisations. His framework is similar to that of Landsbergen Jr and Wolken Jr (2001), but he adds more stages such as value and goal dimension, which help organisations move towards a single goal. This framework helps scholars and practitioners diagnose the current situation and plan for future interoperability improvements. The five levels (as illustrated in Figure 2.12) are: (1) computer interoperability, which includes semantic and technical issues; (2) process interoperability, which includes process and information exchange; (3) knowledge interoperability, which includes knowledge and cooperation among employees from different government organisations; (4) value interoperability, which combines processes and knowledge; and (5) goal interoperability, which includes goal-sharing among cooperating organisations. The content and focus are very different at each of these levels. Organisations need measures with which to assess their current interoperability stage.

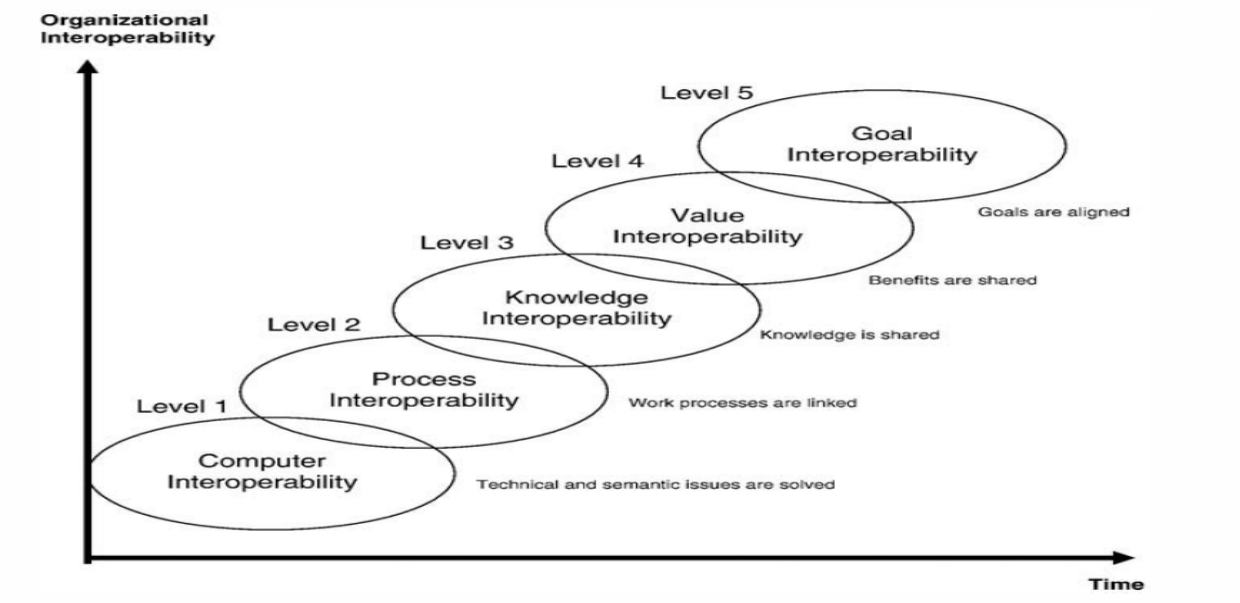

Figure 2.12: Five Levels of Maturity Framework (Gottschalk (2009b))

Kamal and Alsudairi (2009) propose an enterprise application integration (EAI) adoption model that consists of 21 factors influencing EAI adoption in local government organisations (see Figure 2.13). The factors are cost, benefits, barriers, internal pressures, external pressures, IT infrastructure, IT sophistication, IT support, evaluation frameworks, formalisation, centralisation, managerial capabilities, project championship, personnel IT knowledge, technological risks, data privacy and security, higher administrative authority support, return on investments, critical mass, market knowledge, citizen satisfaction, size, and top management support. These are further categorised into pressure, technological, support, financial and organisational factors. After analysis, the authors proposed and mapped the EAI factors to the adoption lifecycle phases: (a) motivation, (b) conception, (c) proposal, and (d) adoption decision. These are explained in Figure 2.13. The authors then prioritised these factors based on their importance in the adoption lifecycle phases as EAI adoption influencers in LGAs (Kamal & Alsudairi, 2009).

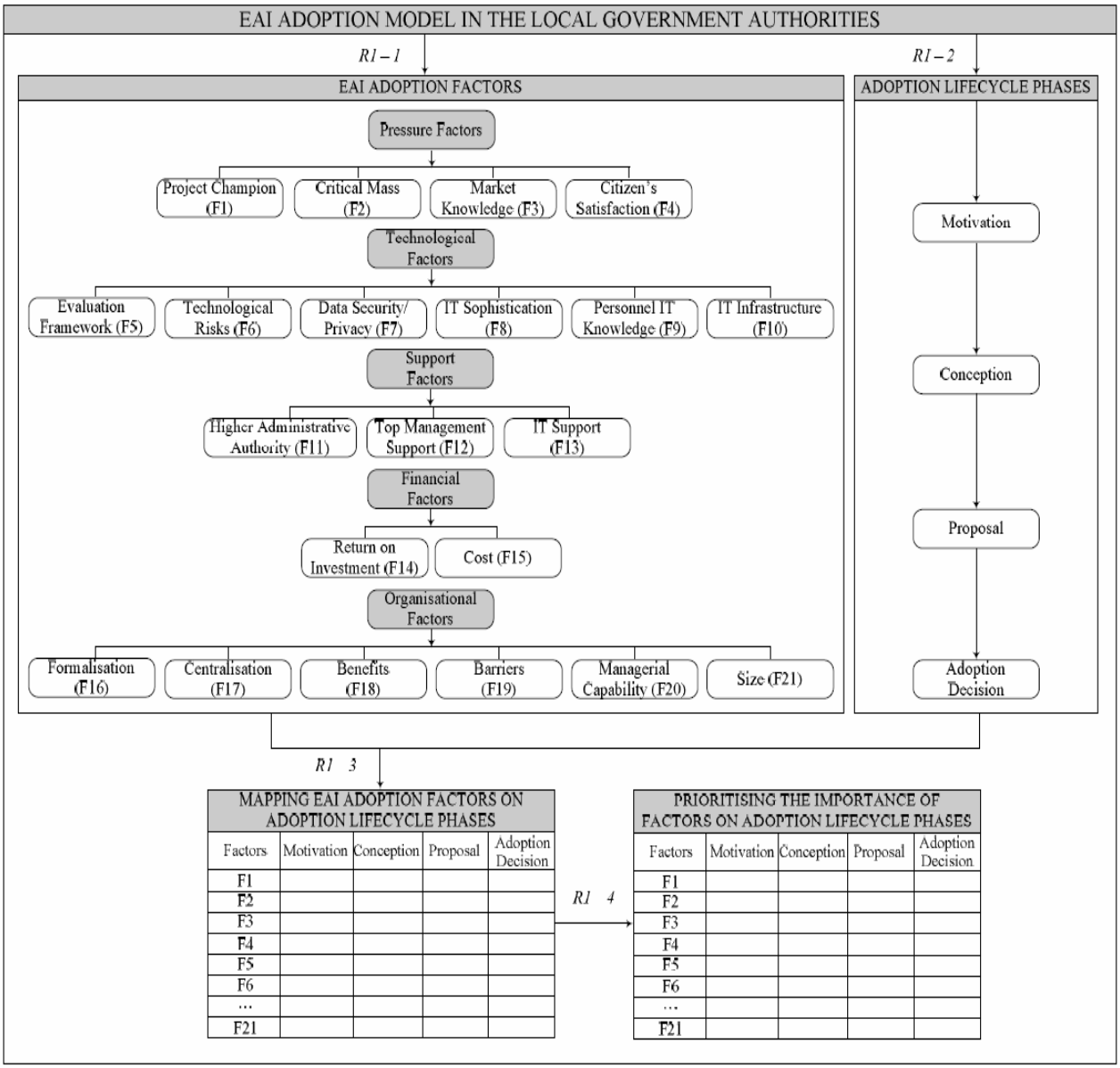

Figure 2.13: Enterprise Architecture Integration Adoption Model (Kamal and Alsudairi (2009))

Sanati and Lu (2010) define the obstacles that may disrupt e-Government service-delivery integration, and suggest a framework based on ontological analysis and modelling using the integrated e-service delivery (IESD) platform. This framework, which shall be called e-service integration modelling (E-SIM), is based on the extensive use of the life-event concept.

Pardo et al. (2011) claim interoperability is vital as a core capability for attaining t-Government implementation. They also state that interoperability is not just a technical issue. Social challenges are an important factor for interoperability and too much reliance on technical issues is recognised as a substantial barrier to e-Government interoperability. Therefore, these researchers have provided a new conceptual framework for e-Government to consider interoperability from a socio-technical perspective. This framework combines the socio-technical dimensions of interoperability and provides a mechanism for researchers and practitioners to explore e-Government

interoperability capabilities in terms of dynamic and interacting policy, management and technological dimensions. They identify a set of seven e-Government interoperability capability categories that represent government interoperability policy, management and technological dimensions. These categories are business architecture, governance and leadership, strategic management, operational management, information policy, cross-organisational collaboration, and technological issues (see Table 2.6).

Table 2.6: Framework of e-Government Interoperability Capability

Categories	Dimensions	Core Characteristics of High Capability
Business architecture	Business architecture	Design and technology decisions guided by business models and enterprise perspectives
Governance and leadership	Governance	Clearly defined, empowered, and active governance mechanism
	Leaders and champions	Strong, effective leadership, and enterprise-wide champions supporting an initiative
	Stakeholder engagement	Stakeholders' engagement and trust in an initiative
Strategic management	Strategic planning	Clear strategic plans addressing visions and action plans tied to specific goals and visions
	Performance evaluation	Systematic, rigorous ongoing evaluation of sharing and its impacts, integrated with management and policy making
Operational management	Project management	Skills, techniques, and tools to direct and assess project performance
	Resource management	Identifying and managing the necessary financial, technical, and human resources and acquiring those resources for an initiative
Information policy	Information policy	Clear, precise information policies that encourage and support the desired information sharing
	Data requirements	Uniform data policies and established data standards
Cross-organisational collaboration	Collaboration readiness	Available resources for collaboration, policies, and practices to support collaboration and effective agreement on resource sharing
	Organisational compatibility	Well-aligned cultures, practices, and work styles
Technological readiness	Secure environment	Rigorous policies, practices, procedures, and technology that defines the security environment
	Technology acceptance	Acceptance, enthusiasm, and comfort toward changes in technology and innovations driven by technology
	Technology knowledge	Knowledgeable staff with experience in compiling, storing, and sharing information and knowledge
	Technology compatibility	Standardised, consistent and interconnective platforms, infrastructures, and applications

Van Veenstra et al. (2011) find that other important issues should be considered when implementing t-Government. t-Government is not just a technical issue; it concerns a fundamental reorientation of government roles and functions relating to meeting citizen and business demands. Suitable governance mechanisms are required to support t-Government implementation. Therefore, these researchers propose a comprehensive framework that uses the mismatch between theoretical ideals and empirical transformation to identify and classify the major barriers that occur when organisations aim for transformation. This framework identifies four categories: IT, organisational and managerial factors, business processes and governance (see Figure 2.14).

Figure 2.14: Framework to implement t-Government (Van Veenstra (2011))

Tripathi et al. (2013) propose a framework to examine the impact of organisational factors on interoperability technology adoption. They have examined the effect of financial resources, strategic goals, security apprehensions, top management support, collaborative mind-sets, promotion efforts and IT maturity on interoperability technology adoption. Four of these organisational factors are significantly related to overall interoperability functionalities: financial resources, strategic goals, promotion efforts and IT maturity. The authors conclude that interoperability adoption is associated closely with certain organisational factors. All of these relate positively to overall interoperability adoption. The higher the level of integration and organisational factors, the more advanced is the government interoperability. As such, focusing on the organisational factors that have a positive impact on interoperability adoption will help to achieve e-Government interoperability and decrease transaction costs. This will enhance government organisation reliability.

2.8 Holistic Factors and Institutional Theory

Building on from the analysis of the literature review, this thesis has determined that many factors and barriers influence e-Government interoperability and t-Government implementation. Therefore,

it is important to understand which of these factors, barriers and issues are relevant to interoperability and t-Government initiatives in the Saudi Arabian context. As Chandler and Emanuels (2002) note, e-Government implementation is a long-term project with many challenges and barriers. Understanding these factors will protect governments from failure (Al-Khouri & Bal, 2007). Research on information systems implementation in government organisations often focuses on success factors (Rosacker & Olson, 2008; Somers & Nelson, 2001). Therefore, this thesis focuses on the success factors for e-Government interoperability, as illustrated in Table 2.7. More discussion of and details regarding these factors are presented in Chapter 4. Analysis of each factor's influence on e-Government interoperability implementation is discussed in Chapters 6, 7 and 8.

e-Government interoperability and t-Government implementation projects require that government organisations accept the consequences of change, including social, organisational, political, and technical outcomes. According to Nelson (2003), e-Government projects lead to organisational change by moving from an existing situation to a new desired situation; organisations must respond as quickly as possible to these changes. Therefore, change can be seen as a situation that shifts from simple and normal conditions to complex, new conditions both externally and internally. Organisational changes will often depend on social, political, economic, demographic and technological developments and trends in different markets or national contexts (Al-Shafi, 2009; Centeno, van Bavel, & Burgelman, 2005). As this research will focus on G2G, which represents the relationship between two or more governments collaborating to achieve t-Government, it must examine and identify the t-Government implementation success factors from an organisational change perspective.

Over the years, several organisational change theories have arisen. These include (but are not limited to) system, social and reasoned action theory (Kritsonis, 2005). Among the earliest and most widely used theories of organisational change are the models of Lewin and Lippitt, and institutional theory.

Many theoretical frameworks use institutional theory to explain IT implementation aspects (Bellamy & Taylor, 1996; Butler, 2003; Laudon, 1985). As this research investigates and analyses how internal factors may affect government organisations achieving e-Government interoperability and implementing t-Government, institutional theory offers a useful conceptual lens. This theory is already used by many researchers to study public sector and e-Government organisational change (Al-Shafi, 2009; Ashaye, 2014; Currie & Guah, 2007; Kim, Kim, & Lee, 2009; Silva & Figueroa B, 2002).

Institutional theory provides a rich, complex view of organisations (Zucker, 1987). It consists of three mechanisms that create organisational conformity (DiMaggio & Powell, 1983): coercive, normative and mimetic. Coercive mechanisms relate to the formal and informal pressure to act compliantly

regarding certain actions, to receive legitimacy and its benefits. Normative mechanisms are described as the consequences of organisational actors' professionalism, such as managers who are influenced by cultural expectations. Mimetic mechanisms occur when organisations try to behave like other organisations in uncertain environments and with unclear organisational objectives, doing this to reduce risk.

The coercive, normative and mimetic aspects of institutional theory will be most beneficial to this research, as they have been applied successfully to both information systems in general, and e-Government adoption and implementation in particular (Al-Shafi, 2009; Ashaye, 2014; Currie & Guah, 2007; Kim et al., 2009; Silva & Figueroa, 2002). According to Kim et al. (2009), institutional theory in the context of e-Government can identify challenges surrounding e-Government system implementation by examining these three institutional mechanisms.

Scott (2008) states that government organisations are institutionalised so they can meet the social expectations created by their particular social, cultural, legal or political context. These three contexts offer an effective framework for evaluating the pressures that relate to current legislation specifying laws and rules relating to e-Services. The wider social and political dimensions and the regulatory and normative mechanisms proposed in institutional theory offer a well-balanced conceptual frame of reference for understanding the institutional changes and associated challenges faced by e-Government implementation (Al-Shafi, 2009). In addition, Butler and Murphy (1999) and King et al. (1994) have used organisational and sociological perspectives to examine the development, implementation and use of IS and IT in organisations.

Most studies adopt the organisational unit as a research subject, rather than employing a broader, multi-level and multi-method approach; however, this research will benefit from using institutional theory as its methodological lens. This will enable alternation between levels of analysis, permitting a more generous interpretation of IS adaptation. Additionally, this approach will combine theories and models when developing the conceptual framework by considering the key forces influencing interoperability levels for t-Government implementation from organisational, technological, social and political themes. This approach is comparable to other e-Government adoption and implementation studies (Al-Shafi, 2009; Ashaye, 2014; Currie & Guah, 2007; Kim et al., 2009; Silva & Figueroa B, 2002).

From the above discussion, it is evident that many studies have applied institutional theory to explore how organisations are institutionalised by social, organisational, technical and political contexts in terms of meeting the norms, values, rules and beliefs upheld by society (Currie & Guah, 2007; Scott, 2005). Therefore, this thesis adopts institutional theory to explore how government organisations are institutionalised to implement t-Government. It will consider the key forces influencing interoperability implementation from technological, organisational, social and political themes. These factors are

discussed below through an institutional theory lens, where the theory is used primarily as a frame of reference for classifying these factors (see Table 2.7).

In this thesis, the technological theme relates to technological compatibility (TC) factors which led government organisations to implement e-Government interoperability such as IT standards, architecture interoperability, data requirements, and back-office systems (Silva & Figueroa, 2002). The organisational theme relates to organisational compatibility (OC) factors, which led to significant insights regarding the importance of institutional environments to organisational structure and process. This includes technical staff, organisational structure, and business process management (Kondra & Hurst, 2008). The social theme (as explained in Section 2.3.4) is limited to implementation within G2G perspectives; therefore, it concerns with the actions that increase and improve customer satisfaction such as citizen centricity (CC) (Affisco and Soliman, 2006). The political theme relates to governance readiness (GR) factors which includes a new rules, procedures, arrangements and actions are required to achieve public sector transformation such as strategy and regulations, leadership and funding (Kim et al., 2009). In addition to the effect of central government (e-Government programs Yesser in the context of Saudi Arabia) in facilitating e-Government implementation among government organisations. Chapter 4 discusses these factors in more detail.

Table 2.7: Factors Influencing Interoperability for t-Government Implementation

Factor	Dimensions	Literature Sources
Technological Compatibility (TC)	Assessed through focusing on IT standards, architecture interoperability, back-office systems and data requirements	Lam (2005b), Ray et al. (2009) Landsbergen Jr & Wolken Jr (2001) Gil-Garcia et al. (2007) Akbulut (2003) Joia (2004) Pardo et al. (2004) Tambouris et al. (2007) Pardo et al. (2011) Scholl & Klischewski (2007) Van Veenstra et al. (2011) Irani et al. (2007)
Organisational Compatibility (OC)	Measured by organisational structure, IT staff, and business processes	Ray et al. (2009) Lam (2005b) Landsbergen Jr & Wolken Jr (2001) Akbulut (2003) Pardo et al. (2004) Gil-Garcia et al. (2007) Tambouris et al. (2007) Scholl & Klischewski (2007) Van Veenstra et al. (2011) Tripathi et al. (2013)
Governance Readiness (GR)	Measured by leadership, strategy and regulations, and Funding	Ray et al. (2009) Lam (2005b) Landsbergen Jr & Wolken Jr (2001)

Factor	Dimensions	Literature Sources
		Pardo et al. (2004) Tambouris et al. (2007) Gil-Garcia et al. (2007) Scholl & Klischewski (2007) Pardo et al. (2011) Van Veenstra et al. (2011)
Citizen Centricity (CC)	Measured by a Citizen Centricity focus, citizens need, measurement of citizens' satisfaction and familiarity	Scholl (2005) Gottschalk (2009b) Irani et al. (2007) Weerakkody & Dhillon (2008) Gouscos et al. (2007) Sanati & Lu (2010) Lee (2010)
e-Government program (Yesser)	Measured by integration ability, GSB, GSN, SSO, NEA, and the 'Saudi' portal	Irani et al. (2007) Weerakkody & Dhillon (2008) Yesser (2006b, 2012)

2.9 A Conceptual Model for e-Government interoperability and t-Government Implementation

An analysis of the literature reveals that many frameworks and models involving information sharing, integration, interoperation and interoperability have been developed from different perspectives. As discussed in Chapter 1, some models and frameworks only focus on technical aspects, while others focus on organisational aspects without considering technical factors. Yet other models and frameworks are driven from a distinct citizen-centric, one-stop service-delivery perspective, sometimes downplaying the enormous obstacles of back-end interoperation. Still other projects are technology-centric, disregarding the numerous non-technical challenges. Many, if not most, models and frameworks do not reflect the complex grid of interwoven technical, organisational, political and social issues and constraints involved. Hence, integration and interoperation projects in e-Government run a high risk of failure (Scholl & Klischewski, 2007).

As stated earlier, no interoperability model or interoperability framework will solve all interoperability problems. However, a combination of models or frameworks may be appropriate when trying to solve interoperability problems. Solutions to interoperability challenges depend on the situation, requiring a credible approach to aligned development (Gottschalk, 2009a). According to Janssen and Scholl (2007), interoperability is important for government collaboration. Building interoperable system requires consideration of political, organisational, social and technical issues. In other words, implementing interoperability involves many elements that should be developed and integrated to achieve interoperability (Benamou, Busson, & Keravel, 2004). This thesis uses a combination of models and theories to develop the conceptual model for creating interoperability required for t-Government implementation by identifying the significant factors for achieving interoperability

effectively and broadly, using an institutional theory as a lens. Currently, no framework exists that maps these factors and concepts together. This highlights the need to consider different dimensions (political, organisational, human and technical) when implementing interoperable systems in local government (Benamou et al., 2004).

Therefore, this thesis has developed a model that includes technical, organisational, political and social aspects. Technical aspects cover technical issues such as linking computer systems and services. Organisational aspects include collaboration issues for government organisations that wish to exchange information but that may have different internal structures and processes, as well as aspects relating to staff requirements. Political aspects cover appropriate decision-making rules and procedures to direct and oversee related initiatives that are planned, underway, or implemented to create a new interoperability capability. Social aspects consider citizen-centric issues.

This thesis endorses the interoperability layers introduced by Novakouski & Lewis (2012): technical, semantic and organisational, as well as the effects of technological capability, organisational capability, governance readiness, citizen centricity and Yesser (e-Government program) factors. The next chapter will detail the proposed model.

2.10 Chapter Summary

This chapter has provided a background for e-Government, outlining both definitions and concepts. It has also detailed the e-Government categories and stages. It has reviewed the existing literature on e-Government interoperability and t-Government implementation to explore and identify the research issues. Limited literature on the implementation of t-Government exists; most models and frameworks do not reflect the complex grid of interwoven technical, organisational, political and social issues and constraints involved. The significant challenges for interoperability are still not well understood, with the existing research remaining relatively limited in scope (Novakouski & Lewis, 2012; Solli-Sæther & Flak, 2012; Van Veenstra et al., 2011). The researcher has identified gaps such as the absence of theoretical models that have been tested and validated for t-Government implementation factors. This research addresses this gap by proposing a conceptual model for implementing e-Government interoperability between government organisations. This model identifies the factors influencing the successful implementation of t-Government. These factors can be classified as technical, organisational, political and social. This can be a guiding tool for IT managers and others involved in day-to-day planning, executing, controlling and regulating t-Government projects. Many studies on e-Government in Saudi Arabia exist. These are discussed in the next chapter. However, no study addresses t-Government implementation in Saudi Arabia with a contextualised focus. The next chapter provides an overview of e-Government in Saudi Arabia, and an e-Government program (Yesser). It also reviews previous e-Government studies conducted in Saudi Arabia.

CHAPTER 3: RESEARCH CONTEXT: E-GOVERNMENT IN SAUDI ARABIA

3.1 Introduction

As stated in Chapter 1, this research aims to develop an interoperability model to assist government organisations in Saudi Arabia to implement t-Government. This chapter provides a generic overview and investigation of the current state of the e-Government initiative in Saudi Arabia. This chapter will discuss the UN's e-Government evaluation in Section 3.2. Section 3.3 will then discuss e-Government initiatives in Saudi Arabia, and Section 3.4 presents studies related to e-Government in Saudi Arabia. Finally, Section 3.5 presents some conclusions.

3.2 The Saudi Arabian Context

As stated in Chapter 1, Saudi Arabia is a Gulf area country that meets the research's requirements. It is classified as a developing country (WB, 2004). Saudi Arabia has invested millions of dollars to adopt and implement e-Government services and applications in its public sector institutions, allocating more than US$ 800 million to implement e-Government services (Yesser, 2006b).

Prior to discussing the e-Government initiative in Saudi Arabia, it worthwhile examining and analysing the UN's evaluation of e-Government in Saudi Arabia. The UN has been tracking the development and evolution of e-Government since 2001. The UN e-Government survey provides a bi-annual (every two years) assessment of the national online services, telecommunication infrastructure and human capital of 192 member states. Based on UN e-Government surveys (UN, 2003, 2004, 2005, 2008, 2010, 2012, 2014), e-Government in Saudi Arabia has moved forward substantially from being ranked 105th in 2003 to 36th in 2014 (see Table 3.1).

These reports also show a high ranking for Saudi Arabia in the e-Government development index (EGDI). EGDI is a composite indicator measuring ICT use by governments to deliver public services at the national level. It is based on a comprehensive survey of the online presence of all 192 UN member states.

In addition, these surveys have assessed the technical features of national websites, as well as the e-Government policies and strategies applied in general and in specific sectors for service delivery. The national portal was a major development in Saudi e-Services. These surveys scored Saud Arabia as one of the top 20 countries in online service delivery. These surveys also assessed the level of data published in national portals. It scored Saudi Arabia as higher than 66.6% in data publishing. Further, the UN e-Government surveys assessed the index of e-participation (EPART, using a three-stage model. e-participation is the process of engaging citizens in policy and decision

making through ICT, ensuring that public administration is participatory, inclusive, collaborative and deliberative for intrinsic and instrumental ends. The three stages operate as follows: 1) e-information measures how participants access public information and information upon demand; 2) e-consultation measures public engagement with contributions to public policies and services; and 3) e-decision making measures the empowerment of people in designing service delivery. The EPART indicates that Saudi Arabia achieved 85.19% in Stage 1, 27.27% in Stage 2, achieving only 11.11% in Stage 3, with an overall score of 51% (UN, 2014) (see Table 3.1 and Figure 3.1).

The 2014 UN survey considers Saudi Arabia as one of the top 20 countries in the Asian region, and one of the top 10 in Western Asia for e-Government development. This status is due to its high gross domestic product (GDP), high literacy rates, small population and a keen desire by government to invest in and develop an online national portal, subsequently offering their citizens advanced and readily accessible e-Services and information. This survey scored Saudi Arabia at 94% in Stage 1 (emerging presence), 68% in Stage 2 (enhanced presence), 63% in Stage 3 (transactional presence) and only 53% in Stage 4 (networked presence), with an overall score of 69% in total (UN, 2014).

Table 3.1: e-Government World Ranking for Saudi Arabia 2003–2014

Year	Rank	Ranking Change	EPART	Online Service Index
2003	105	–	102	–
2004	90	+15	84	73
2005	80	+10	83	73
2008	70	+10	38	60
2010	58	+12	102	75
2012	41	+17	22	70
2014	36	+5	51	77

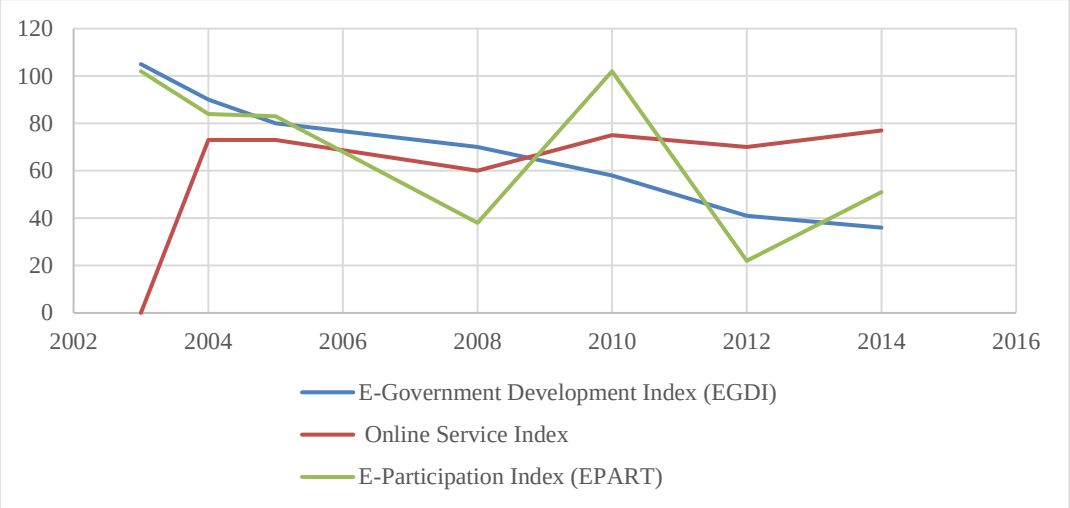

Figure 3.1: e-Government readiness in Saudi Arabia (UN (2014))

The above discussion, Table 3.1 and Figure 3.1 all show that Saudi Arabia has made significant progress regarding online services delivery and e-Government development readiness. However, a noticeably low level of advanced stages (such as t-Government and e-participation) is evident. Levels of t-Government in Saudi Arabia remain low. Therefore, this research will consider these issues, as well as prior relevant literature reviews to determine the key factors that can hinder or enhance interoperability among government organisations in Saudi Arabia when facilitating t-Government implementation.

3.3 e-Government Initiatives and the e-Government Program (Yesser)

Like many other governments around the world, the Saudi Arabian government has recognised that changing from traditional government to e-Government is a significant current public policy issue. Therefore, the Saudi Arabian government has taken some initiatives to improve public service delivery efficiency and effectiveness. The government has realised it is necessary to cooperate and join forces in various areas to become an information society and achieve its established objectives. The concept of e-Government was initiated as part of Saudi Arabia's overall IT plan in 2001 (Abanumy, Al-Badi, & Mayhew, 2005). The plan focused on reforming public organisations via ICT. However, it became apparent that transforming to an information society would not be possible without a comprehensive cooperative effort. As a result, a supreme royal decree in September 2003 directed the Ministry of Communication and Information Technology (MCIT) to design and develop a plan for transferring government services and transactions electronically (MCIT, 2014). MCIT, in partnership with the Ministry of Finance and the Communication and Information Technology Commission (CITC), established the e-Government program in early 2005 under the name 'Yesser'. In Arabic, this word means to 'simplify' or 'make easy'. However, Bawazir (2006) declares that Yesser was not the first effort made by Saudi authorities to promote ICT adoption in Saudi Arabia. e-Government applications were available in the country as early as 1995, through the Saudi Electronic

Data Exchange (SaudiEDI) project, which linked businesses and government agencies. Another early effort was undertaken by the Saudi Ministry of Labour to automate labour information and employment processing systems. However, this initiative failed because of its inability to provide timely and high-quality services to stakeholders (Al-Elaiwi, 2006). The e-Government program Yesser was launched with the following objectives: first, to increase public sector productivity and efficiency, second, to provide user-friendly and enhanced services for individual and business customers, third, to increase return on investment (ROI) and fourth, to provide required information in a timely and accurate manner (Alshehri & Drew, 2010). Yesser facilitates the implementation of e-Government projects in Saudi Arabia. It does this by reducing centralisation in e-Government implementation and ensuring a level of coordination between government organisations. To realise the above objectives, Saudi Arabia has adopted a set of plans and strategies; Yesser has the task of developing and implementing these plans and strategies in cooperation with government organisations. The First Action Plan from 2006 to 2010 has been completed (Yesser, 2006b). Currently, the Second Action Plan from 2012 to 2016 (Yesser, 2012) is operating. In addition, the Yesser program has created many initiatives and products, including regulations and governance frameworks, standards for e-Government systems specifications, and guidelines for government organisations. The next sections seeks to illustrate the impact of e-Government program (Yesser) in facilitating e-Government implementation in Saudi Arabia by discussing the action plans, legislation and regulations, initiatives and products in more detail.

3.3.1 The e-Government First Action Plan (2006–2010)

Saudi Arabia's first five-year plan (2006 to 2010) aimed at increasing the productivity and efficiency of public sector service performance, enhancing services for individuals and businesses, offering needed information in a timely and accurate way, and increasing ROI.

Saudi Arabia's e-Government initiative has a citizen-centric vision; it focuses on a number of aspects that revolve around the central notion of providing better government services to users. Users are understood here as individuals (citizens and expatriates), businesses and government agencies. This citizen-centric vision for Saudi Arabia's e-Government initiative is summarised in the following vision statement:

> By the end of 2010, everyone in the Kingdom will be able to enjoy—from anywhere and at any time—world class government services offered in a seamless, user-friendly and secure way by utilising a variety of electronic means. (Yesser, 2006b)

To meet this vision, the following objectives were set:

- Provide better services by the end of 2010 by focusing on the top (150) most important services electronically, and make these services available to everyone in Saudi Arabia, 24/7 in a seamless, secure and user-friendly way.

- Increase internal efficiency and effectiveness by improving the performance of government organisation back-office systems. This will encourage paperless delivery of all possible official intra-governmental communication, and will ensure the accessibility of all information needed across government organisations.
- Contribute to the country's prosperity through spreading information, knowledge and use of e-Services to develop use of the country's assets and resources by increasing society's productivity in the private, business and public sectors (Yesser, 2015).

3.3.2 The e-Government Second Action Plan (2012–2016)

Based on the achievements of the First Action Plan (2006–2010), Yesser developed the Second Action Plan (2012–2016) in collaboration with government organisations, universities, the private sector, and representatives from the public. The vision of this Second Action Plan is stated as:

> [e]nabling everyone to use effective government services, in a secure integrated and easy way, through multiple electronic channels. (Yesser, 2015)

To meet this vision, this action plan includes the following four themed strategies:

- build a sustainable e-Government workforce
- improve the public's experience of government interactions
- develop a culture of collaboration and innovation
- improve government efficiency.

Further, these four themes support a set of objectives that will be achieved through 46 initiatives dispersed in the following six categories:

- Human capital, communication and change management: ensures the availability of leadership, communication, collaboration and human resources for completing the Second Action Plan.
- e-Services: ensure the availability, maturity and use of e-Services.
- Shared national applications: ensures the standardisation of national databases, e-procurement systems and other applications.
- Infrastructure: improves shared infrastructure by increasing use of the government service bus (GSB) (later sections will discuss the GSB).
- e-participation: supports citizen participation in government processes including administration, service delivery and decision making, by piloting the use of web-based media and social media for evaluating provided e-Services.
- Institutional framework: examines the leadership role and organisational form of Yesser, the governance and funding model, and the regulations covering e-Government.

The next section details this legislation and regulations (Yesser, 2012).

3.3.3 Legislation and Related Regulations

To drive Saudi Arabia's e-Government initiative forward, Yesser has developed many strategies and regulations, a mission statement, and visions to support e-Government implementation, as shown in Table 3.2.

Table 3.2: List of e-Government Regulations and Legislation

No.	Regulations & Legislation	Description	Date
1	Telecommunication regulations	Regulating and restructuring the communications sector	28-05-2001
2	Instructions to establish government agency databases	Premier directed government agencies to develop databases of their activities	04-03-2002
3	Rules governing awarding of IT contracts to private sector	Rules regulating private sector participation in e-Government applications	25-05-2004
4	Resolution to ensure transformation from conventional to electronic processing	Ways of enhancing cooperation to achieve the objectives of comprehensive auditing and performance control	05-10-2004
5	Smart national identity	The smart national identity adoption	24-05-2005
6	Instructions to government agencies to create their own e-Government committees	Called on government agencies to set up their respective internal e-Government committees to enhance e-Services, and increase government productivity and efficiency	26-07-2005
7	e-Government implementation rules	Regulations for adopting e-Government in government organisations	28-03-2006
8	Cyber-crime control regulations	IT criminal law	26-03-2007
9	e-Government regulations and by-laws	Used to adjust transactions and electronic signatures by organising and providing a formal framework	27-03-2007
10	The national CIT Plan	A perspective of communications and IT in the Kingdom for the next 20 years	28-05-2007
11	Creating higher positions for IT resources	The allocation of senior management positions for IT in government agencies	06-09-2007
12	Computing and networking controls in government agencies	Regulations for using computers and information networks in government agencies	16-03-2009
13	Instructions to introduce e-processing of the general public transactions, applications and admissions	Emphasise that government organisations to rely on this technology	29-04-2009
14	Instructions for integration with the public inspection bureau and the use of e-Government programs	To force government organisations to link with the general auditing bureau to exchange data automatically	23-05-2009
15	Strategy for informatics & IT systems in health sectors	Strategy for IT and IS in the health sectors	07-09-2009
16	Instructions to government agencies to ensure compliance with e-Government transformation controls	To ensure that government organisations have implement e-transaction regulations	08-09-2009
17	Supporting and boosting e-Government transformation mechanisms	To support and promote the shift to e-Government	28-06-2010

3.3.4 e-Government Program (Yesser) Initiatives and Products

To understand the role of e-Government program (Yesser) in facilitating e-Government implementation among government organisations in Saudi Arabia, this section will describe the initiatives and products have been implemented by Yesser to help government organisations facilitate the integration of and interoperation between government organisations.

3.3.4.1 Government Secure Network

The Government Secure Network (GSN) connects government organisations with the e-Government data centre to facilitate e-Government initiatives. GSN is becoming a key connection point for e-Government among organisations; it is secure and cost effective. According to Yesser (2015), the number of government entities connected to this network has reached 140 (see Figure 3.2).

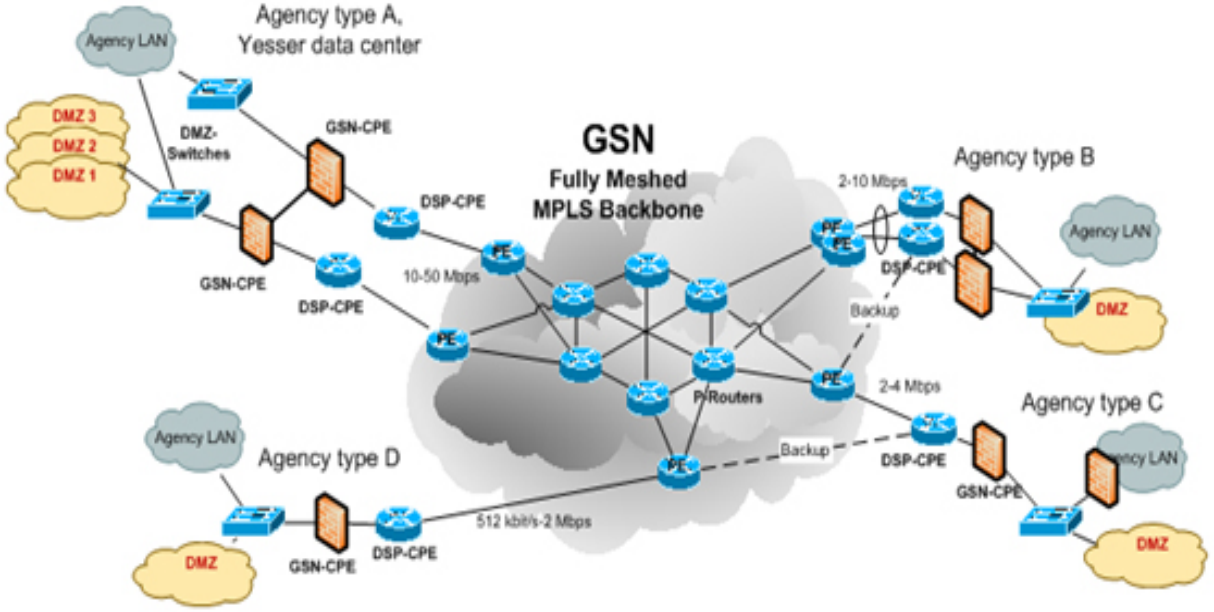

Figure 3.2: Government Secure Network (Yesser (2015))

3.3.4.2 Government Service Bus

The Government Service Bus (GSB) is a national integrated infrastructure of hardware and software designed to facilitate the exchange of shared government data among government agencies, ensuring a safe and timely online delivery of services. It was developed and managed by Yesser (Yesser, 2015) (see Figure 3.3).

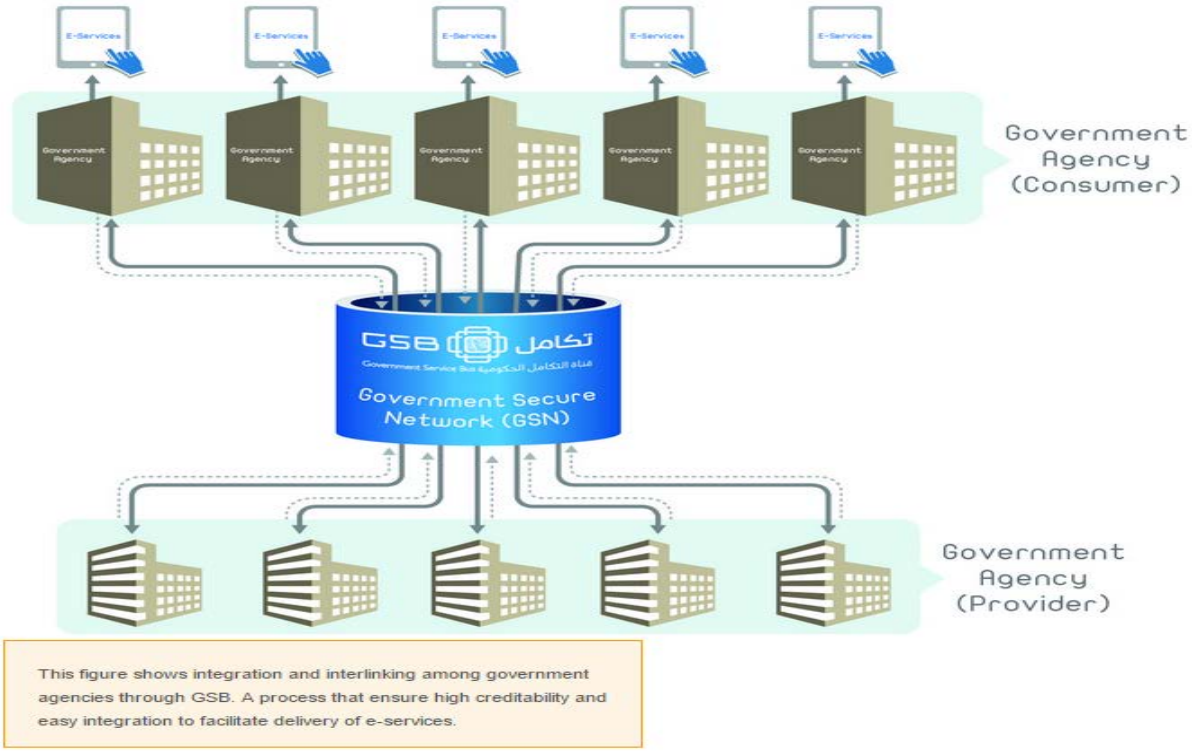

Figure 3.3: Government Service Bus (Yesser (2015))

3.3.4.3 e-Government Data Centre

The e-Government data centre is an infrastructure project established with the highest technical and security specifications under the supervision of the Yesser e-Government program to facilitate data integration between government organisations, and to streamline e-Government service delivery (Yesser, 2015).

3.3.4.4 The Saudi e-Government Portal: 'Saudi'

The Saudi e-Government Portal 'Saudi' (www.saudi.gov.sa) is the central hub for government organisations. It provides e-Services for citizens, residents, businesses, visitors and other government organisations. This integrated portal approach has been chosen as the best way to make e-Services accessible in an efficient way, anytime and anywhere through the internet. These e-Services are achieved via the portal, either by integrating with other government agencies or through links to their websites. In addition, the Saudi portal organises all the government's e-Services into categories based on the beneficiary or on a particular government agency. It also provides an e-service directory. It gathers all the government organisations that offer e-Services in one virtual sphere. Currently, around 2035 online services are available through the national e-Government portal 'Saudi' (Yesser, 2015)

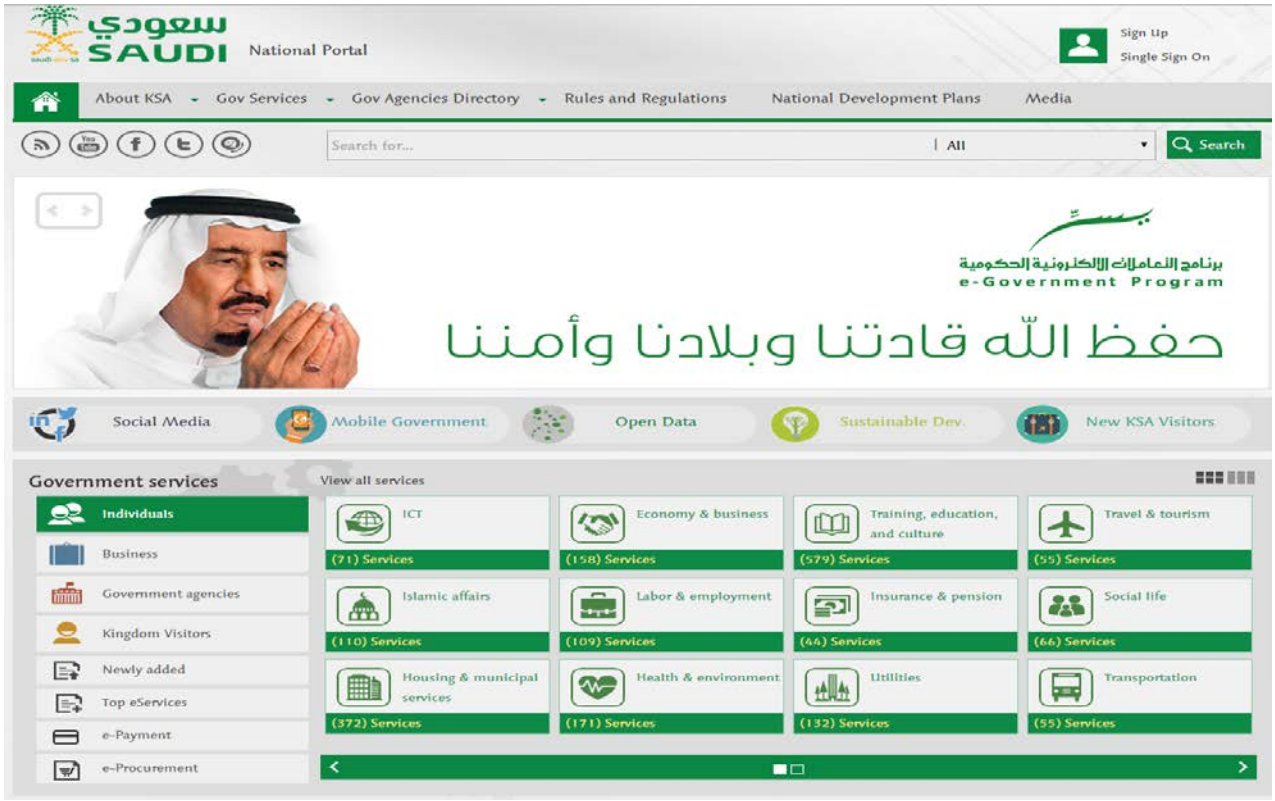

Figure 3.4: Layout of the National e-Government Portal (Yesser (2015))

3.3.4.5 Single sign-on

Single sign-on (SSO) is an authentication process that requires individuals or enterprises to log in once and operate all e-Services offered by different government organisations. It is an important component in implementing e-Government transactions. It is essential to provide a unified reference number for each individual or enterprise to fulfil all requirements of concerned agencies relating to e-Government transactions and their applications (Yesser, 2015).

3.3.4.6 The National Enterprise Architecture Framework

The National Enterprise Architecture Framework (NEA) facilitates the delivery of a consistent and cohesive service to citizens and supports the cost-effective delivery of e-Services by government. NEA supports the identification of re-usable components and services. It facilitates a basis for ICT investment optimisation and enables more cost-effective and timely delivery of e-Services. It achieves this through a repository of standards, principles and reference models that assist in the design and delivery of business services to citizens. NEA's goals include the following: unification and alignment of EA-related terminology and structures on a national level, the creation and adoption of national technology standards and roadmaps, establishing lists of re-usable application components and of shared data components (Yesser, 2015).

3.3.5 Government Services Indicators

To measure government organisations' performance and progress regarding their e-Government services, the e-Government program (Yesser) launched two government services indicators

(Yesser, 2015). These are considered effective tools to measure performance and progress; they help government organisations identify services and develop a roadmap to transfer from traditional to e-Services, while enhancing their maturity level.

These services indicators are as follows:

1. Number of government services: this indicator measures the number of traditional services still delivered in a traditional manner (the customer has to make a physical visit to the government agency to obtain a service). The indicator compares traditional services to the services that have been transformed to e-Services (see Table 3.3 and Figure 3.5). The indicator also measures the number of government services available to each customer (see Table 3.4 and Figure 3.6).
2. Maturity level: the maturity level indicator measures the level and degree of maturity with respect to the delivery of e-Government services. Maturity is realised only by effective change, simplification and automation of internal government agency business processes (see Table 3.5 and Figure 3.7).

Table 3.3: Government Services

Government services		
Traditional services	286	11%
e-Services	2239	89%

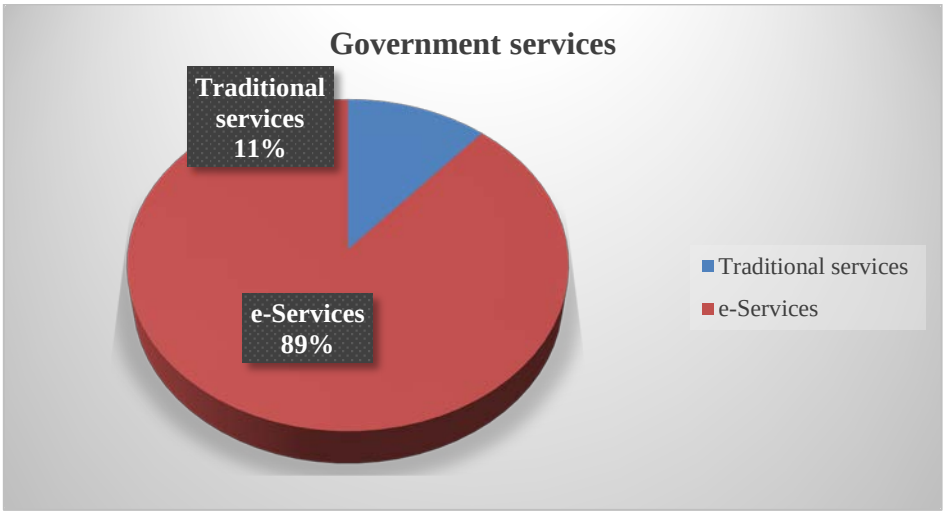

Figure 3.5: Government Services (Yesser (2015))

Table 3.4: Services based on the Beneficiary

The number of services based on the beneficiary		
(G2C) services	1953	55%
(G2B) services	1030	29%
(G2G) services	553	16%

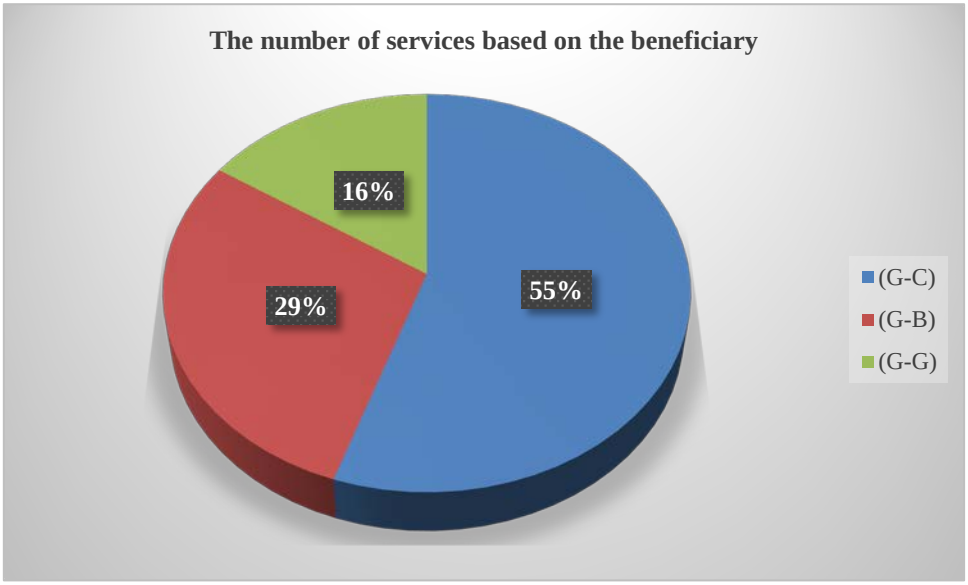

Figure 3.6: Services based on the Beneficiary (Yesser (2015))

Table 3.5: e-Services based on Maturity Level

e-Services based on maturity levels		
Informational service	370	16.6%
Interactive service	491	22.0%
Procedural service	1100	49.2%
Integrated service	273	12.2%

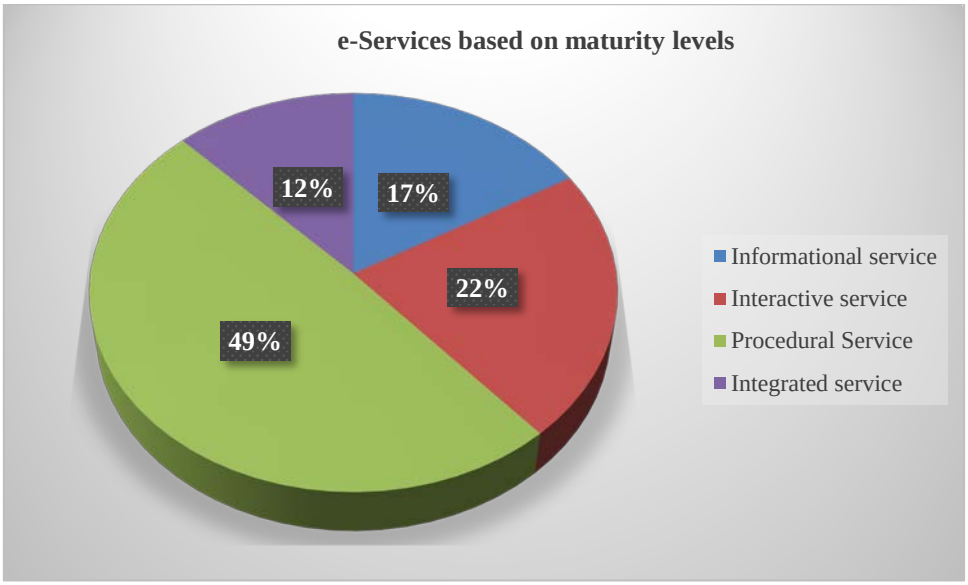

Figure 3.7: e-Services based on Maturity Level (Yesser (2015))

3.4 Previous e-Government Studies in Saudi Arabia

To understand the current state of the e-Government in Saudi Arabia, this section reviews previous studies of e-Government in Saudi Arabia. Many attempts have been made to evaluate e-Government implementation and adoption in Saudi Arabia. In 2005, a study by Abanumy et al. (2005) presented recommendations for improving e-Government website accessibility in Saudi Arabia. The researchers adapted the UN's e-Government stages model to examine e-Government progress in Saudi Arabia. They showed that 38% of Saudi ministries did not have an official website, 14% had reached the second stage, and 48% had reached the third stage. No ministry had reached the fourth or fifth stage. A 2005 study indicated the importance of non-technical factors when implementing e-Government (Al Mashet, 2005). Alsalloum (2005) studied internet adoption in Saudi Arabia, and found that IT adoption depends mainly on the firm's size and funds. Another study by Bawazir (2006) addressed the key factors for successful sustainable development, noting that organisations can achieve their goals by understanding technology thoroughly, allowing organisations to automate business processes; this enables better management of both those processes and the business's services. In the same year, Altameem, Zairi and Alshawi (2006) explored the critical factors for e-Government implementation. They suggested that technical, governance and organisational factors have a significant impact on e-Government implementation. In an e-Government workshop, Al-Shehry et al. (2006) investigated motivations behind the adoption of e-Government systems to provide insights into the e-Government phenomenon from a Saudi Arabian perspective. In 2008, an exploratory study of factors determining the success of e-readiness in Saudi Arabia by Al-Solbi and Al-Harbi (2008) found a lack of shared strategies and regulations for e-Government in Saudi Arabia is a very important issue and the government should take the appropriate action to solve this problem.

Another study by Al-Somali, Gholami and Clegg (2009) implemented the technology acceptance model (TAM) with regard to online banking in Saudi Arabia, examining the factors that influence the adoption of online banking in that country. In 2009, Al-Fakhri, Cropf, Higgs and Kelly (2009) indicated that while many Saudi government departments had websites, these were ineffective. They found that e-Government implementation faced many challenges, such as the current regulations and organisation structures not being appropriate to e-Government implementation. They also stated that fear of the transition process and the shortage of qualified IT staff operated as obstacles to e-Government implementation. They noted that financial resources had a negligible impact on e-Government implementation in Saudi Arabia. In the same year, a study focusing on the acceptability of e-Government by individuals indicated that continuing to educate and train youth in IS, such as e-Government and related areas was the most important factor in e-Government implementation (Hamner & Al-Qahtani, 2009). Another study by Al-Sobhi, Weerakkody and Kamal (2010) indicated that the digital divide and poor infrastructure for conducting payments (secure transactions) for e-Government services was hindering citizens' adoption of e-Services in Saudi Arabia. In the same year, Al-Shehry, Rogerson, Fairweather and Prior (2010) highlighted the key organisational issues that affect e-Government adoption in Saudi Arabia at both national and agency levels. Additionally, Alshehri and Drew (2010) noted that the adoption of e-Government faced many challenges and barriers, such as technological, cultural, organisational and social issues that must be considered and treated carefully. They identified that the lack of standardised, appropriate ICT infrastructure, a strategic plan, collaboration among public sector agencies, appropriate regulation, strong management support, and IT expertise, were crucial barriers to e-Government adoption. In an evaluation of e-Government ministry websites in Saudi Arabia, Al-Nuaim (2011) found that ministry web sites were not citizen-centred, instigating citizen dissatisfaction and frustration. She developed a five-stage framework to distinguish the actual presence of e-Government services between websites. She showed that one ministry out of 22 (4.6%) had no presence at all, eight ministries (36.4%) lacked the basic requirements of an e-Government website, ten ministries (45.4%) were in (or partially in) Stage 1, three ministries (13.6%) had reached Stage 2, while the remaining stages had not yet been reached.

In 2012, a study by Alzaheani and Goodwin (2012) extended the TAM, along with the unified theory of acceptance and use of technology (UTAUT) with regard to e-Government in Saudi Arabia. This thesis examined the factors influencing the adoption of e-Government. In the same year, a study by Alshehri, Drew and Alfarraj (2012) explorde the key factors of user adoption of e-Government services. They identified important factors that affect the adoption process directly, such as technical support, training programs, performance network and internet infrastructure. Kurdi (2013) developed a framework to support e-Government information systems readiness (EGISR) and cloud computing. His framework contains internal, as well as external, factors affecting e-Government readiness.

These have been categorised into four main layers: technology readiness, organisational readiness, people/stakeholders readiness and environment readiness.

In 2013, Alfarraj et al. (2013) identified the factors influencing e-Government development that contributed to delays in initiatives at Saudi government organisations. They concluded that cooperation and collaboration were important factors influencing e-Government implementation in Saudi Arabia, along with other identified factors. Alateyah, Crowder and Wills (2013) developed an integrated model that identified the influential factors affecting citizens' intentions to adopt e-Government services in Saudi Arabia. In the same year, Alghamdi, Goodwin and Rampersad (2013) highlighted the main internal factors involved in assessing e-Government organisational readiness and examined how these factors lead to successful, organisational e-Government readiness. Alfirm (2014) also noted that the majority of Saudi government organisations did not use social media to deliver services. A study by Chatfield and Alanazi (2015) indicated that government had not yet met the requirement for citizen-centric e-Government development. However, they found that both the e-Government interoperability policy framework and collaborative governance had contributed to overcoming citizen-centric implementation challenges.

All of these studies, conducted in Saudi Arabia by various researchers, have focused on different perspectives. Some have concentrated on e-Government adoption, implementation and readiness from a citizen perspective, while others have conducted their research from government perspectives. No rigorous research focusing on the implementation of t-Government in Saudi Arabia has been conducted since the e-Government initiative was launched.

This research proposes a conceptual model for implementing e-Government interoperability between government organisations to achieve t-Government, by identifying the factors influencing the successful implementation of t-Government. These different studies are significant and informative; the discussion chapter will examine how these studies relate to the present research.

3.5 Chapter Summary

This chapter has outlined the background of e-Government and e-Government initiatives in Saudi Arabia. This chapter has also examined the previous studies related to e-Government in Saudi Arabia. The UN's evaluation of e-Government in Saudi Arabia was presented. Much effort has been made to implement e-Government among Saudi government organisations. However, this effort has not achieved the desired results. Hence, this research has developed a model to explore the key factors affecting interoperability between government organisations to facilitate t-Government implementation within the Saudi Arabian context. The next chapter proposes a conceptual model based on the limitations and gaps identified in the existing literature, and on the critical review and

analysis of relevant information collected from existing frameworks and models, using institutional theory as the methodological lens.

CHAPTER 4: THE RESEARCH MODEL

4.1 Introduction

This chapter develops a conceptual model for the study of key factors affecting the interoperability level required for t-Government implementation in the Saudi Arabian public sector, using institutional theory as a lens. It is based upon the critical review and analysis of information collected from previous studies, interoperability frameworks and models related to t-Government in the literature review.

There is a perceived need in, and increasing pressure on, the academic sector for research focusing on bridging the gap between t-Government theory and practice (Novakouski & Lewis, 2012; Solli-Sæther & Flak, 2012). Therefore, based on the identification of the gaps in the literature and the current situation of e-Government in Saudi Arabia (examined in Chapter 3, as well as the theories and models reviewed in Chapter 2), this chapter develops a conceptual model for identifying those factors influencing successful t-Government implementation. No research on applying t-Government in Saudi Arabia exists currently; as such, the conceptual model developed here will be used as a road map for empirical data collection and analysis. This will establish a comprehensive overview of t-Government implementation in the Saudi Arabian context.

The chapter will also discuss the proposed hypotheses and main constructs of the thesis. These will be refined, tested and validated by IT managers and other managers and staff involved in day-to-day planning, executing, controlling and regulating e-Government projects. However, this thesis is limited to G2G perspectives, and therefore e-Government adoption by citizens lies outside its scope. It is expected that the proposed conceptual model will be attractive to e-Government officials, IT managers and researchers charged with analysing and implementing e-Government, and therefore should be considered favourably by e-Government officials and policy makers within Saudi Arabian government organisations.

This chapter is structured as follows: Section 4.2 presents the conceptual model. Section 4.3 outlines the research model and hypothesis development. Finally, Section 4.4 presents a summary of the chapter findings.

4.2 The Proposed Conceptual Model

This research aims to explore the factors influencing the interoperability level required for t-Government implementation. No research has attempted to address and identify the factors affecting interoperability for t-Government implementation in the context of Saudi Arabia until now. Therefore, this research has developed a conceptual model to fill this gap. This research will assesses the

factors affecting interoperability for t-Government implementation in the Saudi public sector by considering key forces within the organisational, technological, political and social contexts. These factors are discussed in the next sections.

This conceptual model applies only to t-Government implementation within G2G situations. It is based upon a critical review and analysis derived from the study of interoperability frameworks and other related models. The model should be refined and validated by e-Government officials and IT managers from within the organisations proposing its implementation. It will then be tested, analysed and validated by other managers and staff involved in day-to-day planning, execution, control and regulation of e-Government projects. Institutional theory is the study's methodological lens; Figure 4.1 illustrates the conceptual model. This conceptual model consists of four levels or contexts: organisational, technological, social and political. The following sections discuss these factors in more detail.

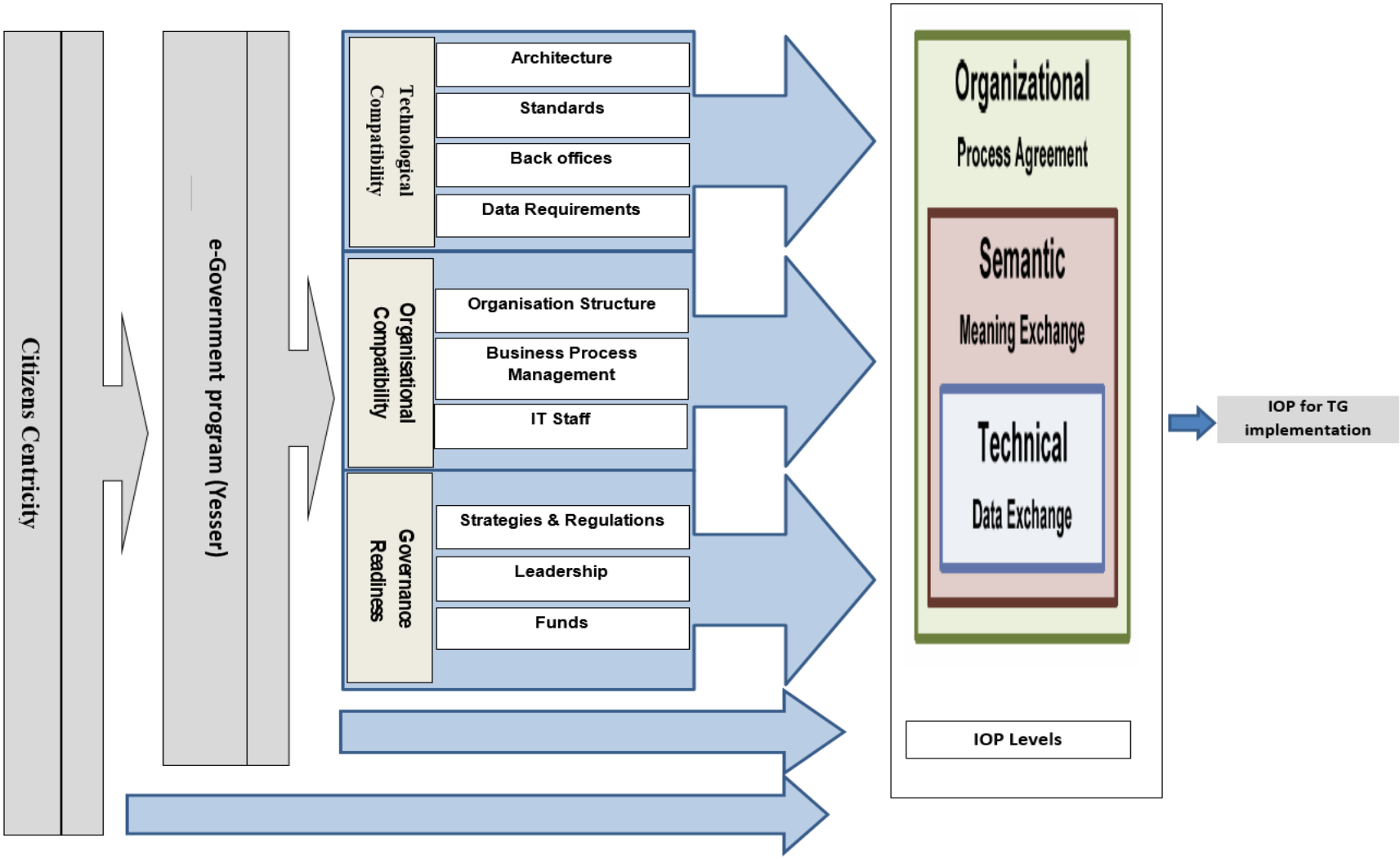

Figure 4.1: The Proposed Conceptual Model for Factors Influencing Interoperability Levels for Migration Towards t-Government

4.3 Research Model and Hypothesis Development

Several important constructs must be considered when assessing this research model. The selection of measurement constructs should be based on the objectives of the assessment and the nature and demands of the projects prioritised for t-Government implementation. The proposed research model comprises six constructs: interoperability for t-Government (IOP for TG) implementation, technological compatibility (TC), organisation compatibility (OC), governance readiness (GR), e-Government program (Yesser) (e-Government), and citizen centricity (CC).

Based on the current situation of e-Government in Saudi Arabia as examined in Chapter 3, and the literature review in Chapter 2, a number of measurement items can be used to measure these constructs. Most have not yet been studied adequately in the context of Saudi t-Government implementation. The model can be hypothesised as follows:

- Technological compatibility (TC) is affected by e-Government program (Yesser), which influences interoperability for t-Government implementation (IOP for TG).
- Organisation compatibility (OC) is affected by e-Government program (Yesser), which in turn influences interoperability for t-Government implementation (IOP for TG).
- Governance readiness (GR) is affected by e-Government program (Yesser), which in turn influences interoperability for t-Government implementation (IOP for TG).
- e-Government program (Yesser) is affected by citizen centricity, which in turn influences interoperability for t-Government implementation (IOP for TG).
- Citizen centricity (CC) has a direct effect on interoperability for t-Government implementation (IOP for TG) (see Figure 4.2).

This section provides definitions for each of the relevant constructs in the context of this thesis.

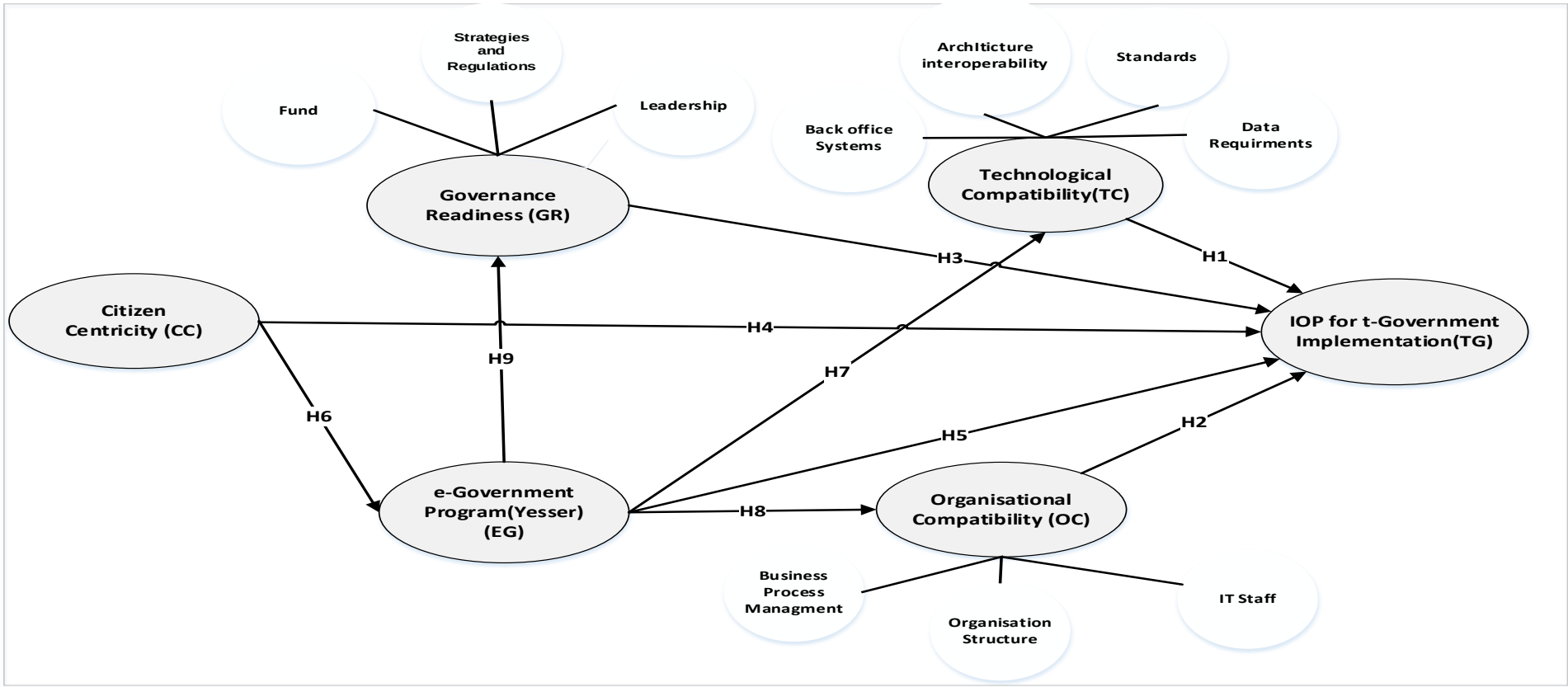

Figure 4.2: The Hypothesised Research Model

4.3.1 Technological Compatibility Construct

This research assumes that the required interoperability level for t-Government implementation will be influenced by technological compatibility. Technological compatibility refers to the compatibility of the IT required for creating interoperability between government organisations to facilitate t-Government implementation. Compatibility is a technological property of system components that enables two components to function together. According to Landsbergen Jr and Wolken Jr (2001), technological compatibility will always be an important consideration when establishing interoperability. By analysing this construct, insight will be gained regarding t-Government implementation requirements (Soliman, Affisco, Affisco, & Soliman, 2006). Researchers hold different opinions as to the most effective classification methods for technological compatibility issues. For the purpose of this thesis, technological compatibility factors focus on those matters that affect the integration between government organisations and interoperability for t-Government implementation. These include (a) IT standards, (b) architecture interoperability, (c) data requirements and (d) back-office systems. Table 4.2 explains these factors and their dimensions in detail. Interoperability may have a negative effect on security. However, as discussed earlier in Chapter 3, the e-Government program (Yesser) created GSB and GSN, which are the key secure connection points for e-Government among organisations. Security issues are not considered here as they are outside the scope of this research.

IT standards are crucial to successful technical interoperability and t-Government implementation (Budhiraja, 2012; Lallana, 2008). The development of IT standards is an important milestone in enabling interoperability across different government organisations. It is common for government agencies to have different, incompatible hardware and software that may not operate or integrate, causing t-Government implementation difficulties. This hinders both G2G development efforts and consequently, eventual t-Government implementation (Gil-Garcia et al., 2005; Gottschalk & Solli-Sæther, 2008b; Lam, 2005b; Skiftenes, 2006). Standards are necessary to avoid hardware and system barriers that would hinder successful t-Government implementation. Keen and Klahr (1991) have defined standards as agreements of procedures, formats and interface functions that assist system and hardware designers to develop new services different from each other, but which remain well suited and compatible if required. Nyrhinen (2006) argues that IT standards transcribe how IT assets are to be obtained, managed and used within an organisation. Standards link the use of physical and intellectual IT assets. Therefore, IT standards are a major factor in t-Government implementation (Gil-Garcia et al., 2005; Gottschalk & Solli-Sæther, 2008b; Lam, 2005b; Skiftenes, 2006). In this thesis, IT standards are measured by hardware, software; open, common, interoperable, and technical features (see Table 4.2).

Architecture interoperability is mainly used to establish e-Government interoperability and the consequent feasibility of implementing t-Government (Lallana, 2008). Many organisations adapt

architecture to achieve interoperability (Al-Khanjari, Al-Hosni, & Kraiem, 2014). Architecture interoperability can apply at different levels, for instance at the systems, enterprise, state or national levels. This thesis is concerned with the systems level. According to Lam (2005a), considerable levels of technical difficulty are faced by many government organisations when integrating e-Government systems. Many of these had previously existed as isolated 'islands of IT'. Other challenges inherent in the integration of e-Government systems include the use of different technology platforms, the employment of proprietary technologies, and the 'closed' design of existing applications. This results in an absence of application interfaces, and differences in development (programming) frameworks (Lam, 2005a). Therefore, this thesis measures architecture interoperability by the ease of application integration, platform commonality, architectural consistency, interoperable architecture, and programming frameworks (see Table 4.2).

Data requirements are a key factor for interoperability and t-Government implementation; hence, they must be managed efficiently and categorised if the integration between different public organisations is to be effected smoothly. Data requirements include capability dimension concerns about identifying and specifying formal policies for data collection, use, storage and handling, as found in documentation of databases, record systems, data quality standards and dictionaries (Pardo & Burke, 2008b). Data comprise a key issue of technological compatibility (AGIMO, 2005, 2009b; Welzel, Hartenstein, & Lucke, 2009). A major concern of many government organisations is the efficient transference of data between different government units. Many organisations might not be prepared to share data with others, for the legal reason that some existing data may not be viewed or accessed by unauthorised people (Themistocleous, Irani, & Love, 2005). According to Lam (2005b), the seamless and efficient exchange of data between government organisations is a fundamental requirement in EGI. Additionally, Harrison et al. (2012) have noted that data concerns are crucial considerations when implementing e-Government. Data requirements in this thesis are measured by the data standards currently in use across organisations, data ownership across government agencies, data legislation, and data access rights (see Table 4.2).

Back-office system integration is one of the biggest obstacles to interoperability for t-Government implementation (Bekkers, 2005; Elnaghi, AlShawi, Weerakkody, & Aziz, 2009; Gottschalk, 2009b). Back-office systems (where the service is produced) refer to the internal operations of an organisation that are not accessible or visible to the public (Sarantis et al., 2008). Internal communication within government departments is often very fragmented, with a lack of cooperation between front- and back-office systems, leading to confusion and frequent serious 'bottlenecks' in e-Government. For successful e-Government interoperability, these systems must operate efficiently. They also require flexibility to enable integration between different or fragmented back-office systems and functions, so that t-Government implementation is successful. Business process management is also necessary at the back-office system level (Snijkers, 2006). Integration

assumes that all participant agencies are joined. The more complex the t-Government development, the more integration becomes necessary among back-office systems. Many researchers have stated that e-Government systems need to link vertically and horizontally between front- and back-office IS, and between different government agencies, for effective t-Government implementation (Al-Shafi, 2009; Baum & Di Maio, 2000; Kamal et al., 2009; Kor, Orange, Elsheikh, Cullen, & Hobbs, 2008; Layne & Lee, 2001; Weerakkody & Dhillon, 2008, 2008; Zarei, Ghapanchi, & Sattary, 2008). In this thesis, back-office systems are measured through managing the business processes of the back-office systems, back systems integration, back systems governance, and legacy back systems (see Table 4.2).

Hence, there is a causal link between technological compatibility and interoperability required for t-Government implementation. The following hypothesis is proposed:

- H1: Technological compatibility factors positively influence the level of interoperability required for t-Government implementation.

4.3.2 Organisational Compatibility Construct

Organisational compatibility issues represent a significant factor in interoperability for t-Government implementation (Weerakkody & Dhillon, 2008). Consequently, organisational compatibility must be thoroughly understood, and any inherent difficulties overcome before achieving satisfactory t-Government adoption (Soliman et al., 2006). Organisational compatibility refers to the organisational changes required for creating interoperability between government organisations to facilitate t-Government implementation. Researchers' opinions vary as to how organisational compatibility issues should be classified, but for the purpose of this thesis, organisational compatibility factors will relate to the ability of government organisations to interoperate and implement t-Government. Thus within these parameters, it will involve: (a) IT staff, (b) organisational structures, and (c) business process management (BPM). Table 4.2 explains these factors and their dimensions in detail.

As IT staffing is an important factor in interoperability and t-Government implementation, organisations with qualified IT staff will be better equipped to deal with both the initial implementation, and any subsequent issues arising from it (Lam, 2005a; Malinauskienė, 2013; Pardo et al., 2011). Conversely, a lack of necessary in-house skills represents a major challenge to successful t-Government implementation (Lam, 2005a). As with all innovative technological phenomena, the skill set for effective employment of t-Government can become obsolete quickly. Therefore, organisations are responsible for ensuring proper and adequate staffing of IT departments to ensure smooth changeovers and future efficiency; organisations must also introduce employee education and training where necessary (Altameem et al., 2006; Huang &

Bwoma, 2003; Weerakkody & Choudrie, 2005). In this thesis, the IT staff factor is measured by training, availability, the existence of in-house staff, and resistance to change.

As public sector organisations are established to accomplish specific tasks, they tend to be highly fragmented, with a relatively high degree of autonomy and hierarchical structures. Thus, they present a major challenge to successful t-Government implementation (Van Veenstra et al., 2011). Organisational structures represent the means whereby an organisation separates and coordinates internal responsibility relationships (Daft, 2012; Strens & Dobson, 1994). Jackson and Morgan (1982) define organisational structures as 'the relatively enduring allocation of work roles and administrative mechanisms that creates a pattern of interrelated work activities and allows the organisation to conduct, coordinate, and control its work activities' (p. 81). As t-Government implementation necessarily requires a radical re-engineering of work processes, public sector agencies will be encouraged to make the necessary fundamental changes to their organisational structures (Al-Mashari, 2006; Gascó, 2010; Scholl, 2005; Scholl, 2003; Weerakkody & Dhillon, 2008). This will enable them to overcome hierarchical fragmented structures (Themistocleous et al., 2005). Organisational structure will be measured in this thesis by interoperable, updated, bureaucratic and other suitable structures.

When contemplating integration with other government organisations, BPM should be regarded as a crucial component of organisational compatibility (Gottschalk, 2009a; Gottschalk & Solli-Sæther, 2008a). Therefore, this thesis treats BPM as part of organisational compatibility. BPM is the way in which an organisation manages its business by focusing on its processes (AGIMO, 2007). To increase and ensure the quality of interaction between government organisations, business processes must be managed in collaboration with IT and beneficiary departments, making use of the skill sets available to experienced IT and business personnel (Van Veenstra et al., 2011).

Introduced in the 1990s by Hammer (1990), BPM is an important e-Government factor, and therefore is a major aspect of t-Government implementation. Business process interoperability is the key to t-Government (AGIMO, 2007). This thesis measures BPM by business process documentation, integration, standards, expertise, adequate training and business process coordination.

Hence, there is a causal link between organisational compatibility and interoperability required for t-Government implementation. The following hypothesis is proposed:

- H2: Organisational compatibility factors positively influence the level of interoperability required for t-Government implementation.

4.3.3 Governance Readiness Construct

Governance readiness in e-Government is closely linked with the political context, as success depends on the level of commitment and innovative vision shown by politicians (Heeks & Stanforth, 2007). Therefore, support from government is necessary to create the appropriate levels of interoperability required for t-Government implementation. According to Heinrich & Lynn (2000), 'governance refers to the means for achieving direction, control and coordination of wholly or partially autonomous individuals or organisations on behalf of interests to which they jointly contribute' (p. 235). In referring to public policies and their implementation, these authors define governance 'as regimes of laws, administrative rules, judicial rulings, and practices that constrain, prescribe and enable government activity, where such activity is broadly defined as the production and delivery of publicly supported goods and services' (Heinrich & Lynn, 2000, p. 235). For the purposes of this research, governance readiness is concerned with principles, roles, responsibilities and compliance strategies to build a comprehensive planning system that will clarify the roles and responsibilities of all government organisations. This will mitigate technological incompatibility and resistance to change. It will encourage investment in scalable strategies and enhance the level of interoperability required for t-Government implementation. It includes: (a) strategies and regulations, (b) leadership and (c) funds. Table 4.2 explains these factors and their dimensions in detail.

Strategies and regulations are important in e-Government development, and are one of the most important element involved in t-Government implementation (Ray, Gulla, Dash, & Gupta, 2011); t-Government establishment inevitably requires major changes in strategic direction, and to modes of paradigm thinking (Elnaghi et al., 2009; Lam, 2005a). Thus, a comprehensive e-Government strategy includes goals, vision and plans, and becomes a major factor when collaboration between government agencies is necessary to ensure successful presentation of online services (Lam, 2005a; Pilling & Boeltzig, 2007; Sang, Lee, & Lee, 2009; Snijkers, 2006).

Appropriate regulations are also important for successful t-Government implementation, as the absence of such a regulatory framework is one of the more onerous challenges hindering effective t-Government establishment (Altameem et al., 2006; Carter & Belanger, 2004; Sahli, Mellouli, & Jabeur, 2009). For the purpose of this thesis, strategies and regulations are measured through the importance of an e-Government strategy, strategy plans, goals, vision and commitment, clear and updated regulations, best practices and national plans.

Leadership always plays a significant role in any group endeavour; thus, the quality of the leadership will have a significant effect on successful t-Government implementation, particularly in e-Government projects requiring a high level of interoperability (Pardo & Burke, 2008a; Pardo et al., 2011). t-Government projects are long-term; consequently, the quality of leadership is crucial (Malinauskienė, 2013). Strong leaders are required to overcome the inherent challenges involved

in such activities. Researchers have identified both vision and leadership as the main drivers of successful e-Government (Elnaghi et al., 2009; Ke & Wei, 2004; Seifert & McLoughlin, 2007). According to many studies (Jaeger & Thompson, 2003; Ndou, 2004; Prybutok, Zhang, & Ryan, 2008), affective leadership is a major contributory factor to successful t-Government implementation. The effectiveness of any leadership derives from its quality. Altameem et al. (2006) and Prybutok et al. (2008) state that effective leaders express more complex and contradictory behaviour than ineffective leaders. Zairi (1994) claims that '[n]owadays leadership is considered as a must for survival. It comes from the level of inspiration, commitment generated and corporate determination to perform' (p. 9). Thus, a particular challenge to government (as the top manager of a project) relates to selecting a strong political leader with both IT and management skills, capable of leading the project to successful completion (Elnaghi et al., 2009; Ke & Wei, 2004; Seifert & McLoughlin, 2007).

The change from e-Government to t-Government requires a major shift in paradigm thinking and strategic direction. It requires a new style of leadership that can format this transformation and provide appropriate management and IT infrastructure to support that dynamic and critical change. In this thesis, leadership is measured by top leaders, leadership support, style and cooperation, and the influence of strong leadership.

As e-Government initiatives are long term, they require ongoing financial support from the government. This can become a major challenge if that funding has to come from a government where political influence may interfere with decisions taken by high-level officials (Eyob, 2004; Pardo et al., 2011). Moreover, Gottipati (2002) argues that the way e-Government projects are being reviewed and funded in the Arabian Gulf is such that projects appear budget-, rather project-based. Thus, funding is inevitably a crucial factor in t-Government implementation, as a lack of adequate, consistent financial backing will become a major challenge to successful e-Government implementation (Huang & Bwoma, 2003). Adequate funding supports the necessary integration of government organisations by facilitating the infrastructure development (such as building, technology, human resources) required to implement t-Government. It ensures that goals and targets are met on time. Its impact on e-Government interoperability is also positive (Pardo et al., 2011). Funding is measured in this thesis through fund amount, measurement mechanisms, fund management and fund controlling factors.

Hence, there is a causal link between governance readiness and interoperability required for t-Government implementation. The following hypothesis is thus proposed:

- H3: Governance readiness factors positively influence the level of interoperability required for t-Government implementation.

4.3.4 Citizen Centricity Construct

t-Government implementation requires that technology investments and service transformation must be directed towards citizens' needs (Irani et al., 2007). This requires a shift from organisation-centric operations to a more citizen-focused approach (Themistocleous et al., 2005). Citizen centricity is identified as a critical success factor for t-Government implementation, which means that interoperability among public organisations becomes imperative (Janssen & Scholl, 2007; Themistocleous et al., 2005). t-Government implementation is about government organisations availing themselves of the latest in technological advances to serve its citizens better. It requires cooperation between government organisations to provide seamless, accessible and citizen-focused government services (Al-Sebie & Irani, 2005; Irani et al., 2007; Weerakkody & Dhillon, 2008). Therefore, the focus should be on citizens' needs and the delivery of services that add value for citizens (Lindquist, 2013; PWC, 2012; UN, 2014). Governments tend to use social media to meet citizens' needs. The public is already very familiar with social media platforms such as Facebook and Twitter and these platforms provide an opportunity for government organisations to rely on them without establishing their own platforms (Alfirm, 2014; Alateyah et al., 2013). These platforms are cost efficient, as social media initiatives do not require high investment costs; they typically operate on commercial and non-governmental platforms. Once these tools are in place, governments can also consult on sector-related issues that affect citizens' quality of life (UN, 2014). This is a step beyond the simple provision of information as described above. In a similar vein, governments can learn to use social media as a tool to collect and consider people's views and feedback. Citizen centricity is measured in this thesis by citizen-centric focus, citizen needs, citizen satisfaction, and citizen understanding.

Hence, there is a causal link between citizen centricity and interoperability required for t-Government implementation. The following hypothesis is proposed:

- H4: Citizen centricity positively influences the level of interoperability required for t-Government implementation.

4.3.5 e-Government Program (Yesser) Construct

During the last years, central governments have faced increasing demands regarding interoperability and integration to implement t-Government. Governments have initiated comprehensive frameworks that provide guidance for activities at the local and regional levels, avoiding investments that do not contribute to interoperability (Klischewski, 2004). This engagement supports t-Government implementation through a thoroughly developed plan (Irani et al., 2007). According to Weerakkody and Dhillon (2008):

> Central government departments are endeavouring to work with each other to deliver better services to citizens via a one-stop-shop environment for all services under the guise of electronic government (e-Government). (p. 1)

In his analysis of e-Government adoption, Reddick (2005) identifies central government as the supply-side perspective responsible for governance, provision and services delivery. In the Saudi Arabian context (as stated in Chapter 3), central government e-Government is operated by the e-Government program Yesser. Yesser operates as facilitator, enabler, and motivator for e-Government implementation in the public sector through establishing various initiatives and products. Important factors must be considered in this research to measure Yesser's impact on the interoperability required for t-Government implementation. These factors include integration between Yesser, GSB, GSN, SSO, NEA, and the Saudi portal (Yesser, 2015).

Hence, there is a causal link between the e-Government program (Yesser) and the interoperability required for t-Government implementation. The following hypothesis is proposed:

- H5: The e-Government program (Yesser) positively influences the level of interoperability required for t-Government implementation.

As stated in Chapter 3, the Yeseer program has provided many technical initiatives that should lead to e-Government development in Saudi Arabia and facilitate the inte-governmentration between government organisations. In addition, Yesser enables organisations to build a reliable infrastructure that facilitates e-Government implementation and enables data exchange between government organisations by improving organisations' back-office performance. Yesser also helps government organisations to standardise work processes inside an agency by presenting standards for e-Government systems specifications. Further, the Yesser program has developed many strategies and regulations to support e-Government implementation. Moreover, the Yesser program was created to increase the government organisation productivity, to provide e-Government services to citizens in a simple and appropriate way.

One of the objectives of creating Yesser was to provide better, more convenient, and more seamlessly integrated e-Government services for citizens. Yesser began promoting citizen-centric services by providing e-Services via the Saudi Arabian government national portal. It has done this by integrating with other government organisations and creating links to their websites, enabling citizens to access e-Services anytime and from anywhere through the internet. This approach was chosen as the best way to enable efficient government services. This indicates clearly that a significant citizen centricity influence on the e-Government program exists (Yesser, 2015). Therefore, the following hypotheses are proposed:

- H6: Citizen centricity positively influences the e-Government program (Yesser).
- H7: The e-Government program (Yesser) positively influences Technological Compatibility.
- H8: The e-Government program (Yesser) positively influences Organisational Compatibility.
- H9: The e-Government program (Yesser) positively influences Governance Readiness.

Tables 4.1 and 4.2 below illustrate the research hypotheses model and the items used to measure the model constructs.

Table 4.1: Research Hypotheses

Hypothesis	Description
H1	Technological Compatibility factors positively influence the level of interoperability required for t-Government implementation
H2	Organisational Compatibility factors positively influence the level of interoperability required for t-Government implementation
H3	Governance Readiness factors positively influence the level of interoperability required for t-Government implementation
H4	Citizen Centricity positively influences the level of interoperability required for t-Government implementation
H5	The e-Government program (Yesser) positively influences the level of interoperability required for t-Government implementation
H6	Citizen Centricity positively influences the e-Government program (Yesser)
H7	The e-Government program (Yesser) positively influences Technological Compatibility
H8	The e-Government program (Yesser) positively influences Organisational Compatibility
H9	The e-Government program (Yesser) positively influences Governance Readiness

Table 4.2: Measurement Items for the Conceptual Model

Constructs	Measured Item	Item Name	Code	References
Technological Compatibility (TC)	IT Standards	Hardware standards	S_1	Pardo et al. (2011)
		Software standards	S_2	Pardo et al. (2011), Tripathi et al. (2012a; 2012b)
		Open Standards	S_3	Budhiraja (2012), Ray et al. (2011), Tripathi et al. (2012a; 2012b), Irani & Alsebi (2006), Tambouris et al. (2007)
		Common standards	S_4	Ezz & Papazafeiropoulou (2006), Laskaridis et al. (2007), Ray et al. (2009) Gottschalk (2009a) Soares & Amaral (2011) (Gouscos et al. (2007)
		Interoperable standards	S_5	Pardo et al. (2011), Skiftenes (2006) Soares & Amaral (2011)
		Technical standards	S_6	Dos Santos & Reinhard (2011), Lam (2005a), Nyrhinen (2006)
	Architecture interoperability	Consistent architecture	A_1	Soares & Amaral (2011), Weerakkody & Dhillon (2008)
		Applications integration	A_2	Kamal et al. (2009), Lam (2005b) Ray et al. (2011)
		Interoperable architecture	A_3	Lam (2005a) Elliman, Sarikas & Weerakkody (2007) Skiftenes (2006) Ebrahim & Irani (2005)
		Program framework	A_4	Lam (2005a), Skiftenes (2006)
		Platforms	A_5	Garlan, Allen & Ockerbloom (1995), Gottschalk (2009b), Hreño, Bednár, Furdík & Sabol (2011) Skiftenes (2006)
	Data requirements	Data ownership	D_1	Lam (2005a), Laskaridis et al. (2007), Ray et al. (2009) Landsbergen Jr & Wolken Jr (2001)
		Data legislation	D_2	Dos Santos & Reinhard (2011), Lam (2005a), Laskaridis et al. (2007), Weerakkody & Dhillon (2008)

Constructs	Measured Item	Item Name	Code	References
		Data monitoring	D_3	Lam (2005a), Laskaridis et al. (2007), Tripathi et al. (2012b)
		Data standards	D_4	Herbert & Ralf (2009), Kubicek, Cimander & Scholl (2011), Lam (2005a), Landsbergen Jr & Wolken Jr (2001), Pardo et al. (2011)
	Back systems	Business process of back systems	BA_1	Decoster & Zwicker (2009), Elliman et al. (2007), Weerakkody & Dhillon (2008)
		Integration between back systems	BA_2	Herbert & Ralf (2009), Klischewski & Scholl (2006), Ray et al. (2011), Tripathi et al. (2013), Weerakkody & Dhillon (2008) Kamal et al. (2009) Elnaghi, AlShawi, Weerakkody & Aziz (2009) Gottschalk (2009b) Irani & Alsebi (2006)
		Governance of back systems	BA_3	Gottschalk (2009b), Herbert & Ralf (2009), Bekkers (2005)
		Back systems legacy	BA_4	Elliman et al. (2007), Ezz & Papazafeiropoulou (2006), Herbert & Ralf (2009), Lam (2005a), Pardo et al. (2011), Themistocleous et al. (2005), Weerakkody & Dhillon (2008) Skiftenes (2006) Ebrahim & Irani (2005)
Organisational Compatibility (OC)	IT staff	Staff resistance	ST_1	Janssen & Cresswell (2005), Weerakkody & Dhillon (2008) Joia (2004)
		Staff training	ST_2	Heeks (1999), Lam (2005a), Malinauskienė (2013), Moon (2002), Tat-Kei Ho (2002), Valdés et al. (2011) Themistocleous (2005) Malinauskienė (2013) Ebrahim & Irani (2005) Joia (2004)
		Staff availability	ST_3	Dos Santos & Reinhard (2011), Kamal & Alsudairi (2009) Pardo et al. (2011), Soares & Amaral (2011), Tripathi et al. (2013) Irani & Alsebi (2006)
		In-house staff	ST_4	Altameem, Zairi & Alshawi (2006), Dos Santos & Reinhard (2011), Elliman et al. (2007), Lam (2005a), Weerakkody & Dhillon (2008)

Constructs	Measured Item	Item Name	Code	References
	OS	Update OS	STR_1	Abramowicz, Bassara, Wisniewski & Zebrowski (2008), Decoster & Zwicker (2009), Lam (2005a)
		Suitable OS	STR_2	Decoster & Zwicker (2009), Pardo et al. (2011), Weerakkody & Dhillon (2008)
		Bureaucracy of OS	STR_3	Janssen & Cresswell (2005), Kamal, Weerakkody & Irani (2011), Malinauskienė (2013), Weerakkody & Dhillon (2008), Hu, Cui & Sherwood (2006)
		Interoperable OS	STR_4	Decoster & Zwicker (2009), Janssen, Charalabibis, Kuk & Cresswell (2011), Ebrahim & Irani (2005)
	BPM	Business process integration	BU_1	Hammer & Champy (1994) Irani et al. (2007)
		Business process training	BU_2	Davenport (2013), Grover, Jeong, Kettinger & Teng (1995) Weerakkody & Dhillon (2008) Themistocleous et al. (2005)
		Business process coordination	BU_3	Al-Rashidi (2013), Davenport (2013), Grover et al. (1995), Herbert & Ralf (2009), Laskaridis et al. (2007) Weerakkody & Dhillon (2008)
		Business process documentation	BU_4	Davenport (2013), Müller, Tilley & Wong (1993)
		Business process standards	BU_5	Davenport (2013), Feuerlicht & Cunek (2011), Grover et al. (1995), Hellman (2010), Müller et al. (1993) Pardo et al. (2011)
		Business process expertise	BU_6	Davidson (1993), Grover et al. (1995), Hellman (2010), Hoffman (1997)
Governance Readiness (GR)	Strategy & regulations	e-Government strategy	STA_1	Dos Santos & Reinhard (2011), Ray et al. (2011) Ebrahim & Irani (2005)
		Strategy commitment	STA_2	Lam (2005a)
		Strategy plan	STA_3	Lam (2005a), Malinauskienė (2013) Tripathi et al. (2013)

Constructs	Measured Item	Item Name	Code	References
		Strategy goal	STA_4	Lam (2005a), Pardo et al. (2011), Soares & Amaral (2011) Tripathi et al. (2013)
		Strategy vision	STA_5	Lam (2005a)
		Clear regulations	LE_1	Janssen & Scholl (2007), Pardo et al. (2011), Soares & Amaral (2011), Skiftenes (2006)
		Update regulations	LE_2	Janssen et al. (2011), Janssen & Scholl (2007), Lam (2005a), Pardo et al. (2011)
		Best practice	LE_3	Decoster & Zwicker (2009), Hellman (2010), Lam (2005a)
		National plan	LE_4	Decoster & Zwicker (2009), Hellman (2010), Lam (2005a), Lampathaki, Kroustalias, Koussouris, Charalabidis & Psarras (2010), Soares & Amaral (2011), Tambouris et al. (2007)
	Leadership	Leaders support	L_1	Klischewski & Scholl (2006), Lam (2005a), Luk (2009), Pardo et al. (2011), Tripathi et al. (2013), Irani et al. (2007)
		Strong leader	L_2	Bekkers (2005), Hossan, Habib & Kushchu (2006), Luk (2009), Pardo et al. (2011)
		Leader cooperation	L_3	Hellman (2010), Luk (2009), Ray et al. (2009), Soares & Amaral (2011)
		Leader style	L_4	Elnaghi, AlShawi, Weerakkody & Aziz (2009), Luk (2009), Malinauskienė (2013), Pardo & Burke (2008a), Pardo et al. (2011), Scholl & Klischewski (2007)
		Top leader	L_5	Luk (2009), Weerakkody & Dhillon (2008), Soares & Amaral (2011) Tripathi et al. (2013)
	Funds	Fund amount	F_1	Dos Santos & Reinhard (2011), Elliman et al. (2007), Huang & Bwoma (2003), Ray et al. (2009), Tripathi et al. (2013), Weerakkody & Dhillon (2008)
		Measurement mechanism	F_2	Scholl & Klischewski (2007), Soares & Amaral (2011), Hellman (2010)
		Fund management	F_3	Landsbergen Jr & Wolken Jr (2001), Ray et al. (2009), Scholl & Klischewski (2007), Hellman (2010)

Constructs	Measured Item	Item Name	Code	References
		Fund controlling	F_4	Klischewski & Scholl (2006), Pardo et al. (2011), Scholl & Klischewski (2007), Hellman (2010)
Citizen Centricity (CC)	CC	Citizen focus	C_1	Archmann (2007), Laskaridis et al. (2007), Lee (2010), Pardo & Burke (2008b), Shareef, Kumar, Kumar & Dwivedi (2011), Themistocleous et al. (2005) Irani et al. (2007) Elnaghi, AlShawi, Weerakkody & Aziz (2009)
		Citizen needs	C_2	Laskaridis et al. (2007), Pardo & Burke (2008b), Shareef et al. (2011)
		Citizen satisfaction	C_3	Laskaridis et al. (2007), Shareef et al. (2011)
		Citizen understanding	C_4	Laskaridis et al (2007), Shareef et al. (2011)
Central government	e-Government (Yesser)	Yesser integration	Y_1	Yesser (2006, 2012, 2015)
		Yesser GSN	Y_1	Yesser (2006, 2012, 2015)
		Yesser GSB	Y_1	Yesser (2006, 2012, 2015)
		Yesser SSO	Y_1	Yesser (2006, 2012, 2015)
		Yesser NEA	Y_1	Yesser (2006, 2012, 2015)
		Yesser 'Saudi'	Y_1	Yesser (2006, 2012, 2015)

4.4 Chapter Summary

This chapter sought to develop a model of key factors affecting the interoperability required for t-Government implementation within the Saudi public sector, in response to identify the research gap. This model is based on a critical review and analysis of relevant material derived from previous studies of interoperability frameworks and models related to t-Government (conducted in the literature review of Chapters 2 and 3). The research model was developed using institutional theory as a lens. It defines the five constructs determined as influencing t-Government implementation in Saudi Arabia. Nine hypotheses were generated to explore the most important factors likely to influence that implementation process. The following chapter discusses the appropriate research approach, the methodology and the design used to evaluate the proposed model. This will then be refined in Chapter 6, before being tested and validated in Chapter 7.

CHAPTER 5: RESEARCH METHODOLOGY

5.1 Introduction

This chapter discusses the study's research methodology. It explains and justifies the approach identified as being best suited to this investigation and details the method implemented. A research methodology is an overall approach to addressing a research problem; it requires a firm theoretical underpinning, and involves data collection, analysis and interpretation (Collis & Hussey, 2013). A number of research techniques are available, but it is important to select the technique that can best answer the research questions and is most suitable for the subject (Creswell, 2013; Srivastava & Thomson, 2009). As Simon (1969) notes, '[t]here are always many ways to tackle a problem, some good some bad, but probably there are several good ways. There is no single perfect design. A research method for a given problem is not like a solution to a problem in algebra … there is no "best" way' (p. 4).

This chapter will explain the most appropriate research approach and strategy, along with data collection and analysis techniques. The chapter commences with an overview of different paradigms and approaches to research, and then explains the selection of methodology relevant for this thesis. The implementation of a mixed-methods research approach is explained, together with such factors as strategy selection, data collection, data analysis, and reliability and validity issues relating to the current study. The chapter ends with a brief conclusion.

5.2 Research Paradigms and Approaches

Research must be based on theoretical and philosophical ways of knowing and learning about the world. In general, two main paradigms can be used to provide a basis for research: postpositivist and constructivist (Creswell, 2013; Denscombe, 2014).

Constructivist investigates why people have different experiences and perceptions, although it is less concerned with searching for external causes and fundamental laws to explain people's behaviour. Vygotsky (1978) originally proposed this theory, emphasising the critical importance of culture and social context for research findings. The central purpose of this philosophy is to obtain peoples' views about the research issue being studied, in this way gaining an in depth understanding of the research problem (Creswell, 2013).

Postpositivist focuses on developing hypotheses from an existing theory and making empirical observations of individual behaviour to confirm the hypotheses (Creswell, 2013; Neuman, 2010). As explained by Noor (2008):

> Postpositivist is about a reality which is socially constructed rather than objectively determined. Hence, the task of social scientist should not be to gather facts and measure how often certain patterns occur, but to appreciate the different constructions and meanings that people place upon their experience. (p. 1602)

It usually entails a theory and involves collecting data to prove or disprove that theory by examining the causal and co-relational relationships among variables (Creswell, 2013; Neuman, 2010). This approach uses precise numeric measures to test theories in a specific domain by selecting a limited set of variables for testing a specific hypothesis (Creswell, 2013; Neuman, 2010).

Constructivist is mostly associated with qualitative approaches that focus on exploring the meanings individuals ascribe to social or human problems (Denzin & Lincoln, 2008; Punch, 2013). This understanding (which may be based on only a small-scale survey) is achieved by obtaining textual data from a few selected cases. Qualitative studies explore the socially constructed nature of reality by understanding the meaning that people give when describing a phenomenon (Creswell, 2013). Qualitative approaches commonly use interviews and discussion groups to obtain data on people's experiences and ideas, and to determine how they give meaning to those experiences (Denzin & Lincoln, 2008). Data collected through interviews are analysed to identify themes and patterns regarding the situation being studied; multiple interpretations often exist (Creswell, 2013; Neuman, 2010).

Postpositivist is associated with quantitative methods whereby statistical procedures are used to analyse data (often large quantities of data); this analysis can then be generalised to a larger population (Punch, 2013). Quantitative techniques are often based on theoretical models. They focus on testing those theories to answer research questions (Creswell, 2013). In social research, quantitative approaches seek to obtain statistical descriptions of people's viewpoints and behaviours for testing and verifying specific theories in various situations (Creswell, 2013). To obtain data, one common approach is to use questionnaires and then analyse the data statistically to answer the research questions (Creswell, 2013).

Quantitative and qualitative approaches have their respective merits and disadvantages (Clark & Creswell, 2011). For example, quantitative approaches fail to consider the context in which people participate in dialogue (Clark & Creswell, 2011). Conversely, qualitative approaches recognise the environmental features in which data are collected, but these features are open to the influence of individual researcher's biases and personal interpretations of the information received (Clark & Creswell, 2011). Moreover, the results from small-scale qualitative research cannot be generalised to large populations. In contrast, quantitative approaches are free of personal bias and their results can (with some confidence) be generalised to a large group (Clark & Creswell, 2011).

Based on the discussion above, this research proposes a model to clarify and understand the factors that influence interoperability level required for t-Government implementation. It is useful to

adopt two paradigms: constructivist and postpositivist. It is evident that this research would be most effectively undertaken using constructivist principles during the first phase of the study. This would ensure that multiple perspectives and deeper understandings would be valued. Using a postpositivist approach during the second phase would guide the identification and measurement of variables and statistical trends. Thus, multiple perspectives have been used in this design, and these shift from one phase to the other (Clark & Creswell, 2011).

Qualitative research is useful in the exploratory stage (first phase) to develop the conceptual model and hypotheses, and to operate as the design foundation for quantitative research. The second phase quantitative research can provide explanatory or causal evidence regarding the proposed model (Clark & Creswell, 2011).

5.3 Research Design

This research has adopted a sequential mixed-methods (exploratory) design, as illustrated in Figure 5.1. Exploratory design is based on two main phases: qualitative followed by quantitative research. Qualitative research develops the conceptual model and hypotheses, and operates as a foundational design for the quantitative research. The quantitative research that follows is useful to test these model and hypotheses (Clark & Creswell, 2011). Summarising and interpreting the two strands is done at the final stage after the researcher has collected and analysed both sets of data (Clark & Creswell, 2011). This has the added benefit of enabling the researcher to obtain different data on the same research problem, achieving a better understanding of the problem (Clark & Creswell, 2011). Exploration with e-Government officials and top managers is useful to establish the important factors and the relationships between them; this is required to develop the model and hypotheses. In addition to contributing to refining the conceptual framework and identifying the sampling units for formal research, it is also useful to develop the research instrument for further empirical research (Blaxter, 2010; Clark & Creswell, 2011). After the qualitative phase, quantitative research is conducted to identify the key factors in t-Government implementation. This is also useful when testing the impact of factors identified in the previous phase. As such, an exploratory sequential mixed-methods methodology is extremely useful for this research (see Figure 5.1).

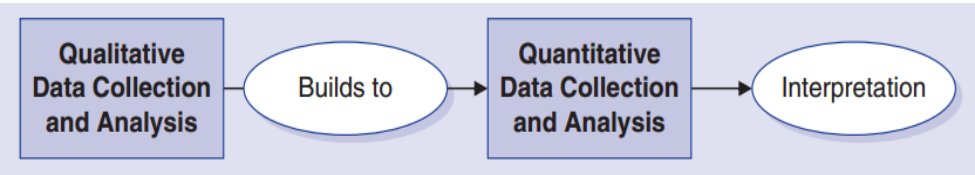

Figure 5.1: Exploratory Design (Clark & Creswell (2011))

The four steps for conducting exploratory sequential mixed-methods are: (a) strand design and data collection, (b) using strategies to build on the qualitative results, (c) designing and implementing the quantitative study, and (d) interpretation (Clark & Creswell, 2011). The first step

includes the collection and analysis of qualitative data to explore the phenomenon. The next step is to develop a model by identifying the important variables for this research. The third step includes quantitative analysis to examine and test the proposed model. Finally, the researcher interprets, discusses and compares the qualitative results with the quantitative results. (see Figure 5.2).

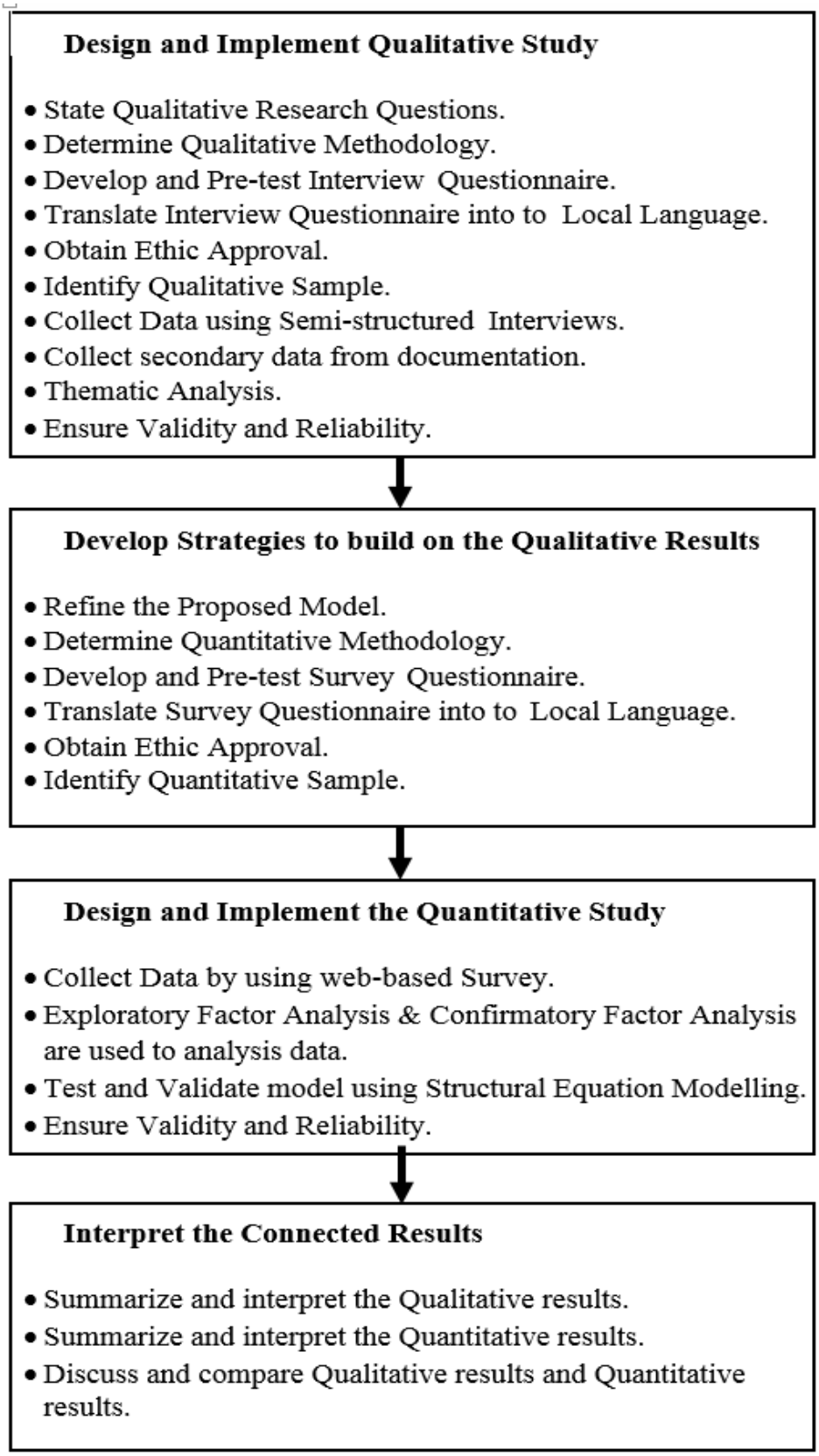

Figure 5.2: Exploratory Sequential Mixed-Methods Four Steps (Clark & Creswell (2011))

5.4 Research Methodology Implementation

This research has investigated the interoperability required for t-Government implementation in Saudi Arabia. It is exploratory in nature, examining the current t-Government situation in that country. It sought to investigate the factors affecting interoperability for t-Government implementation by hypothesising a theoretical conceptual model. This model was then tested with survey data to identify the critical factors for t-Government implementation.

The results obtained from the qualitative strand and the findings obtained from the quantitative strand were then interpreted. Figure 5.2 illustrates the processes involved in the sequential mixed-methods approach of this project.

5.5 Phase 1: Qualitative Study

The first phase of the exploratory sequential-mixed-methods approach involved a qualitative study to answer these research questions as follows: What is the current e-Government situation in Saudi Arabia? What are the key factors that might influence the interoperability required between government organisations for t-Government implementation in Saudi Arabia?. To adequately answer the above research questions, the qualitative study employed interview questions and documentation. The following sections explain these in detail.

5.5.1 Interview Questions Design

Interviews are an important method for obtaining data in qualitative research (Bryman, 2012; Creswell, 2013; Punch, 2013). These can take several forms: structured, semi-structured and un-structured interviews. A semi-structured method was used as the conceptual framework had already been formulated. This technique uses prepared questions, but these are open-ended, as the interviewees had flexibility in how they replied, often being encouraged to expand on or explain particular points that may illuminate an issue more effectively (Clark & Creswell, 2011; Creswell, 2013).

This thesis also used Miles and Huberman's (1994) technique. All the research constructs were included within the various questions, and each interviewee was asked to indicate the level of importance he attributed to each factor. These levels were (1) highly important, (2) important, and (3) less important.

5.5.2 Interview Question Pre-Testing

The interview questions were tested and refined with the help of three PhD students who had prior experience of e-Government and had previously worked on e-Government projects in Saudi Arabia.

5.5.3 Translation to Arabic

The interview questions were translated into Arabic using the double (two-way) translation method (Bailey, 2008). This method translates a document from English into Arabic and then a different person translates it back from Arabic into English. If the result is not the same as in the original questionnaire, errors have been made. This method ensures that the Arabic questionnaire conveys the same meaning as the English one; four professional translators were hired to undertake the double translation independently. The interviews were conducted mainly in Arabic, but as some technological terminologies are in English, the researcher gave interviewees the freedom to answer some questions in English.

5.5.4 Qualitative Study Sampling Method

To ensure an adequate representative cross-section of views and experiences, the interview participants were selected through 'purposive sampling'. This technique involves a variety of non-probability sampling employed to select a small number of cases. It obtains a greater depth of information from a smaller number of participants. It is commonly used in qualitative studies (Teddlie & Yu, 2007). This helps the researcher obtain a wide range of views and to select cases that may be particularly informative. This technique has enabled the researcher to choose interviewees according to their position and experience with regard to e-Government provisions (Teddlie & Yu, 2007). The sample includes top managers, ICT and e-Government specialists from various backgrounds within Saudi Arabia.

5.5.5 Data Collection

5.5.5.1 Interviews

Semi-structured interviews were conducted with 12 government management employees from different government organisations. Baker and Edwards (2012) have suggested that this number is enough to conduct qualitative interviews. These interviews lasted for approximately 40 minutes. To expedite the interviews, one week before the interview, each interviewee was sent an email including a copy of the invitation letter, information about the research background, the project's aims, the interview questions, participation benefits, any risk to participating, and participants' rights. The interviews were conducted in Arabic or English, based on the interviewee's preference. With prior approval, the interviews were audio-recorded and later transcribed and translated from Arabic to English. All of the interviews were conducted at locations selected by the participants.

The participants revealed diverse demographic characteristics. Among the participants, three are aged from 51 to 55 years, three from 46 to 50, two from 41 to 45, and four from 31 to 40. They represent a variety of employment sectors. Ten interviewees came from different government organisations and two interviewees came from an e-Government program (Yesser). Table 5.1 presents the participants' background information.

Table 5.1: Demographic Analysis

Occupation	Age	Emp. No	Experience	Qualification
IT manager	50	1300	24	Bachelor
Business development manager	32	25000	10	Master
IT director	54	1300	35	High diploma
Finance manager	53	1300	30	High diploma
IT manager	52	1500	27	Master
e-Transaction manager	44	500	20	Master
IT development manager	39	1500	18	Bachelor
Chief information officer (CIO)	48	1200	23	Bachelor
IT manager	47	800	21	Master
IT manager	45	2000	20	Bachelor
e-Transactions consultant	32	150	9	Bachelor
Architecture & standards manager	34	150	13	Master

5.5.5.2 Documentation

This project used documents to augment the interviews and to provide background information about t-Government in Saudi Arabia. Documents are important sources of additional information and can include policies, plans, reports, strategies, regulations and website information. For this project, document analysis proved useful in enabling the researcher to develop more understanding and knowledge and to identify possible new areas of enquiry (Denscombe, 2014).

5.5.6 Data Analysis

Several methods for analysing qualitative data exist; the most commonly used are content and thematic analysis (Attride-Stirling, 2001; Braun & Clarke, 2006; Howitt, 2010). Content analysis is a flexible method for analysing textual data and involves coding and classifying data to make sense of the information recorded and to highlight important messages, features or findings (Attride-Stirling, 2001; Braun & Clarke, 2006). Thematic analysis is another technique that entails identifying, analysing and reporting patterns (themes) within data (Attride-Stirling, 2001; Braun & Clarke, 2006).

This research adopted thematic analysis for analysing the interview data, based on the theoretical concepts developed in Chapter 4. Using thematic analysis has the advantage of identifying and summarising the key features of a large and complex body of data (Attride-Stirling, 2001). This approach also facilitates social interpretations of complex qualitative data and can yield unexpected insights, while identifying similarities and differences within the information. It has the added benefit of being relatively easy and quick.

Thematic analysis first entails transcribing the interview data. This is the process of transforming verbal data into written text suitable for further analysis (Braun & Clarke, 2006; Howitt, 2010).The main methods of transcription are 'secretarial transcription' and 'Jefferson transcription' (Howitt, 2010). The former focuses on the words but does consider other factors such as intonation or expression (Attride-Stirling, 2001). The latter considers how the words are spoken; this may include overlaps in the interviewee's responses, pitch, tone, volume and speed. Arguably, there is no major advantage in Jefferson transcription as thematic analysis focuses on what is said, rather than on how it is said (Braun & Clarke, 2006). This research has used secretarial transcription, which required ensuring transcription accuracy by verifying transcripts against the original voice recordings. Transcribed data in text form were analysed using the thematic analysis method. This involved four steps, described as follows (Braun & Clarke, 2006) (see Figure 5.3).

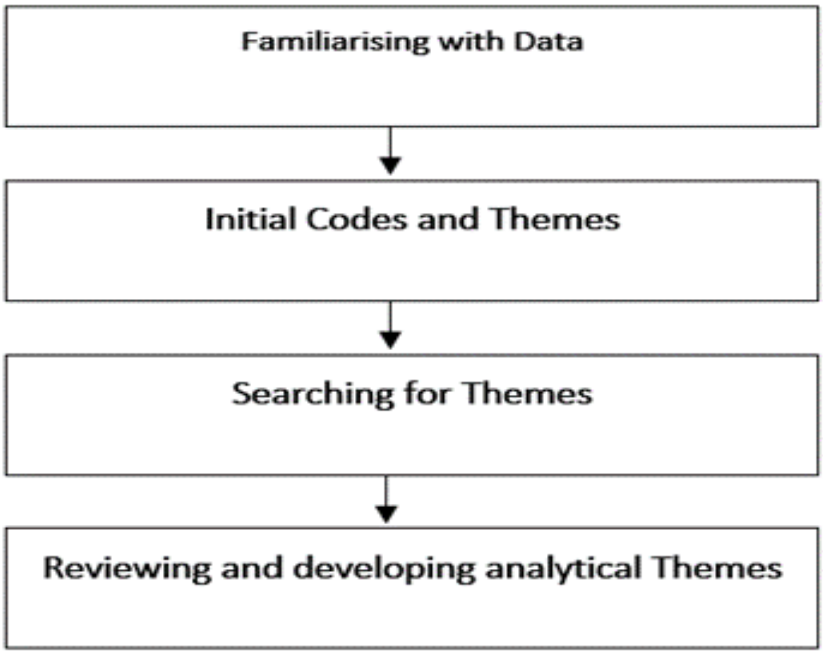

Figure 5.3: Thematic Analysis Steps

5.5.6.1 Familiarising with Data

The first step entails the researcher becoming familiar with all aspects of the data, including the depth, breadth, and details of the data set. For this project, the researcher conducted 12 face-to-face interviews. These were recorded, and the researcher took notes as each interview progressed.

5.5.6.2 Initial Codes and Themes

The second step requires coding, assigning specific 'codes' for each line, term, phrase or expression in the text (Attride-Stirling, 2001; Braun & Clarke, 2006). A code is a label to 'identify a feature of the data that appears interesting to the analyst, and refers to the most basic segment or element of the raw data or information that can be assessed in a meaningful way regarding the

phenomenon' (Braun & Clarke, 2006, p. 88). The codes were generated in a deductive manner by examining the data set using specific questions about which the researcher sought information (Braun & Clarke, 2006). Two methods can generate codes and themes: manual or computer-assisted systems (Bazeley & Jackson, 2013; Gibbs, 2002; Boyatzis, 1998). This thesis used NVivo (version 10.0) software for qualitative data analysis to tag and name sections of text within each data item. This software is used in many investigations and is effective to ensure efficient and accurate qualitative analysis when compared with manual methods (Bazeley & Jackson, 2013). NVivo is a computer-assisted qualitative data analysis package (CADAP) developed by QSR international. It contains functions that support the coding and retrieval of text, and provides functions for researchers to write research memos during the analysis process (Bazeley & Jackson, 2013; Gibbs, 2002). The codes used here are divided into groups corresponding to the constructs investigated in this research. As this project employs thematic analysis instead of content analysis, the number of times that a code appears in the text is not pertinent to the findings (Bryman, 2012).

5.5.6.3 Searching for Themes

The third step involves searching for any themes that emerge from the initial coding. Themes are identified by reviewing each code attached to the text, and then sorting the codes into groups to extract the salient and common themes (Attride-Stirling, 2001; Braun & Clarke, 2006). During this stage, visual maps are often constructed to illustrate the themes for identifying relationships between codes and themes, and between different theme levels, such as basic, organising and global themes (Attride-Stirling, 2001).

5.5.6.4 Reviewing and Developing Analytical Themes

The fourth step is the process of review, which involves breaking down main themes into two or more sub-themes, converging overlapping themes to create new themes and discarding those themes deemed irrelevant (Attride-Stirling, 2001; Braun & Clarke, 2006). This step also involves developing thematic networks that show significant global, organising and basic themes, as well as concepts, patterns and structures that have arisen in the text at multiple levels (Attride-Stirling, 2001; Braun & Clarke, 2006). This last step returns to the original research questions and the theoretical interests underpinning them, and considers them in relation to arguments grounded on the patterns that emerged when exploring the texts.

5.6 Phase 2: Quantitative Study

The quantitative study was applied to answer these research questions as follows: What are the key factors that might influence the interoperability required between government organisations for t-Government implementation in Saudi Arabia? How could these factors influence the interoperability required between government organisations for t-Government implementation in Saudi Arabia What is the relative importance of these factors and the relationships between them?.

To adequately answer these research questions, the quantitative strand of this project tested and validated the refined model. A hypothesis-testing approach was applied to determine whether the hypothesised relationships between the model constructs were true. A multivariate analysis of the data from the questionnaire survey was applied to assess the causal relationships between constructs. To test and validate the theoretical framework, this project employed a survey questionnaire to obtain quantitative data.

5.6.1 Questionnaire Design

The survey consisted of a number of close-ended questions, this system having the advantage of being relatively easy to code and analyse. As recommended by Kleysen and Street (2001), the questionnaire was sub-divided into seven manageable sections reflecting the model constructs. The first section explained the research aims and the terms used in the questionnaire, as well as the researcher's contact information. Sections 2, 3 and 4 contained 69 questions to collect the information needed for testing and validating the conceptual framework and for investigating the factors affecting t-Government transition. Five sub-sections were developed: technological compatibility, organisation compatibility, governance readiness, the e-Government program (Yesser) and citizen centricity. The last section collected participants' demographic information.

This survey used one measurement scale to avoid contaminating the participants' responses (Worthington & Whittaker, 2006). This consisted of a six-point Likert-type scale (Miller & Salkind, 2002). This system is recommended for obtaining people's attitudes, values and perceptions by recording each participant's level of agreement or disagreement for each item (Miller & Salkind, 2002). The scale used in this thesis offered the following possible responses: (1) strongly agree; (2) agree; (3) somewhat agree; (4) somewhat disagree; (5) disagree; and (6) strongly disagree. Using a six-point scale offers a range of options that enables participants to select responses that closely reflected their experiences more accurately, resulting in higher reliability and validity (Chang, 1994). In addition, the six-point scale follows a normal distribution from Kolmogorov–Smirnov (K-S) test, and it is a more closely scale points approach to the normality (Leung, 2011).

5.6.2 Questionnaire Pre-Testing

On several occasions, advice was sought from the statistical consultant at Flinders University to verify the research model, hypotheses and questionnaire's statistical validity and analysis. The questionnaire was then tested by five Saudi PhD students from the School of Computer Science, Engineering and Mathematics at Flinders University (Bailey, 2008). Based on their responses and feedback, modifications were made to some questions and instructions, and all of their comments and suggestions regarding the clarity, validity and consistency of the questions were incorporated into the survey instrument (Miller & Salkind, 2002).

5.6.3 Translation into Arabic

Participants for this survey were all engaged in IT or e-Government at various Saudi Arabian organisations. The questionnaire was translated into Arabic using the double (two-way) translation method (Bailey, 2008). As discussed earlier, this refers to a system where one person translates a document from English into Arabic and then another person translates it back from Arabic into English. If the result is not the same as the original questionnaire, errors will have been made (Bailey, 2008).To guarantee that the Arabic version of the questionnaire conveyed the same meaning as the English, four professional translators were hired to undertake the double translation independently. Additionally, two professionals were engaged to ensure that no syntax or semantic biases occurred during the translation from English into Arabic. In addition, to ensure that the translation did not digress from the original, a panel of translation experts reviewed the Arabic translation before it was distributed. In response to the translators' recommendations, the Arabic was revised for clarity.

5.6.4 Sampling Method for Quantitative Study

Selecting a suitable sample is important as the selection criteria affects the reliability of the results and hence the theory formation. This thesis used stratified sampling through which the researcher divided the population into sub-populations (or stratas) based on specific categories, and then randomly selected participants from each category (Neuman, 2010). The participants came from sections of government organisations and included IT managers and other staff involved in planning, executing, controlling and regulating e-Government projects. A sample size of 1194 government officials was chosen by coordinating with Yesser e-Government program officials. The sampling frame comprised 166 Saudi government organisations. To avoid potential bias in the data, no more than five valid feedback questionnaires were chosen from each organisation (Thiagarajan & Zairi, 1998). According to Kline (2005, p. 110), a sample size of 200 minimum is effective for SEM. Hoe (2008) has further argued that any number above 200 provides sufficient statistical power for data analysis. In this thesis, the total sample size was 219; this is above the recommended sample size.

5.6.5 Data Collection

Data collection for quantitative investigations may take several forms, the main ones being experimental research or survey research. Empirical studies usually employ a survey research approach whereby data are obtained via questionnaires. This approach has the advantage of yielding a sizeable structured data set (Hair et al., 2010). The central aim of this thesis was to test the hypothetical relationships of a theoretical framework. As such, a survey was considered the most effective strategy for data collection. A web-based survey was selected for this project; it has the advantages of speed and validity, as well as avoiding the costs and time required to print and

send hard copy questionnaires by post. It has the added advantages of fostering high response rates and ensuring participants' anonymity (Sadiq Sohail, 2008).

Using an online system enables automated data entry; that is, data files in Excel format can be imported directly from the survey vendor to software analysis programs, such as the Statistical Package for the Social Sciences (SPSS). This project used a web-based commercial survey system from QuestionPro (http://www.questionpro.com).

A questionnaire survey was conducted in Saudi Arabia. Survey questionnaires were distributed to 166 organisations by coordinating with e-Government programs (Yesser). From this, 917 people viewed the survey, and 477 people responded. Of the 477 responses, 258 were incomplete (more than 70% of the questions were unanswered) and hence unusable. The number of completed responses was 219. A sample size of 200 minimum is effective for SEM (Hoe, 2008; Kline, 2005).

The response rate was around 19%. This is quite satisfactory, based on our previous knowledge and considering the length of the questionnaire—eight pages including a one-page cover letter. Five questions captured demographic information: age, education level, occupation, organisation size, and the number of G2G services. More than 72.9% of the respondents were between 20 and 45 years old and more than 88% had a bachelor or postgraduate degree. More than 41% of the respondents were managers. More than 55% of the respondents were from organisations with over 500 employees, and 53% were from organisations having from one to five G2G services. The respondents' demographic information is summarised in Table 5.2.

Table 5.2: Demographic Analysis

Demographic Variables		Frequency	Percentage
Age group	20–25	7	3.2
	26–30	26	12.0
	31–35	52	24.0
	36–40	36	16.6
	41–45	37	17.1
	46–50	25	11.5
	51–55	26	12.0
	More than 55	8	3.7
Qualification	High school	3	1.4
	Diploma	24	11.1
	Bachelor	87	40.1
	High diploma	13	6.0
	Master	74	34.1
	Doctorate	16	7.4
Job	Manager	26	12.0
	Dept. manager	64	29.5
	System analyst	60	27.6
	Technician	13	6.0
	Others	54	24.9
Employee number	Less than 100	31	14.3
	101–500	65	30.0
	501–1000	35	16.1
	1001–2000	25	11.5
	2001–5000	20	9.2
	More than 5000	41	18.9
Number of G2G services	1–5	54	24.9
	6–10	61	28.1
	11–15	52	24.9
	16–20	36	16.6
	Nothing	14	6.5

5.6.6 Data Analysis

The questionnaire data were analysed using multivariate statistics. Exploratory Factor Analysis (EFA) uncovered the number of factors that underlay the set of items in each model construct conceptually and statistically, and Confirmatory Factor Analysis (CFA) provided a foundation for subsequent model assessment and refinement. Structural Equation Modelling (SEM) then examined the research hypotheses (Hair et al., 2010).

EFA can identify appropriate variables, and can analyse relationships between large numbers of variables, explaining them in terms of their common dimensions (Hair et al., 2010). For this work, EFA provided information on the factor structures of each model construct. Using CFA, the results were then confirmed to provide a basis for refining and assessing each model. CFA was used sequentially to ensure the measurement scale validity by confirming the factor structures uncovered from the EFA process. CFA is a proven technique for testing how well a hypothesised factor structure matches the actual data (Hair et al., 2010).

SEM was employed to provide a transition from exploratory to confirmatory analysis (Hair et al., 2010). This method enables the researcher to test whether latent variables in a pre-specified hypothesised theoretical model are related to each other (Hair et al., 2010). It does this by analysing a structural model that contains dependent relationships linking the latent variables in the hypothesised theoretical model. SEM is a very useful way to test theories; the researcher can express a theory with a set of latent and observed variables and define the relationships between these variables. SEM examines how well a theory can fit a data sample (Hair et al., 2010). The SEM process involves two steps: validating the measurement model, and fitting the structural model (Byrne, 2013; Hair et al., 2010; Kline, 2011). To analyse the data, AMOS (analysis of moment structures) Version 22 and SPSS Version 22 were used. SPSS is often used for generating descriptive statistics, charts, tables and plots of distribution and trends. AMOS performs complex SEM analysis (Arbuckle, 2013).

Moreover, multi-group confirmatory analysis, along with invariance testing determined the effect of moderators on the research model. Prior to conducting these multivariate statistical analyses, an examination of the data and scale reliability were conducted. This determines if they meet the basic assumptions required for further analysis (Byrne, 2013; Hair et al., 2010). This project used Cronbach's alpha, a measure of reliability that provides an indication of the response consistency across items. Figure 5.4 illustrates the statistical technique used in the current research.

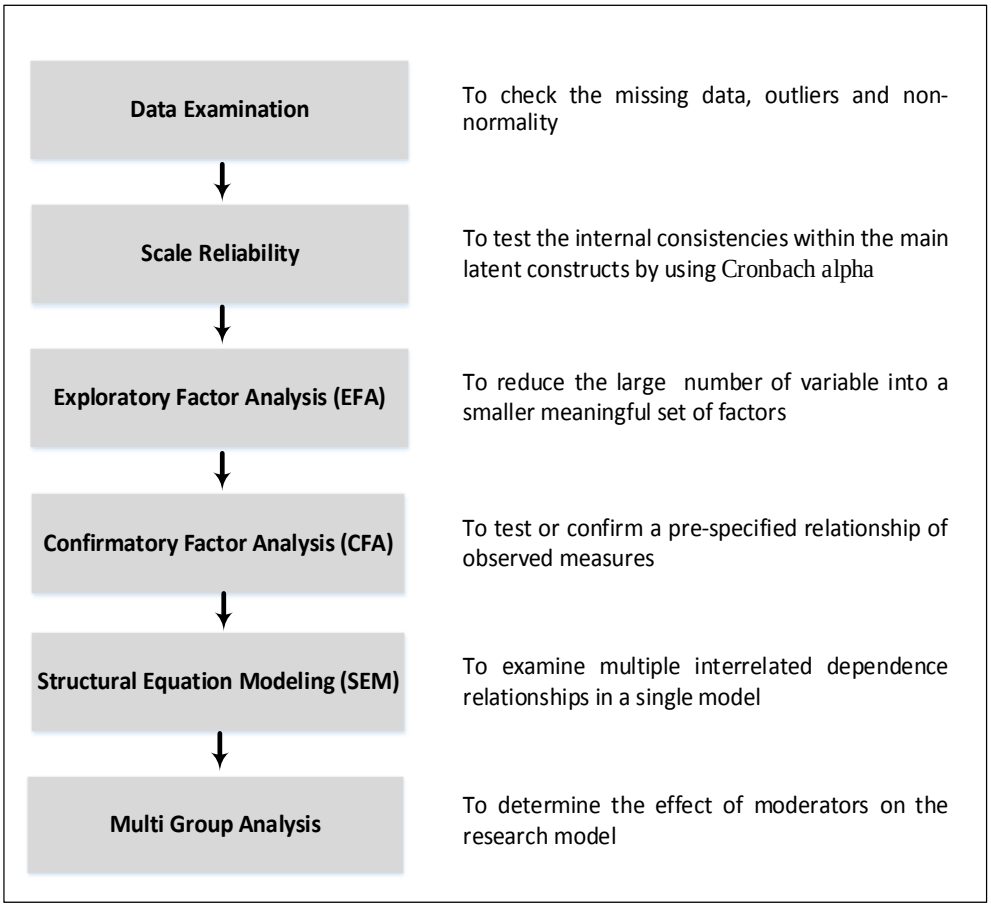

Figure 5.4: Statistical Techniques used in the Current Study

5.7 Research Validity

The value of a research project depends on the methodology's validity. In general, this refers to the quality of collected data, results and interpretations. As this thesis used mixed-methods research involving both qualitative and quantitative methods, appropriate procedures were required to determine the validity of both approaches (Clark & Creswell, 2011).

The validity of research findings is critical for demonstrating a project's rigour and trustworthiness (Burke, 1997; Clark & Creswell, 2011; Hair et al., 2010). Mixed-methods investigation validity involves applying appropriate procedures for data collection, analysis, and merging findings to achieve meaningful conclusions (Clark & Creswell, 2011). To ensure validity, it is vital to identify and preclude possible threats, such as data collection from inappropriate participants, any forms of bias, the production of non-comparable results, a lack of trustworthiness in data analysis, and the failure to use appropriate methods to compare the results obtained from individual strands (Clark & Creswell, 2011). These validity threats can arise at different stages of the project, including during data collection, analysis and interpretation.

To ensure the qualitative method's validity, this thesis used descriptive, interpretative, theoretical and external validity tests (Burke, 1997). For quantitative validity, this thesis used discriminant, convergent and factorial validity tests (Hair et al., 2010). These tests are discussed in more detail in Chapters 6 and 7.

To fulfil the requirements for an exploratory mixed methodology, the individuals who participated in the survey were not the same individuals who provided the qualitative data. As the purpose of quantitative data is to generalise the result to a population, different participants were used in the qualitative phase (Clark & Creswell, 2011). Further, to ensure validity at the data analysis stage, the thematic analysis findings in qualitative phase were used for multivariate statistical analyses in the quantitative phase. Regarding the data interpretation stage, this thesis ordered the qualitative findings as the first phase and the quantitative findings as the second phase, to fit the design and answer the mixed-methods research questions (Clark & Creswell, 2011).

5.8 Ethical Considerations

This project addressed all ethical issues and obtained written consent from all parties. Researchers must protect participants' rights and inform them in writing about the research procedures and any possible risks. Participants must know the project's purpose. Confidentiality and anonymity must be assured. Approval was obtained from the Flinders University Social and Behavioural Research Ethics Committee (SBREC) prior to commencing the data collection phase. (The project approval number is 6277; see Appendix A).

5.9 Chapter Summary

This chapter has outlined and justified the research paradigms and methodologies best suited for answering the research questions. By reviewing various research methodologies, the exploratory sequential-mixed-methods methodology was determined most suitable. The facility to triangulate results obtained from the independently analysed qualitative and quantitative data is a particular advantage of this approach. Hence, qualitative and quantitative data were collected and analysed separately in two phases. Data collection involved interviews and documentation for the qualitative phase and a survey questionnaire for the quantitative phase. Thematic analysis was applied to the interviews and documentation, and the SEM technique was used to analyse the survey.

The next chapters will present the details and discussion of the relevant analysis undertaken in this thesis.

CHAPTER 6: QUALITATIVE FINDINGS

6.1 Introduction

As described in earlier chapters, this thesis has used both qualitative and quantitative analyses for creating and testing interoperability models for e-Government in Saudi Arabia. It has analysed the factors affecting interoperability required for t-Government implementation and the relationships existing between them.

The research model was developed in Chapter 4. This current chapter presents the findings from the qualitative approach used to refine and validate the proposed model. Thematic analysis investigated the factors derived from the literature and the relationships between them to address why some of the relationships between constructs are significant and some are not. The remainder of this chapter is structured as follows. First, Section 6.2 presents the qualitative validity. Section 6.3 presents the thematic data analysis from the interviews regarding the constructs from the research model presented in Chapter 4. Section 6.4 discusses other inter-relations between constructs. Section 6.5 examines the impact of factors influencing interoperability for t-Government implementation using the Miles and Huberman scale. Section 6.6 discusses moderating the relationships among the proposed model constructs. Section 6.7 presents the revised model. Finally, Section 6.8 summarises the qualitative research findings.

6.2 Qualitative Validity

Regardless of the methods used to analyse qualitative data, the issue of research finding validity and reliability is always important (Johnson, 1997). Several types of validity can used to ensure the value and quality of qualitative research:

a) descriptive validity
b) interpretative validity
c) theoretical validity
d) internal validity
e) external validity.

The first refers to the accuracy of facts reported by the researcher. Interpretive validity concerns the meanings the researcher gives to phenomena under investigation. Theoretical validity focuses on whether theoretical rationalisations developed from the research matches the data. External validity is concerned with the extent to which a study's findings can be generalised. Internal validity refers to 'the degree to which a researcher is justified in concluding that an observed variable is causal' (Johnson, 1997, p. 287).

In this work, various procedures were used to ensure the research's descriptive, interpretive and theoretical validity. Descriptive validity was strengthened by the researcher taking notes during interviews. These notes were then checked against the interview audio-recordings. Additionally, the recorded interviews were listened to many times before being transcribed (Braun & Clarke, 2006).

Interpretative validity was strengthened through informal conversations with selected participants during the thematic analysis stage. In this way, it was possible to remove any prior miscommunications or misunderstandings. Another step was obtaining feedback from selected participants during the thematic analysis to ensure that participants' views and experiences were represented accurately (Johnson, 1997). In addition, participants' words were provided verbatim in the thematic analysis findings (Johnson, 1997). Theoretical validity was ensured in several ways. This was done by devoting time to collecting information, studying the interview participants and their backgrounds to establish detailed theoretical explanations for the thematic analysis findings (Johnson, 1997). Moreover, advice and assistance from experienced researchers was useful to identify specific problems that may have arisen in the thematic analysis process (Johnson, 1997). Simultaneous triangulation facilitated thematic analysis findings validation.

Internal validity was maintained by pattern matching and explanation building, which were performed during thematic analysis. To strengthen the external validity, the final themes were tested against each other and in every interview transcript during data analysis. This was important to ensure the ability to generalise themes across multiple interview transcripts (Johnson, 1997).

6.3 Thematic Analysis Findings

This section presents an analysis of the comments made by interviewees regarding the research model constructs presented in Chapter 4.

This thesis used thematic analysis to identify the critical factors for the interoperability required to implement t-Government, and to examine and analyse the effect of these factors and the relationships between them. These research findings may assist the Saudi Arabian government to understand how it can improve existing practices when implementing t-Government in Saudi Arabia.

The collected data were identified and grouped into themes, sub-themes and basic themes, according to the relationships between the variables identified in the proposed model (see Figure 4.2). This model organised around five main themes: technological compatibility (TC), organisational compatibility (OC), governance readiness (GR), citizen centricity (CC), and the e-Government program (Yesser) (see Figure 6.1). The next sections discuss each theme separately.

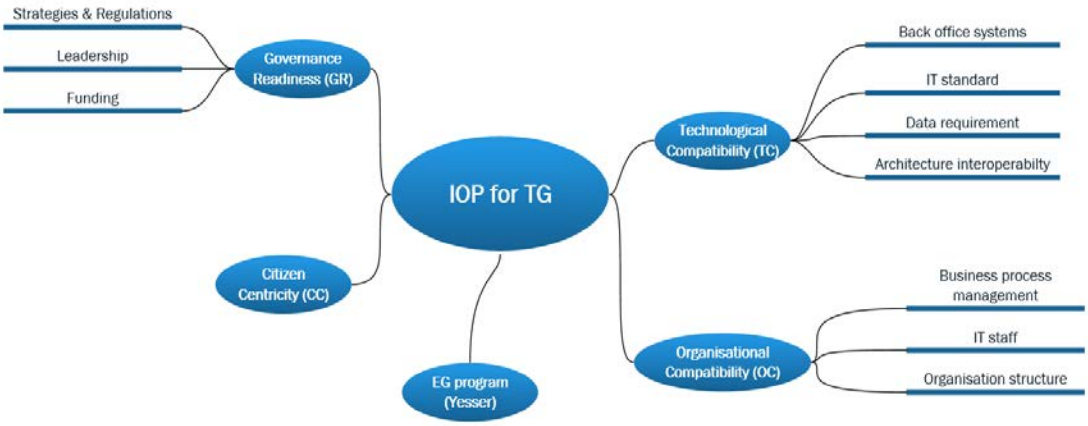

Figure 6.1: Critical Factors for Interoperability for t-Government

6.3.1 Technological Compatibility Theme

The Technological Compatibility (TC) theme highlights four sub-themes: IT standards, architecture interoperability, data requirements and back-office systems. Each of these is detailed in the following sections.

6.3.1.1 IT Standards

IT standards adoption is sub-theme discovered in this research. They are abstracted from the six basic themes of (a) software standards, (b) hardware standards, (c) interoperability standards, (d) common standards, (e) technical standards, and (f) open standards. All interviewees confirmed that IT standards operated as a milestone for the interoperability required for t-Government implementation. IT standards enable and facilitate integration between different government organisations. Interviewees identified a lack of technical standards as a major barrier to achieving t-Government. The following quotations highlight two IT Managers' responses:

> Government organisations should be concerned about the technical aspects and how they can connect together through unified technical standards. There is a need to have a unified standard and this should be implemented in every organisation which is the part of the integration. Without standardisation there will be no integration.

> Every organisation has its own software and hardware and they have not yet adopted an IT standards. e-Government integration can only be achieved by defining the common technical standards and building best practices.

Open standards are the basic element of interoperability. Therefore, the need exists to develop an open standard that any organisation can use to develop its systems. This facilitates integration between organisations. This was confirmed by many interviewees. For example, as one Architecture & Standards manager stated: 'Open standards help government organisations to develop their system and software according to unified models, and this will help organisations to integrate easily'. Another important issue is standard interoperability. One IT Manager stated that

‘[g]overnment organisations who want to share information should be concerned about standard interoperability’. Merely establishing standards is not enough. They must be reviewed and re-developed regularly. An e-Transaction manager stated:

> Standardising is an important issue for integration and implementation of t-Government, but if this standardising is not reviewed and updated regularly, it will not be useful. Therefore, observing the standards and modifying them when ... essential is very important.

6.3.1.2 Architecture interoperability

Architecture interoperability is another important sub-theme uncovered by this thesis. It is described by five basic themes: (a) application integration, (b) platforms, (c) consistent architecture, (d) interoperable architecture, and (e) programing frameworks. All interviewees agreed that architecture interoperability is a key factor in t-Government, and that differences in architecture will lead to e-Government interoperability project failure. For example, an e-Transaction manager stated: ‘[c]onsistent IT architecture is an essential factor to build interoperability between government organisations’. Many organisations use different platforms, and this is a major reason for e-Government interoperability project failure. Another IT development manager: ‘[a]s common platform facilitates interoperation between government organisations, by enabling them to integrate easily to provide e-Services’. Further, some IT Managers noted that their systems had been built using architectures that did not support integration. Therefore, these systems required new architecture to assist integration. For example, an IT director stated: ‘[o]ur systems were built a long time ago, and I don’t think that these systems support integration’. However, one IT manager claimed that technical architecture was not a crucial issue. Organisations could overcome this issue by using cloud computing: ‘[t]echnical architecture is an important issue, however an organisation should not focus on technical architecture too much, they can use data centre virtualisation which supports cloud computing’.

6.3.1.3 Data Requirements

Data requirements constitute another sub-theme identified in this thesis. It is abstracted from four basic themes: (a) data ownership, (b) data legislation, (d) data monitoring and (d) data standards. This thesis found data requirements were an important issue regarding the interoperability required for t-Government implementation. Unwillingness to share data impedes integration between government organisations. Integration does not exist without data sharing. All interviewees in this thesis confirmed this. For instance, one IT manager stated that ‘[s]haring data between government organisations is important in e-Government integration project. There is a need to encourage organisations to share their data’. However, the concept of sharing data does not exist in Saudi Arabia. Many organisations do not want to integrate due to this requirement. Such issues can block integration between government organisations. As one e-Government team member stated: ‘interoperability and t-Government implementation rely on the integration between government

organisations, and the big challenge for integration is the lack of clarity in data ownership'. This must be done by controlling and managing sensitive information through policies and legislation related to sharing data. All interviewees confirmed that data must be managed and categorised for efficient integration. For example, an IT director claimed that '[d]ata management is an important factor in the integration between government organisations and help decision makers to take the right decisions'. Another IT manager clarified the importance of data ownership legislation:

> Data ownership is one of the most important issued for the integration between government organisations. Each organisation has it is own database, and they want to have full control over their data. Therefore, there is a need for legislation on data ownership to encourage information sharing across government organisations.

However, some organisations do not share data. These organisations think if data are shared, power will be lost. This was confirmed by some interviewees. The following quotations highlight two IT managers' explanations: '[t]here are some organisations that don't share their data because they think that they will lose their power'; '[o]ne of the differences between government organisations is the threat of losing power and being replaced by IT services. Many agencies want to have full control over their information'. There is a need to overcome these perceptions and motivate organisations to share data. Interviewees indicated that monitoring data is another important issue in data sharing. As one (CIO) stated:

> [t]he big challenge to integration projects is data monitoring, so organisations need to clarify the legislation regarding managing data. It will be impossible to share data with other organisations unless the organisations are assured that their data are secure and protected.

6.3.1.4 Back-Office Systems

This thesis has revealed that back-office systems are a key factor for the interoperability required for t-Government implementation. This factor is abstracted from the following basic themes: (a) back systems integration, (b) legacy back systems, (c) back systems business process, and (d) back systems governance. The integration of back-office systems in different organisations is critical because of the differences in back-system applications, databases and interfaces. All interviewees agreed with this statement. The following quotations highlight IT managers' perceptions: '[t]he most important issue is technology, and other things can be sorted out easily. The back system is a very important factor for the integration between organisations to provide electronic services to serve the beneficiary'; 'back-office systems are very important to providing electronic services integrative'. One e-Government team member stated: '[b]ack-office systems are [a] crucial part of interoperability between government organisations, however, solutions to enable government organisations to integrate are provided by the government security network and the government services bus'.

Many different applications and systems are used in government organisations. This situation could hinder integration between government organisations. A Business development manager stated: '[s]ome organisations are using IBM products, some are using Oracle products, and some are using products from other companies. This will make the integration hard'. One IT manager emphasised the importance of back systems business process for the integration and suggested employing unified back-system processes for the main systems used by organisations. He stated:

> [t]he integration between the back systems of the organisations is important to achieve the interoperability. Therefore, it should be a unified process for the identical systems such as payroll system, finance system, ERP [enterprise resource planning] systems, and they should be developed by responsible organisations. For example: the finance system should developed by Ministry of Finance; the ERP should be developed by Ministry of Civil Service and so on.

In addition, many studies reveal that legacy back-office systems affect EGI; many Saudi Arabian public sector organisations have legacy systems for their core business. This will make integration between government organisations difficult. As one IT development manager stated: '[i]n my opinion, many government organisations have old legacy systems, and this will make these organisations difficult to integrate. On the other hand, in some organisations, the systems are new and their systems are not an issue for integration'. Back-system governance is an important issue. All interviewees agreed it is an important factor for EGI projects. For example, an IT manager stated 'I think many organisation don't have polices for their back-office system and it is important for the integration between government organisations'.

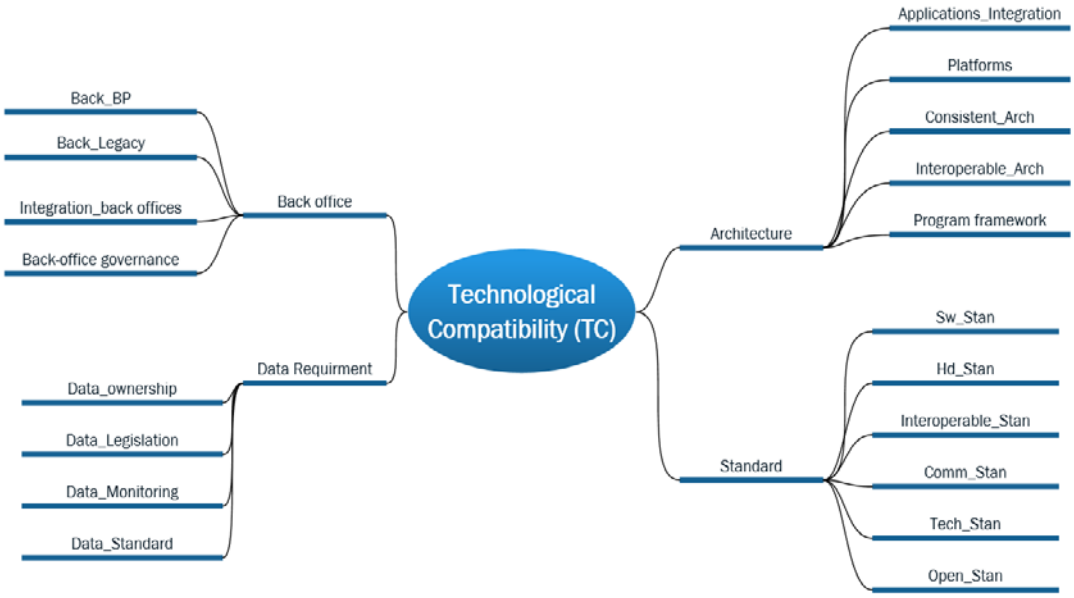

Figure 6.2: Thematic Network of Technological Compatibility

6.3.2 Organisational Compatibility Theme

The Organisational Compatibility (OC) theme highlights three sub-themes: IT staff, organisational structure and Business Process Management (BPM). These are explored in the following sections.

6.3.2.1 IT Staff

IT staff is another sub-theme identified in this research. It is abstracted from four basic themes: (a) training, (b) availability of qualified staff, (c) in-house technical staff, and (d) staff resistance. All interviewees stated the importance of technical and qualified people for t-Government implementation. It is an important issue in EGI projects. Organisations need knowledgeable people to deal with integration. Organisations with enough qualified staff can keep up with changes and integrate with other organisations easily. An IT director stated that 'IT staff are considered as one important foundation to support the integration process between different government organisations to transition to transformational government'. All interviewees indicated that t-Government is a new phenomenon and the public sector in Saudi Arabia lacked qualified IT people with the ability and knowledge to make this transition. Therefore, government organisations should pay more attention to training their staff.

The following quotations highlight IT managers' perceptions: '[t]ransformational government is a new phenomenon, so government organisation should train their staff in how to deal with these kinds of projects'; 'e-Government integration projects is new in the field of technology, so we need to continue training our staff. IT staff help to speed the integration between organisations'; '[t]ransformational government is the last stage in e-Government and it is the most complex stage in e-Government implementation. It needs qualified IT staff'.

In addition, suitably trained in-house technical staff members are needed to help organisations establish the technical requirements for integrating and sharing information with other government organisations. One interviewee stated:

> Government organisations with their own technical staff in-house can more easily establish effective relationships with the other organisations and can identify their requirements for establishing these relationships, while it is very difficult for organisations that don't have in-house IT staff.

An IT manager identified that a lack of qualified staff and IT training was a major barrier to sharing information with other government organisations: '[b]ecause we don't have enough qualified people it is difficult for us to keep up with other organisations'. Another IT director pointed out that some organisations with no qualified IT staff always seek assistance from the private sector: '[w]e have a huge number of employees, but there is a lack of qualified IT people. So we always seek assistance from the private sector such as consulting companies'. One of the e-Government team members stated: '[t]he Lack of human resources makes the difference between government organisations achieving the t-Government and not achieving it'.

6.3.2.2 Organisational structure

Organisational structure is abstracted from four basic themes: (a) interoperable structure, (b) update structure, (c) suitable structure, and (d) structure bureaucracy. The importance of

organisational structure to interoperability for t-Government implementation is explored in this thesis. It plays an important role in achieving integration between government organisations. All interviewees agreed with this statement. The following quotations highlight the explanation of some IT managers: '[o]rganisation structure is an important issue. It helps managing the process of e-Government projects effectively, so top managers should reform or restructure their organisations to make e-Government projects easier and more successful'; '[o]rganisation structure is one of the most important ways of helping e-Government projects to be implemented'. Therefore, it is important for organisations who want to integrate with other organisations and adopt t-Government to develop a suitable integration structure. This will help the organisation's employees to perform their duties as required. This was confirmed by many interviewees. For example, a business development manager stated that '[a] suitable structure is a big challenge to e-Government integration projects. It helps government organisations to achieve the interoperability between them'. Government organisations in Saudi Arabia typically have a hierarchical structure, and this will not help qualified IT staff to participate in the decision-making process. As an IT manger stated:

> Transformational government needs integration between government organisations, but before the integration, we need to make sure that organisation structures are suitable for this integration, and IT people should participate in the decision-making process.

For this reason, the council of ministers has called on government organisations to establish their own internal e-Government committees. The main purpose of these committees is to supervise e-Government implementation plans in their organisations. The committee is required to report to a senior official in each organisation. Guidelines suggest the committees each have five to seven members, including the highest e-Government official at the respective organisation. These committees will help government organisations to overcome the limitations of the bureaucratic decision-making process by involving qualified people (Yesser, 2015). As one IT manager stated:

> [o]ne of the main challenges that faced me was the restructuring of organisation to develop electronic services between many integrated organisations. This is why each organisation should have a committee of qualified people in areas related to e-Government transactions and it should connect to the top official manager in this organisation.

6.3.2.3 Business Process Management

Business Process Management (BPM) is another important sub-theme discovered in this thesis. It is described by six basic themes: (a) business process documentation, (b) business process integration, (c) business process standards, (d) training, (e) business process coordination, and (f) business process expertise. All interviewees agreed that BPM is one of the most important components of the interoperability required for t-Government implementation. BPM facilitates integration between government organisations; hence, it improves service delivery to citizens. For example, a business development manager stated that '[w]ithout business process management,

it will be difficult to integrate with another department or organisation to share information and automate the services which provided to the citizens in an efficient way'. Unified and similar processes are important. The following quotations highlight the interviewees' perceptions: '[w]e need to manage our process and unify the same processes in all government organisations before we do any things, this will help us to integrate easily when implementing the e-Services'; '[o]ne big challenge for the integration between government organisations is the complicated nature of the business process. It needs to unify to avoid the duplication of work'; '[i]ntegration between government organisations requires a re-engineering process at a very high level in business processes'. In addition, collaboration between government organisations to unify related business processes is needed. Another IT manager stated:

> [o]rganisations should learn from other organisations which have implemented BPM and this will help them to avoid their mistakes and to unify the related business processes easily. Also, it should be agreement in the final result.

BPM is a difficult task. It requires qualified people with an ability to manage the processes. Some organisations have no problem managing their business processes, but others lack skilled employees. The following quotations highlight the explanations of two IT managers: '[m]anaging the change of business process is an important and difficult task, and we don't have the expertise to do this work. I think also many organisations are not able to manage their business process alone. So we contracted with a company that specialises in managing business processes'; '[w]e don't have expertise in changing business processes, but we need to train our staff how to manage our business process'.

Documenting business processes is another important issue. This helps organisations to automate their services easily. It also helps with the integration between government organisations in determining related business processes and facilitates service-delivery automation. However, many organisations do not have any documented business processes, and some have only just started to write down and document their business processes. A Chief information officer of one of the ministries: '[w]e don't have documented business processes, but when we knew how important business process is in automated service delivery is, we started to document all of our business processes'.

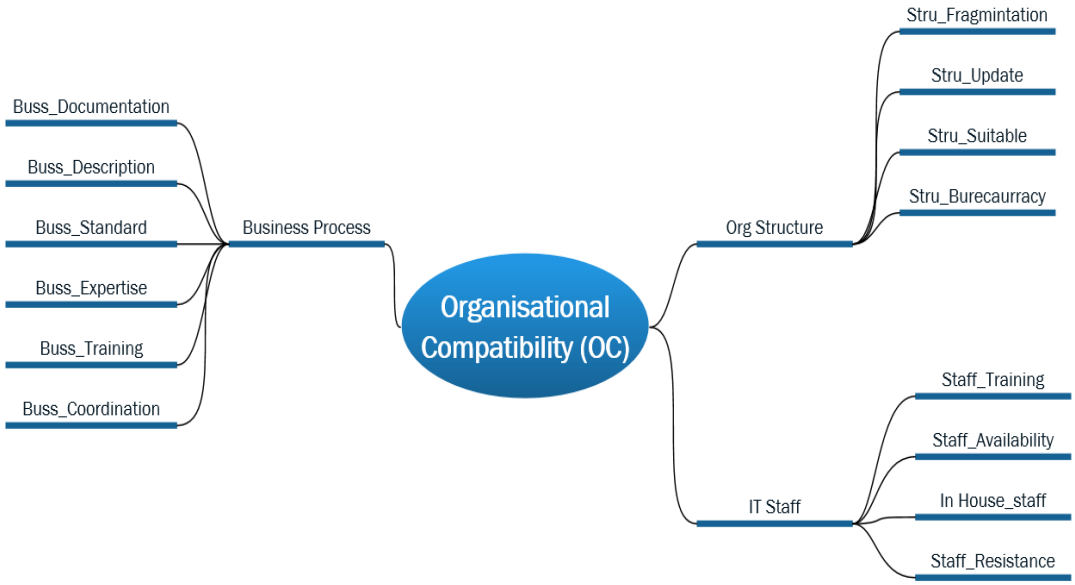

Figure 6.3: Thematic Network of Organisational Compatibility

6.3.3 Governance Readiness Theme

The governance readiness (GR) theme highlights four sub-themes: strategy and regulations, leadership, funding and stakeholders. These are explained further in the following sections.

6.3.3.1 Strategies and Regulations

Strategies and regulations are another important sub-theme identified in this thesis. This sub-theme consists of nine basic themes: (a) e-Government strategies, (b) commitment, (c) plans, (d) goals, (e) vision, (f) clear regulations, (g) updating of regulations, (h) best practice, and (i) a national plan. This thesis reveals that strategies and regulations have important effects on interoperability for t-Government implementation. This statement is confirmed by all interviewees. For example, one expert in this thesis stated that: '[s]trategies and regulations are considered as important issues to the successful implementation of interoperability between organisations. Therefore, there should be concern about the strategies and regulations related to interoperability for t-Government'.

Government organisations must have a strategy plan and clear vision for t-Government implementation to achieve this successfully. Finance manager of one of the ministries stated that '[e]ach organisation should have a strategy plan and a clear vision to adopt t-Government successfully'. This point was echoed by an IT manager: 'government organisations should clearly define their vision and plan to help them to succeed in integration projects to adopt t-Government. Vision and strategy are important issues as they include the road map and the plane for integration projects'. In that light, the Council of Ministries issued legislation. Its details included one point regarding this. The legislation states: '[e]ach government organisation should set out a detailed plan for the transformation and implementation of e-Government interoperability' (Yesser, 2015). Related to this, one of the e-Government team members stated that:

> [g]overnment organisations should listen to and follow up on all the legislation issued by the Council of Ministries and set out a detailed strategic plan for the implementation of e-Government interoperability in order to help them achieve interoperability efficiently and effectively.

However, some interviewees argued that many government organisations still do not have an e-Government strategy. Some others have an e-Government strategy but it is not clear enough. For example, an IT manager stated: '[m]ost government organisations don't have an e-Government strategy plan and some of them only have it on paper and not actually implemented and this is why many e-Government projects fail'. An e-Government strategy plan should be clear to all employees in the organisation, not just the managers. As one expert in this thesis explained:

> [m]any organisations have a clear e-Government strategy plan, however it is only clear to the manager in the organisation, and this is one of the main causes of the failure of e-Government projects. Also, this strategy plan should be created by the employees, and all the employees in this organisation should participate.

This thesis has found that many strategies and regulations have been created in government organisations, but they are often not effective. It is essential that strategies for t-Government implementation are then translated into effective and clear roadmaps that can be interpreted easily and followed by all government organisations. The most critical element identified in interoperability for t-Government is a commitment to this strategy. Many interviewees have pointed this out. For example, one IT manager stated:

> [s]ome organisations don't have an e-Government strategy, and some of these organisations strategy can't connect with the real word, it is unrealistic. An e-Government strategy should cover every internal aspect and the integration between government organisations as well. There should be commitment and follow up to gain success.

Coordination between organisations to create a shared vision is important. Another IT manager commented:

> [w]e have an e-Government strategy and clear regulations but the problem is there is no coordination between government organisations to actually implement e-Government and therefore there will definitely be failure in any attempt to establish t-Government.

There should be no gap between an e-Government strategy and real life implementation. All regulations related to e-Government should be updated regularly. Many interviewees agreed with this statement. For example, one e-Transactions consultant at one of the ministries stated that '[m]any organisations have a wonderful e-Government strategy plan, but this plan is not implemented in real life. I think there is a gap between planning and implementation'. One e-Government team member noted that '[w]e issued many regulations but in reality many of them have not been implemented yet'.

Regulations related to e-Government should be updated regularly. All interviewees stressed the need for this. For example, one IT manager stated that 't-Government is a new phenomenon therefore it requires regulations to be updated regularly to make sure it meets the demands'.

6.3.3.2 Leadership

Leadership is another important sub-theme identified in this research. It is abstracted from five basic themes: (a) top leader, (b) leader support, (c) leadership style, (d) strong leadership and (e) leaders' cooperation. This thesis emphasises the importance of leadership to t-Government implementation. All interviewees agreed with this statement. For example, one IT manager stated that '[t]ransformational government needs big support from the leadership. Leadership is the most important factor that makes everything work together in a seamless way'. Other IT managers said that top leadership is critical to t-Government implementation success. Top leader support is considered as a fundamental factor that can facilitate or impede the success of any EGI project. One finance manager at one organisation stated:

> King Abdullah supports the transition to e-Government, therefore he issued a royal decree to force government organisations in this country to implement e-Government projects. As a result, many organisations started to follow this royal decree and started to implement e-Government.

Government organisations are different. Some have strong support from their top management and some do not. This support prioritises t-Government implementation projects. As an IT manager explains:

> Government organisations are different; some of them lack top management support, and some are OK. There should be support from top management in government organisations and it is difficult to progress one step forward without this support. It plays a big role in advancing the process of transformation.

One e-Government team member stated: '[t]he lack of top management support makes the difference between government organisations in achieving transformational government'. Another e-Government team member stated: 'I think that the main reason in the difference of the level of t-Government, is the support and interest from the senior leadership in the various government organisations'.

Some top managers do not want to take any risks by being involved in integration projects. They do not support such transformation. As one expert in this thesis stated: '[s]ome leaders don't want to face any risks from the transformation so they move slowly'. Leadership is needed to communicate with leaders in other government organisations to obtain their support for t-Government implementation. This requires special leadership skills and knowledge to cultivate the appropriate management who will support interoperability. The following quotations highlight the explanations of two IT managers: '[t]he top manager should be open-minded to achieve the integration between government organisations'; '[s]ome top managers don't have the ability to

communicate properly with the end users, and with other government organisations because they don't have enough knowledge, and they are not qualified enough, so we face problems in integration projects between government organisations'.

A strong leader plays a vital role in the outcome of an e-Government project. Strong leaders are needed by organisations as they have the ability to manage an integration project's complexity. However, many government organisations lack the leadership that can manage this kind of project successfully. Competent leadership can lead to efficient and effective t-Government transition. All interviewees agreed with this statement. For example, an interviewee stated that '[s]trong leadership is one of the most important factors that support and force the integration project to succeed. Without a strong leader, it would be very difficult to get success'. Strong leadership can speed up the integration process between different government organisations by gaining long-term commitment of resources, and they can ensure a smooth and efficient cooperation between departments. As an IT manager stated: '[w]e need strong leadership for commitment and to guarantee that the integration projects are completed. Strong leadership can ensure the success faster by overcoming any obstacles faced'.

In addition to the necessity of top leadership support, middle managers, such as IT managers, also plays a role in t-Government implementation projects. The following quotations highlight two interviewees' responses:

> In this country, King Abdullah supports the implementation of e-Government along with other top political leaderships to implement e-Government, but I think that the problem in many organisation lies with the middle management who are actually responsible for implementing the projects.
>
> Sometimes the top leaders at government organisations don't have enough knowledge. Therefore, it is not only important for top manager support, support from their middle manager such as the IT manager is needed.

6.3.3.3 Funding

Funding is another sub-theme identified in this research. It is abstracted from four basic themes: (a) amount, (b) measurement mechanism, (c) management, and (d) controlling. All interviewees stated that funding is an important factor in e-Government projects, and they agreed that financial support is critical to the interoperability required for t-Government implementation. They agreed that integration and interoperation between government organisations might be limited without the availability of sufficient funds. However, due to support from King Abdullah bin Abdulaziz (Saudi Arabia's king), along with the availability of money and the fixed budgets provided by top management, all interviewees commented that funding was not an obstacle in Saudi Arabia. They claimed they had sufficient financial support from the government to implement e-Government and that funding was not a limiting factor.

The following quotations highlight two IT mangers' responses: [f]unding is an essential element in any kind of e-Government project. Nevertheless, we don't have any financial problems at the present, and it is not an obstacle to e-Government projects at all, because of the support from King Abdullah bin Abdulaziz for the transformation to e-Government'; '[f]unding is not an issue or a challenge for e-Government system in our country'. All interviewees confirmed they always received any monies they required for e-Government projects. However, some stated that delays in receiving the required funding could be experienced because of bureaucratic paperwork, which can take some time to complete. As one interviewee explained: 'I think we can't consider funding as a key challenge of e-Government projects, even though the process of getting such funds takes a long time due to bureaucratic issues'. Another IT manager expressed the same view:

> [b]ecause of the support from King Abdullah, there is no problem in financial support at all, and we get all the budget we need to develop any e-service delivery. Nevertheless, the process of getting funding needs to be improved. This is because an excessive amount of time is often needed to get funding due to complicated bureaucratic procedures.

All interviewees confirmed that obtaining sufficient funds was not an obstacle; however, all were concerned about managing these funds. The following quotations highlight two interviewees' concerns: '[a]lthough, the Ministry of Finance is doing a good job overall, there is a need for greater efficiency of implementing and monitoring state revenues, and the procedures for applying for funds from organisations'; '[t]he most important issues to support the integration between organisations is funding. Also, managing and monitoring expenditure is necessary to complete the transformation project to the end'. Additionally, e-Government team members were concerned about the different amounts of funding between government organisations. One stated that '[o]ne of the main reasons for the differences between governments organisations in relation to progress in the stages of e-Government is the amount of funds they have been allocated'.

6.3.3.4 Stakeholders

This factor is a new governance readiness factor identified during the interviews; it was not included in the conceptual model proposed in Chapter 4 (see Figure 4.2). This new factor refers to the need for stakeholder involvement, identification, management and cooperation. The interview findings identified stakeholders as an essential element to e-Government interoperability and consequently for t-Government implementation. In the literature, this factor is considered important in e-Government (Elnaghi et al., 2009; Hu, Cui & Sherwood, 2006; Janssen & Cresswell, 2005; Kamal et al., 2011; Rowley, 2011). All interviewees stressed the importance of stakeholders. For example, one IT manager stated: '[s]takeholders are a key player in all t-Government projects'. Involving stakeholders and understanding their relative level of influence is essential for the success of such projects. Stakeholders must understand their roles and duties from the beginning until the end of each project. Another IT manager stated:

> t-Government projects are big projects, so government organisations should involve their stakeholders to make sure of the success of such projects and to involve them in all phases of these projects to ensure its success and to ensure that there was no need to refer them to earlier points. This gains time and saves effort.

Cooperation among stakeholders is very important during all phases to achieve successful implementation. The following quotations reflect two IT managers' indication about the importance of cooperation between stakeholders: '[t]here must be cooperation between all stakeholders for the success of any e-Government project. For example, there must be cooperation between the relevant departments in the organisation or between an organisation and other organisations for an effective e-Government program and in Saudi Arabia we face difficulties in how to cooperate with other organisations'; 'cooperation between stakeholders at all the times is required for the success of an integration project'. It is vital coordinate stakeholders by identifying which stakeholders are critical at each stage, and prioritising their relative level of knowledge and expertise in t-Government integration projects. All interviewees agreed with this statement. For example, one IT development manager stated: '[i]nvolving and coordinating stakeholders in t-Government projects is an important task, and we should consider this issue as essential to achieve successes'.

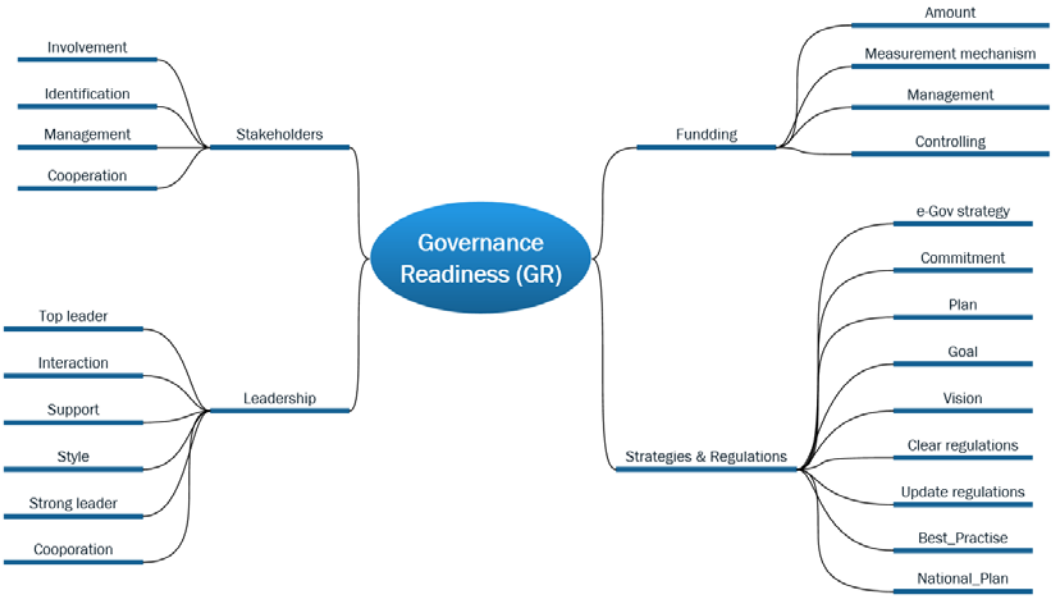

Figure 6.4: Thematic Network of Governance Readiness

6.3.4 Citizen Centricity Theme

Citizen centricity (CC) theme is abstracted from four basic themes: (a) citizen-centric focus, (b) citizen-centric needs, (c) citizen-centric satisfaction, and (d) citizen-centric understandings. All interviewees agreed on the importance of a citizen-centric perspective in interoperability and t-Government, and that government organisations should implement e-Government according to their citizens' needs, not just government needs. The following quotations highlight interviewees' perceptions: 'I think it's important that government organisations are not run to serve the just

government's needs but instead are run to serve citizen's needs as well'; '[g]overnment organisations should function according to the citizen needs, not the government needs'; '[c]itizens now, unlike the past, have the internet they know how to deal with the internet and with social media, they understand, that they need better, faster and higher quality services. These put government organisations under pressure. The target of government organisations in developed countries is to serve their citizens. Therefore, our organisations need a big effort to change their focus direction from government needs to citizens' needs'.

t-Government implementation should be provided so that citizens can access information easily and complete their transactions. As one IT manager stated: 'e-Government is about dealing with citizens. If we don't treat this issue seriously, it might lead to the failure of e-Government projects, and the main purpose of the integration between government organisations is citizens'. Therefore, the success level achieved when providing citizen-centric services and end-user satisfaction should be measured regularly. Government organisations should consider their citizens' suggestions. One chief information officer of one of the ministries stated that '[g]overnment organisations need to integrate to provide better services to their citizen, but they also need to measure the quality of their services to satisfy their citizens'.

Many interviewees confirmed there is no measurement of citizen satisfaction. The following quotations highlight interviewees' views: 'I do not think that there is a measurement of citizen satisfaction by any government organisation, perhaps they don't have time to do so'; '[c]itizens' level of satisfaction needs to be continuously assessed and government organisations should react swiftly to citizen suggestions and complaints'. Some IT managers said that many government organisations still did not know about the citizen-centric concept. As some IT managers stated: '[t]he concept of being citizen centric has not been clear until now. Many organisations focus on their work rather than the citizens' needs. Therefore, the slogan of all government agencies should be changed towards serving their citizens'; '[s]ome government organisations did not implement e-Government services in order to provide e-Services that meet the citizens' needs'.

Revisiting the interviewees' responses clarified that most interviewees agreed that citizen centricity has a big impact on interoperability for t-Government implementation.

Figure 6.5: Thematic Network of Citizen Centricity

6.3.5 e-Government Program (Yesser) Theme

e-Government Program (Yesser) is abstracted from six basic themes: (a) integration to Yesser, (b) GSN, (c) GSB, (d) SSO, (e) NEA and (f) the 'Saudi' portal. All interviewees agreed that the e-Government program Yesser was designed to enhance the productivity of government organisations. It should help in terms of methodologies, data, standards and knowledge, enabling these organisations to interoperate easily and implement t-Government. One e-Government team members stated: '[t]he e-Government program (Yesser) was created to help and enable government organisations integrate together to provide e-Services to their citizens'. This thesis has revealed that the Yesser program helps integration between government organisations through its connection to the GSN, the GSB, the Saudi portal, compatibility with SSO, and implementation of the NEA. One IT manager stated: '[i]t should be a connection between all government organisations and Yesser is designed to help them to integrate easily'.

The GSN is a network to connect government agencies with the e-Government data centre, using the highest international technical and security standards. The GSB is a middle platform that contains integrated structures of hardware and software designed to facilitate the exchange of shared government data among government bodies. The following quotations highlight interviewees' perceptions: '[t]he GSN has been implemented to enable constant connections among all Saudi organisations. Furthermore, free hardware (servers and routers) has been provided to all participating organisations'; '[m]any of the technical issues can be overcome using the current integration infrastructure (GSB), and no integration is allowed without using the GSN/GSB. All data exchange must be done inclemently through GSN/GSB'; 'GSN and GSB are important for integrity with many other organisation systems. Many of the technical issues can be overcome by using the current integration infrastructure government security bus (GSB)'; '[f]or integration all organisations must integrate to the government secured network and the government service bus to exchange information securely and reliably'; '[o]ne of the main requirements of integration between government organisations is IT standardisation, and Yesser helps government organisations with this issue'.

Other important integration support elements are the NEA, SSO and the Saudi portal. The NEA is a framework to facilitate the delivery of consistent and cohesive services. SSO is considered a significant regulation for conducting e-Government transactions. The Saudi portal is an important

way of enabling government services efficiently. It also makes e-Services accessible globally at any time through the internet. The following quotations highlight IT managers responses: '[g]overnment organisations should take advantage of Yesser by emphasising the use of NEA and connect via SSO for effective integration between different governmental organisations'; 'e-Government implementation needs a common IT infrastructure and Yesser will help organisations by allowing connection with the GSN, GSB, and Saudi portal to integrate and share information'.

Revisiting the interviewees' responses clarified that most interviewees agreed that e-Government program (Yesser) has a big impact on interoperability for t-Government implementation.

Figure 6.6: Thematic Network of e-Government Program (Yesser)

6.4 Other Inter-Relationships

This thesis also uncovered other relationships between citizen centricity and e-Government program (Yesser), the e-Government program (Yesser) and technological compatibility, the e-Government program (Yesser) and organisational compatibility and the e-Government program (Yesser) and governance readiness and the e-Government program (Yesser). These are examined in the following section.

6.4.1 Citizen Centricity and the e-Government Program (Yesser)

As discussed in Chapter 3, an objective of creating Yesser was to provide better, more convenient, and more seamlessly integrated e-Government services for citizens. Yesser has developed two action plans in cooperation with government agencies. Based on these two e-Government action plans, Yesser began promoting citizen-centric e-Services through the Saudi Arabian government's national portal by integrating with government organisations through links to their websites. This approach is the most efficient way of providing government services. This is a clear indication of the significant impact of a citizen-centric approach towards an e-Government program. One e-Government team member said:

> Now, citizens rely on the internet, and social media. Therefore, citizens need to be considered as the main objective in raising productivity and efficiency of the public sector, achieving success in e-Government and offering better and easy to access services for citizens.

Some interviewees confirmed this issue. For instance, one IT manager said:

> Yesser began to promote the citizen-centric approach and the Saudi Portal is one of the initiatives [that] illustrate this. The Saudi portal provides seamless and integrated e-Services from one single point. This portal will allow users to access one single service without the need to contact several government organisations.

6.4.2 The e-Government Program (Yesser) and Technological Compatibility

As mentioned in Chapter 3, Yesser has provided many technical initiatives that should lead to the development of e-Government in Saudi Arabia and facilitate integration between government organisations. In addition, Yesser was established to help organisations build a reliable infrastructure to facilitate e-Government implementation and enable data exchange between government organisations by improving back-office performance. Yesser was also developed to help government organisations standardise work processes inside agencies by publishing standards for e-Government systems specifications. Some interviewees were not satisfied with Yesser's achievements. Some organisations have not yet obtained benefits from these technical initiatives. Many interviewees noted that no real coordination existed between Yesser and other government organisations. For example, one IT director explained: 'I can see and hear about many technical initiatives from Yesser or from their website. However, there is not any coordination between our organisation and Yesser. Yesser want us to ask them for help'. Another IT development manager explained that Yesser does not have enough power to force government organisations to follow them:

> Yesser has provided many useful technical initiatives to help government organisations to integrate, but Yesser don't have enough power to force these government organisations to actually do so. Yesser should have the power to follow up on government organisations and force them to transform to e-Government.

As such, it seems reasonable to say that Yesser does not have enough power to force government organisations to use their technical initiatives. One interviewee suggested that more authority and power should be given to Yesser to force government organisations to follow their initiatives: [i]t is obvious there is no coordination between government organisations. I think Yesser with more authority can lead to this rule'.

Revisiting the interviewees' responses clarifies that some interviewees agree that Yesser can help government organisations to integrate by providing many technical initiatives.

6.4.3 The e-Government Program (Yesser) and Organisational Compatibility

As discussed in Chapter 3, Yesser was created to increase government organisation productivity and to ensure that organisations provide e-Government services to their citizens in a simple and appropriate way. One e-Government team member stated:

> Yesser is keen to support and facilitate the change to e-Government transaction projects, so we take into consideration the human resources by developing a program that helps staff in government organisations to use and support the transformation to e-Government.

An objective of the second action plan was stated as:

> Yesser establishes a central pool of resources and support for establishing, based on demand and supply assessment of critical areas of need to enable a unified response to the issue of a severe shortage of skilled ICT professionals, and to facilitate faster project initiation and delivery.

However many interviewees noted that Yesser did not cover organisational issues such as organisational structure or BPM. For example, one IT manager stated:

> Yesser has addressed technical issues such as frameworks and standards, however Yesser has not addressed organisational readiness such as, business process management, and organisation structure in their strategy.

Another IT manager stated that:

> Yesser strategy aims to improve government organisations' productivity and efficiency. However, Yesser should take into account more than just technological issues, and Yesser is not addressing organisational issues.

Revisiting the interviewees' responses clarifies that most interviewees were not satisfied with Yesser's achievements regarding organisational compatibility.

6.4.4 The e-Government Program (Yesser) and Governance Readiness

As discussed in Chapter 3, Yeseer was assigned the task of developing and implementing e-Government in Saudi Arabia. The program has developed two action plans in cooperation with government agencies. The First Action Plan from 2006 to 2010 has been completed. The Second Action Plan covers 2012 to 2016.

The Yesser program has created many initiatives and products, including regulations and governance frameworks, to drive Saudi Arabia's e-Government initiative. However, interviewees have claimed that many organisations do not obtain the benefits from these regulations, strategies and frameworks. The following quotations highlight some of their responses: '[t]he idea of Yesser is to help government organisations to move to e-Government and that is a great idea, however Yesser didn't cover their expectations. Many government organisations don't have a clear vision and strategy to move towards e-Government. Yesser should assist them to prepare their strategies and vision'; '[w]e hear that Yesser has created many initiatives, governance frameworks, development programs, but in reality we never have seen them. For example, the development program for the leaders or staff. We never heard that one of our leaders or staff got any training from Yesser'. One e-Government member stated: '[w]e have created two strategic action plans based on the successful implementation of many countries to achieve success, and we don't have

the power to force the government organisations to follow up on our strategic action plans'. Another IT manager stated: '[s]trategic action plans and regulations alone will not lead to integration between government organisations. Organisations need compulsion to follow these strategies and regulations. Yesser needs to show all the services available from them to let organisations take advantage of these services'.

Revisiting the interviewees' responses clarifies that some interviewees agree Yesser has created many initiatives, action plans, policies and governance frameworks to help government organisations integrate. However, many are not satisfied with Yesser's outcomes. Some organisations have not obtained any benefits from these initiatives.

6.5 The Impact of Factors Influencing interoperability for t-Government Implementation

For further analysis, the researcher has used Miles and Huberman's (1994) scale. Each interviewee was asked about the impact of each factor on the interoperability required for t-Government implementation, based on: (1) high impact (●), (2) medium impact (⊙) and (3) less impact (○). The numbers were then calculated and each factor was identified as high impact, medium impact, and less impact, based on the number given for each factor. As an illustration, the results are provided in Tables 6.1 and 6.2 below, providing an analysis of the factors, based on interviewees' responses.

Table 6.1: Summary of Impact Factors Influencing Interoperability for t-Government Implementation

		Impact Influences			
Constructs	**Factors**	●	◉	○	**Results**
H1: TC	Back-office systems	9	3	0	●
	IT standards	12	0	0	●
	Data requirement	10	2	0	●
	Architecture interoperability	10	1	1	●
H2: OC	Organisational structure	9	3	0	●
	Business processes	12	0	0	●
	IT staff	12	0	0	●
H3: GR	Strategies & regulations	12	0	0	●
	Leadership	12	0	0	●
	Stakeholders	9	3	0	●
	Funding	1	5	6	○
H4: CC		11	1	0	●
H5: e-Government program (Yesser)		8	2	2	●

Table 6.2: Summary of the Significant Impacts between Constructs

	Impact Influences			
Constructs	●	◉	○	Results
H6: CC → e-Government program (Yesser)	9	2	1	●
H7: e-Government program (Yesser) → TC	7	2	3	●
H8: e-Government program (Yesser) → OC	4	0	8	○
H9: e-Government program (Yesser) → GR	3	2	7	○

6.6 Moderating Relationships Among the Proposed Model Constructs

The qualitative findings have identified that organisational size (along with the amount of G2G services) has a significant effect on interoperability required for t-Government implementation. Many interviewees stated that large organisations were more likely to integrate with other government organisations due to support from the Yesser program. For example, one business development manager stated:

> Large organisations are more easily integrated and interoperated with other governments. Yesser only support large organisations to integrate with GSB & GSN and they ignore small organisations. Thus there is a huge difference between small and large organisations in integration.

In the literature, this moderator is considered important in IT adoption. Many studies have found that organisation size is a primary predictor of IT adoption and e-Government service provision (Brudney & Selden, 1995; Holden et al., 2003; Moon, 2002). Norris and Moon (2005) have also indicated that size was positively associated with adoption for all online transactions.

With respect to the number of G2G services (as mentioned in Chapter 3, Table 3.4) G2G services comprise 553 (16%) of all provided e-Services. The interview findings indicate differences between government organisations in providing G2G services. Some governments have more than ten G2G services. Some government organisations have less than ten services, and some organisations do not have any G2G services. Many interviewees noted that organisations with more G2G services were more likely to integrate with other government organisations and implement t-Government. For example, '[o]rganisations such as the ministry of interior are more likely to implement t-Government. They have more support than organisations who have a number of G2G services'. Another stated that 'Yesser prioritised support of government organisations on their importance in providing G2G services. The greater the number of G2G services, the more support from Yesser'.

6.7 Revised Conceptual Model

After conducting the qualitative data analysis (as presented in the previous sections), several refinements to the conceptual model stemming from the literature review have been made. A concise and applicable conceptual model to frame and indicate the key factors, and their context, has been developed to better understand the problem in a more comprehensive way. This revised model is shown in Figure 6.7. The revised model considers the following issues:

1. The interview findings identified stakeholders as an essential element to the interoperation between different government organisations and consequently for t-Government implementation. Stakeholder involvement, identification, management and collaboration are required to achieve interoperability between government organisations and implement t-Government successfully.
2. Very little consensus existed among interviewees regarding the impact of funding on t-Government implementation in the Saudi Arabian context. However, to ensure there is no effect from funding on t-Government implementation projects, this thesis tested and analysed the funding factor quantitatively.
3. In the qualitative findings, e-Government officials and top managers noted that organisation size and the number of G2G services moderated the relationships in the proposed model (in the Saudi Arabian context). Therefore, two moderators have been added to the conceptual model, one for organisation size and one for the number of G2G services.

This thesis argues that the conceptual model from the literature review clearly identifies a number of hypotheses representing current gaps in the literature. It argues that TC, OC, GR, CC, and e-Government programs positively influence interoperability for t-Government implementation. It has also argued that CC positively influences the e-Government program (Yesser), and that the e-Government program (Yesser) positively influences TC. Moreover, it showed no impact from Yesser towards OC or GR.

The qualitative exploratory phase suggested that organisation size and the number of G2G services moderate relationships in the proposed model for Saudi Arabia. Therefore, two more hypotheses have been added to the conceptual model (see Figure 6.7). The following 11 hypotheses are reflected in the conceptual model, as shown in Table 6.3.

Table 6.3: The Revised Hypotheses

Hypotheses	Descriptions
H1	Technological Compatibility factors positively influence the level of interoperability required for t-Government implementation
H2	Organisational Compatibility factors positively influence the level of interoperability required for t-Government implementation
H3	Governance Readiness factors positively influence the level of interoperability required for t-Government implementation
H4	Citizen Centricity positively influences the level of interoperability required for t-Government implementation
H5	The e-Government program (Yesser) positively influences the level of interoperability required for t-Government implementation
H6	Citizen Centricity positively influences the e-Government program (Yesser)
H7	The e-Government program (Yesser) positively influences TC
H8	The e-Government program (Yesser) positively influences Organisational Compatibility
H9	The e-Government program (Yesser) positively influences Governance Readiness
H10	Organisation size will moderate the relationships among the proposed model constructs
H11	The number of G2G services will moderate the relationships among the proposed model constructs

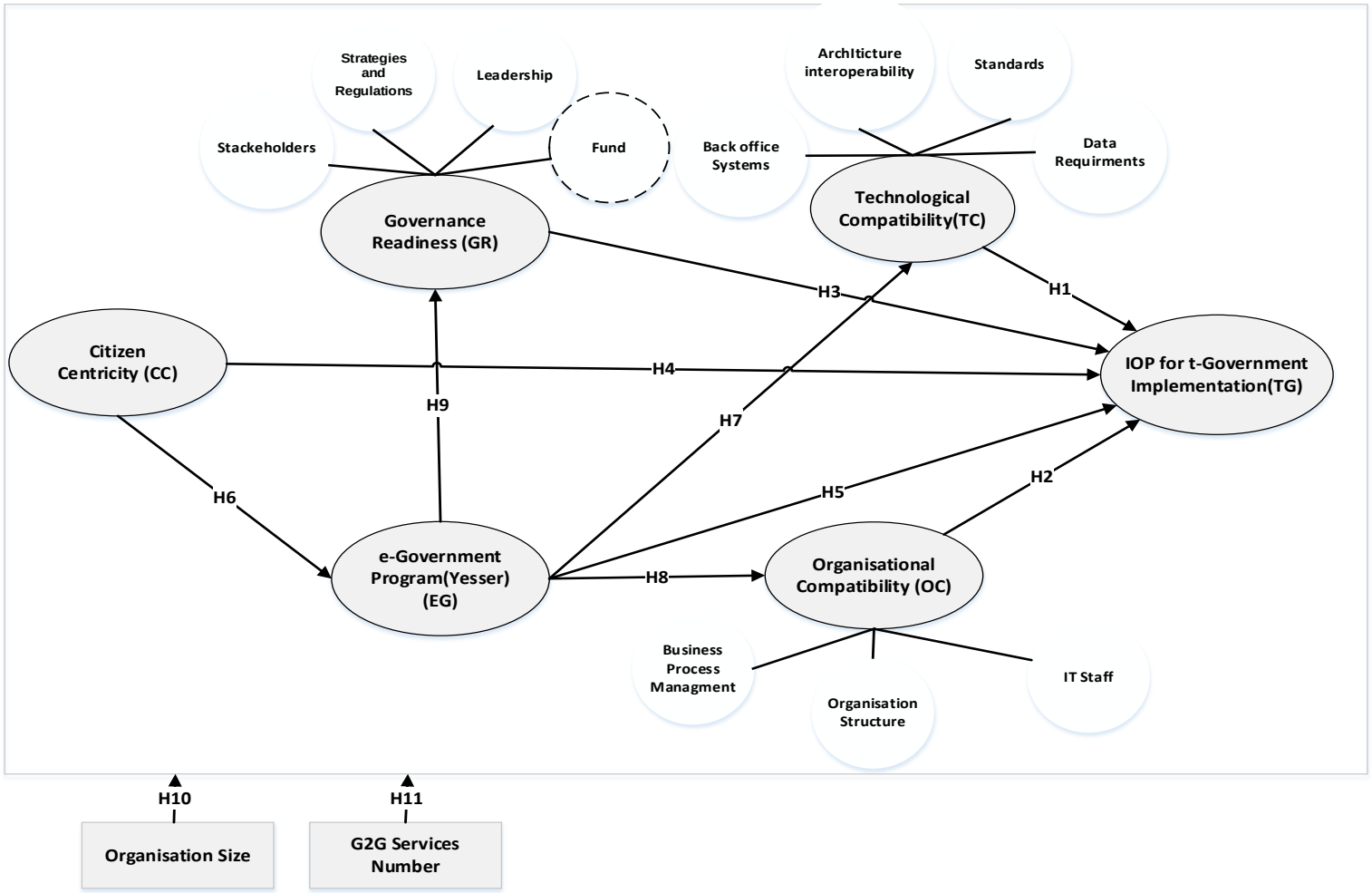

Figure 6.7: The Revised Conceptual Model

6.8 Chapter Summary

This chapter has investigated the factors that emerged from the qualitative research. Thematic qualitative analysis analysed the study's findings. The analysis reveals that technological compatibility, organisational compatibility, governance readiness, citizen centricity and the e-Government program (Yesser) are critical interoperability factors required for t-Government implementation. It has also revealed that the Yesser program has a significant impact on technological compatibility, and no impact on organisational compatibility and governance readiness. Moreover, it has revealed that citizen centricity has a significant impact on Yesser program. Therefore, the findings have confirmed all the hypotheses except two. In addition, organisation size and the number of G2G services moderated relationships in the proposed model, and two hypotheses were added to the refined model (see Figure 6.7). The qualitative research assisted in refining the conceptual model and developing the hypotheses. Refining the research instrument in the qualitative interviews was important for the quantitative stage. The next chapter provides a quantitative analysis of the data obtained from government organisations in Saudi Arabia.

CHAPTER 7: QUANTITATIVE FINDINGS

7.1 Introduction

As discussed earlier in Chapter 5, this thesis has adopted multivariate statistics to obtain meaningful and consistent data to measure the constructs in the refined conceptual model presented in Chapter 6. This chapter presents the results from the quantitative findings.

This chapter is organised as follows. Section 7.2 discusses how the data set was prepared for analysis. Scale reliability is covered in Section 7.3. Section 7.4 covers Exploratory Factor Analysis (EFA). A detailed examination of the Confirmatory Factor Analysis (CFA) and Structural Equation Modelling (SEM) quantitative data analysis appears in Sections 7.5 and 7.6. Section 7.7 presents the tests of a multi-group analysis. Finally, Section 7.8 summarises the chapter.

7.2 Data Examination

Data examination is an initial step in any analysis procedure. According to Hair et al. (2010), the researcher examines data for completeness and consistency prior to analysis. However, some important steps in multivariate analysis should be considered before conducting SEM analysis. The researcher must ensure that the assumptions guiding SEM analysis are met in the relevant research domain (Cruz, 2007). SEM assumes that the data set is complete, without any missing values (Kaplan, 2009). Thus, when using SEM as a data analysis technique, missing data becomes a critical issue (Carter, 2006; Hair et al., 2010; Kline, 2011). The data set must be normally distributed (Arbuckle, 2009; Byrne, 2010; Shumacker & Lomax, 2004). This includes properly handling the appearance of outliers, kurtosis and skews in the data set (Cruz, 2007). To draw accurate conclusions using SEM the data set must be prepared by applying appropriate data screening procedures (Cruz, 2010). Data were coded according to the constructs and measurement variables for analysis, as shown in Table 7.2. Several tests were conducted to deal with outliers and detect kurtosis and skews in assessing the data set normality in the next sections.

Table 7.1: Constructs and Measurement Variables Coding

Constructs	Measured Item	Item Name	Code
Technological Compatibility (TC)	IT Standards (TC1)	HD standards	S_1
		SW standards	S_2
		Open standards	S_3
		Common standards	S_4
		Interoperable standards	S_5
		Technical standards	S_6
	Architecture interoperability (TC2)	Consistent architecture	A_1
		Applications integration	A_2
		Interoperable architecture	A_3
		Program framework	A_4
		Platforms	A_5
	Data requirement (TC3)	Data ownership	D_1
		Data legislation	D_2
		Data monitoring	D_3
		Data standards	D_4
	Back Systems (TC4)	Back BP	BA_1
		Integration back offices	BA_2
		back-office governance	BA_3
		Back systems legacy	BA_4
Organisational Compatibility (OC)	IT staff (OC1)	Staff resistance	ST_1
		Staff training	ST_2
		Staff availability	ST_3
		In-house staff	ST_4
	Organisational structure (OC2)	Update organisation structure	STR_1
		Suitable organisation structure	STR_2
		Bureaucracy organisation structure	STR_3
		Interoperable structure	STR_4
	Business processes management BPM (OC3)	Business process integration	BU_1
		BPM training	BU_2
		Business process coordination	BU_3
		Business process documentation	BU_4
		Business process standards	BU_5
		Business process expertise	BU_6
Governance Readiness (GR)	Strategies & regulations (GR1)	e-Government strategy	STA_1
		Strategy commitment	STA_2
		Plan	STA_3
		Goal	STA_4
		Vision	STA_5

Constructs	Measured Item	Item Name	Code
		Clear regulations	LE_1
		Update regulations	LE_2
		Best practice	LE_3
		National plan	LE_4
	Leadership (GR2)	Support	L_1
		Strong leader	L_2
		Cooperation	L_3
		Style	L_4
		Top leader	L_5
	Stakeholders (GR3)	Identification	STAK_1
		Involvement	STAK_2
		Management	STAK_3
		Cooperation	STAK_4
	Fund (GR4)	Amount	F_1
		Measurement mechanism	F_2
		Management	F_3
		Controlling	F_4
Citizen Centricity (CC)		Citizens' focus	C_1
		Citizen needs	C_2
		Citizen satisfaction	C_3
		Citizen understandings	C_4
e-Government program (Yesser)(EG)		Yesser integration	Y_1
		Yesser GSN	Y_1
		Yesser GSB	Y_1
		Yesser SSO	Y_1
		Yesser NEA	Y_1
		Yesser 'Saudi'	Y_1
Interoperability (IOP) for t-Government (TG)		Efficiency	I_1a
		Effectiveness	I_1b
		Responsiveness	I_1c

7.2.1 Data Screening

This section examines the data to ensure that no data are missing. It also detects errors and manages outliers. Answering all survey questions was mandatory. Participants must have answered a question before submitting the page and if they did not answer a required question, they could not advance to the next page until they had done so. Therefore, no missing data points are missing from the data set. Additionally, no errors exist as the data were exported directly from the questionpro.com website to SPSS 22.0. Further, some scales are asked in a negative way to ensure that respondents

followed the questionnaire properly. This required recoding the responses to these statements. As a result, during this stage, the researcher re-coded the revised items using SPSS 22.0.

7.2.2 Dealing with Outliers

Outliers are defined as the cases representing values that differ substantially from all others in a particular data set (Byrne, 2013; Hair et al., 2010; Kline, 2011; Pallant, 2013) Detecting outliers is vital as outliers can change the data analysis results. According to Hair et al. (2006), 'problematic outliers are not representative of the population, are counter to the objectives of the analysis, and can seriously distort statistical tests' (p. 73).

This thesis used Mahalanobis distances D2 to detect the outliers with SPSS 22.0. Mahalanobis distances D2 measure the distance of each case from the means of the predictor constructs (Hair et al., 2010). As a result, to deduct the outliers, Mahalanobis distances D2 were computed with the regression procedure for the constructs. The criterion for multivariate outliers is a Mahalanobis distance at $p \leq .001$. A case is a multivariate outlier if the probability associated with its D2 is 0.001 or less. D2 follows a chi-square distribution with degrees of freedom equal to the number of variables included in the calculation (Hair et al., 2010). After calculating the Mahalanobis, the analysis results indicated that the data contained two cases with a number of univariate outliers. Therefore, two cases were removed from the data set and the number of cases was reduced from 219 to 217.

7.2.3 Normality

To meet the requirements of data analysis, it was necessary to investigate the sample data's multivariate normality. The concept of normality indicates that each single item has a normally shaped distribution. According to Hair et al. (2010), normality occurs at univariate level with each individual variable or at multivariate level when a two or more variables have a normally shaped distribution. This thesis tested the variables' normality using skewness and kurtosis tests (Hair et al., 2010) to determine whether the variables were normal for using statistical techniques like SEM. These techniques are used both commonly and widely to test variables' normality.

The appearance of skewness and kurtosis threatens the SEM analysis (Byrne, 2013; Hair et al., 2010). The skewness of a data set seriously affects the algorithms that are used to test the mean (Byrne, 2013). Kurtosis is used to calculate the variance and covariance (Byrne, 2013). Therefore, it is necessary to conduct these data set tests prior to SEM analysis.

An examination of the skewness and kurtosis values in this thesis indicate that some items exist for which the skewness and the kurtosis values sit outside the recommended range. Skewness values greater than 3.0 and Kurtosis values greater than 7.0 (Byrne, 2013; Kline, 2011) (as with ST_1, STR_4, S_1, STA_1) are problematic. As such, these items were deleted (see Appendix D).

SEM requires data to be normally distributed to derive accurate results (Byrne, 2013; Kline, 2011). The parameter estimation techniques used in SEM, such as maximum likehood (ML) (early versions) do not provide accurate results when the data sets' non-normality is more pronounced (Byrne, 2013). Therefore, this thesis examined normality using specific statistics tests for normality, such as Kolmogorov-Smirnov (K-S) (Hair et al., 2010; Pallant, 2013). This test examines whether the distribution of observed variables differs significantly from a normal distribution (Pallant, 2013). The significance value of the K-S test for each of the observed variables indicates the degree to which the data deviate from normality. A significance value approaching 0.000 indicates that the data are non-normally distributed (Pallant, 2013). The K-S test results reveal that the data set here deviates from normality (see Appendix D). As a result, bootstrapping was applied to remedy this issue (Byrne, 2013; Kline, 2011). This strategy is presented in the next sections.

7.2.4 Dealing with Non-Normality

Base on K-S results from the previous section, the data are non-normally distributed. Therefore, this thesis should use a technique to remedy non-normal data. Bootstrapping is a commonly accepted technique used to remedy non-normal data (Byrne, 2013; Kline, 2011). It is a sub-sampling procedure undertaken within the original sample. It creates different sub-samples from the original sample (Byrne, 2013). This allows a researcher to test the SEM models in a condition of multivariate normal distribution, enabling accurate results (Byrne, 2001). However, a major limitation of the bootstrapping technique is that it requires a large sample (larger than 40) (Thompson, 1994). As the sample in this thesis is (N = 217), it is appropriate to use bootstrapping to remedy the issue of data set non-normality. This thesis adopts the bootstrap ML estimation, as it is robust against violations of normality (Hair et al., 2010).

7.3 Scale Reliability

Six scales were used in the survey questionnaire to measure the constructs proposed in the conceptual model: technological compatibility, organisational compatibility, governance readiness, citizen centricity, the e-Government program (Yesser), and interoperability for t-Government. To ensure scales construct reliability, the Cronbach alpha coefficient (α) was performed. This is the most commonly used reliability measure (Cronbach, 1951). A low Cronbach alpha coefficient indicates that variables may not be represented or poorly represent the construct. Cronbach's alpha should be the first evaluation measure used to assess measurement scale quality (Churchill Jr, 1979). As a guideline, Churchill suggests that a Cronbach's alpha coefficient of around 0.90 indicates excellent internal consistency, around 0.80 indicates very good internal consistency, and around 0.70 indicates adequate internal consistency. Table 7.2 presents the Cronbach's alpha for the construct's measurement scales. The values range from 0.797 to 0.920, well above the acceptable lower limit and falling in a range between 'very satisfactory' and 'excellent'.

Table 7.2: Constructs Cronbach's Alpha

Constructs	Number of cases	Number of variables	Cronbach's alpha (α)
TC	217	18	0.864
OC	217	12	0.807
GR	217	21	0.816
CC	217	4	0.797
EG	217	6	0.887
IOP for TG	217	3	0.920

7.4 Exploratory Factor Analysis

Exploratory Factor Analysis (EFA) produces a large number of relationships among normally scaled variables in a simple way (Byrne, 2013; Hair et al., 2010). EFA is used where links between the observed and latent variables are unknown or uncertain (Byrne, 2013).

EFA is particularly useful as a preliminary analysis in the absence of a sufficiently detailed theory about the relationship of variables to the underlying constructs (Anderson & Gerbing, 1988). Worthington and Whittaker (2006) state that 'when developing new scales, researchers should conduct an EFA first, followed by CFA' (p. 815).

Most measured variables in the constructs of this thesis were derived from previous research and an extensive literature review. However, EFA was considered useful, as these variables had not been measured extensively within the Saudi Arabian context. Therefore, EFA was necessary for the present study to determine the extent to which the observed variables related to the latent variables (support quality construct), and that each variable intended for inclusion in the path model was meaningful. According to Byrne (2013), 'EFA determine how, and to what extent, the observed variables are linked to their underlying factors' (p. 6). This type of technique explores the data and provides the researcher with information about how many factors are needed to represent the data in the best way (Hair et al., 2010).

This thesis examined the 64 research construct variables for the following reasons:

- To understand whether these variables could be grouped, revealing 'big picture' of t-Government implementation.
- To assess the research constructs' convergent validity and discriminate validity.

EFA was conducted for each construct. Three main steps must be followed to conduct this analysis: data suitability, factor extraction and factor rotation. The following sections provide details of these analyses.

7.4.1 Data Suitability

Prior to performing the EFA, data suitability was considered, to ensure that the dataset was suitable for EFA techniques. This was done by estimating the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and through Bartlett's test of sphericity (Pallant, 2013).

The KMO value was 0.771, exceeding the recommended value of 0.6 and indicating sampling adequacy (Pallant, 2013; Tabachnick & Fidell, 2013).

The Barlett's test of sphericity value was significant at (p = 0.000), indicating that adequate relationships existed between the variables included in the analysis and that factor analysis would be a suitable technique. Additionally, the 217 cases in this thesis satisfied the minimum acceptable sample size of 100 for EFA. These results therefore indicate that the data were appropriate for factor analysis (Hair et al., 2010; Pallant, 2013; Tabachnick & Fidell, 2013) (see Table 7.3).

Table 7.3: KMO and Bartlett's Test

KMO and Bartlett's Test		
KMO measure of sampling adequacy.		.771
Bartlett's test of sphericity	approx. chi-square.	12646.486
	df	2346
	sig.	.000

7.4.2 Factor Extraction

Factor extraction discovers factors based on a particular method and criterion to decide if the number of factors is adequate (Hair et al., 2010). This thesis used principal component analysis (PCA) to perform the factor extraction. This method is used widely for underlying factors that reflect what the variables have in common (Hair et al., 2010). This thesis performed the extraction for six constructs: technological compatibility, organisational compatibility, governance readiness, citizen centricity, the e-Government program and interoperability for t-Government. A combination of the following criteria for each dimension was then used: 1) latent root (eigenvalue) criterion, 2) percentage of variance criterion (Hair et al., 2010).

The latent root criterion suggests that when the factors have an eigenvalue greater than 1, they are significant. When factors have a value less than 1, they should be disregarded. The percentage of variance criterion ensures the practical significance of the derived factors. Hair et al. (2010) states that it is quite common to consider a solution that accounts for 60% (or less) of the total variance in social science research, as the information in this area is often imprecise.

7.4.3 Factor Rotation

Factor rotation aims to improve the interpretation of given factors (Tabachnick & Fidell, 2013). After the number of factors has been extracted for each dimension, it then becomes possible to determine

the degree to which the items load onto these factors for each dimension. This was done by examining the factor loadings. The initial factor solution did not provide an adequate interpretation, as most items had high loadings on the most important factors, and small loadings on the other factors. For this reason, factor rotation was employed to achieve simpler and more meaningful solutions (Tabachnick & Fidell, 2013).

The rotation technique maximises high item loadings and minimises low item loadings; therefore, it produces a more interpretable and simplified solution. The Varimax orthogonal rotation technique was preferred; it is the most commonly used oblique rotation technique (Tabachnick & Fidell, 2013). After the factors were rotated, a specific criterion was employed to justify the significance of the factor loadings, ensuring a meaningful correlation between the variable and the factor (Hair et al., 2010; Tabachnick & Fidell, 2013). To ensure that the variables in each factor had practical significance, the recommended cut-off factor loading of 0.50 was used (Hair et al., 2010). The results of the EFA for each construct are presented in the next sections.

7.4.4 Exploratory Factor Analysis Results

Based on the above techniques and criteria, Exploratory Factor Analysis (EFA) was performed separately for each construct. EFA using a PCA extraction with the Varimax orthogonal rotation was performed with SPSS 22.0.

7.4.4.1 Technological Compatibility

Pre-analysis to check data suitability was conducted for technological compatibility (TC). The KMO test of sampling adequacy value was (0.850); this exceeds 0.6, and the Bartlett's test of sphericity value was significant. This confirmed the suitability of items for EFA (see Table 7.4).

Table 7.4: KMO and Bartlett's Test Technological Compatibility

KMO and Bartlett's Test		
KMO measure of sampling adequacy		.850
Bartlett's test of sphericity	approx. chi-square	2687.875
	df	78
	sig.	.000

To determine the number of components (factors to extract), eigenvalues of 1 or more were checked. Four components met this criterion, explaining a total of 86.726% of the variance. Both the eigenvalue and the percentage of variance criterion suggested four factors, accounting for 86.726 % of the total variance (see Table 7.5).

For factor rotation, as presented in Table 7.6, the variables loaded in four components. The first component explained 47.214% of the total variance, the second component explained 15.495% of

the total variance, the third component explained 14.042% of the total variance, and the fourth component explained 9.976% of the total variance. The total amount of the variance explained was 86.726%.

The factor loadings of all other variables were significant, with values ranging from 0.843 to 0.973, being well above the 0.50 threshold level without being loaded equally highly on more than one factor. Nevertheless, five variables were removed: (S_2, A_1, A_5, D_4, BA_1) due to their low factor loadings (<0.50). As a result, four factors were derived from the entire 13 variables. Variables S_3, S_4, S_5 and S_6 loaded on the first factor labelled ‘IT standards’. Variables A_2, A_3 and A_4 loaded on the second factor labelled ‘architecture interoperability’. Variables D_1, D_2 and D_3 loaded on the third factor labelled ‘data requirements’. Variables BA_2, BA_3 and BA_4 loaded on the fourth factor labelled ‘back-office systems’.

Table 7.5: Factor Analysis Results for Technological Compatibility

			Components				Initial eigenvalues		
Factors	Codes	Variables description	1	2	3	4	Total	% of Variance	Cumulative %
IT Standards (TC1)	S_3	Open standards	0.930						
	S_4	Common standards	0.843						
	S_5	Interoperable standards	0.879						
	S_6	Technical standards	0.932				6.138	47.214	47.214
Architecture interoperability (TC2)	A_2	Application integration		0.863					
	A_3	interoperability architecture		0.923					
	A_4	Program framework		0.930			2.014	15.495	62.709
Data requirements (TC3)	D_1	Data ownership			0.901				
	D_2	Data legislation			0.973				
	D_3	Data monitoring			0.925		1.825	14.042	76.750
Back systems (TC4)	BA_2	Integration between back offices				0.943			
	BA_3	Back systems governance				0.971			
	BA_4	Legacy back systems				0.973	1.297	9.976	86.726

7.4.4.2 Organisational Compatibility

For organisational compatibility (OC), pre-analysis was conducted to check the data suitability. The KMO tests of sampling adequacy value was (0.839), exceeding 0.6, and the Bartlett's test of sphericity value was significant. This confirmed the suitability of the items for EFA (see Table 7.6).

Table 7.6: KMO and Bartlett's Test for Organisational Compatibility

KMO and Bartlett's Test		
KMO measure of sampling adequacy		.839
Bartlett's test of sphericity	approx. chi-square	2437.018
	df	45
	sig.	.000

To determine the number of components (factors to extract), eigenvalues of 1 or more were checked. Three components met this criterion, explaining 84.346% of the variance. Both the eigenvalue and

the percentage of variance criterion suggested three factors, which accounted for 84.346 % of the total variance (see Table 7.7).

For factor rotation, as presented in Table 7.7, the first component explained 50.553% of the total variance, the second explained 19.460% of the total variance, and the third explained 14.351% of the total variance. The total amount of variance explained was 84.346%.

The factor loadings of all other variables were significant, with values ranging from 0.830 to 0.986, well above the 0.50 threshold level without being loaded equally highly on more than one factor. Nevertheless, two variables were removed (BU_1, BU_2) due to their low factor loadings (<0.50). As a result, three factors were derived from the entire 10 variables. Variables ST_2, ST_3 and ST_4 loaded on the first factor labelled ‘IT staff’. Variables STR_1, STR_2 and STR_3 loaded on the second factor labelled ‘organisation structure’. Variables BU_3, BU_4, BU_5 and BU_6 loaded on the third factor labelled ‘BPM’.

Table 7.7: Factor Analysis Results for Organisational Compatibility

			Components			Initial Eigenvalues		
Factors	Codes	Variables description	1	2	3	Total	% of Variance	Cumulative %
IT staff (OC1)	ST_2	Staff training	0.913					
	ST_3	Staff availability	0.873					
	ST_4	In-house staff	0.867			5.055	50.553	50.553
OS (OC2)	STR_1	Update organisational structure		0.986				
	STR_2	Suitable organisational structure		0.948				
	STR_3	Bureaucracy of organisational structure		0.968		1.946	19.460	70.013
BPM (OC3)	BU_3	Business process coordination			0.981			
	BU_4	Business process documentation			0.830			
	BU_5	Business process standards			0.861			
	BU_6	Business process expertise			0.889	1.435	14.351	84.346

7.4.4.3 Governance Readiness

Pre-analysis was conducted to check the data suitability for Governance Readiness (GR). The KMO tests of sampling adequacy value was (0.834), exceeding 0.6, and the Bartlett's test of sphericity value was significant. This confirmed the suitability of the variables for EFA (see Table 7.8).

Table 7.8: KMO and Bartlett's Test for Governance Readiness

KMO and Bartlett's Test		
KMO measure of sampling adequacy		.834
Bartlett's test of sphericity	approx. chi-square	3364.268
	df	91
	sig.	.000

To determine the number of components (factors to extract), eigenvalues of 1 or more were checked. Four components met this criterion, explaining 82.775% of the variance. Both the eigenvalue and percentage of variance criterion suggested three factors, which accounted for 82.775% of the total variance (see Table 7.9).

For factor rotation, as presented in Table 7.9, the first component explained 37.965% of the total variance, the second component explained 19.718% of the total variance, the third component explained 16.598% of the total variance, and the fourth component explained 8.494% of the total variance. The total amount of variance explained was 82.775%.

The factor loadings of all other variables were significant, with values ranging from 0.657 to 0.996, well above the 0.50 threshold level without being loaded equally highly on more than one factor. Nevertheless, seven variables were removed (STA_5, LE_3, LE_4, F_4, L_4, L_5 and STAK_3) due to their low factor loadings (<0.50). As a result, four factors were derived from the entire 14 variables. Variables LE_1, LE_2, STA_2, STA_3 and STA_4 loaded on the first factor labelled ‘strategy and regulations’. Variables L_1, L_2 and L_3 loaded on the second factor labelled ‘leadership’. Variables STAK_1, STAK_2 and STAK_4 loaded on the third factor labelled ‘stakeholders’. Variables F_1, F_2 and F_3 loaded on the fourth factor labelled ‘funds’.

Table 7.9: Factor Analysis Results for Governance Readiness

			Components				Initial Eigenvalues		
Factors	Codes	Variables description	1	2	3	4	Total	% of variance	Cumulative %
Strategy & Regulations (GR1)	LE_1	Clear regulations	0.930						
	LE_2	Update regulations	0.876						
	STA_2	Strategy commitment	0.922						
	STA_3	Strategy plan	0.911						
	STA_4	Strategy goal	0.900				5.315	37.965	37.965
Leadership (GR2)	L_1	Leader support		0.996					
	L_2	Strong leader		0.961					
	L_3	Leader cooperation		0.989			2.761	19.718	57.683
Stakeholders (GR3)	STAK_1	Stakeholder involvement			0.736				
	STAK_2	Stakeholder management			0.657				
	STAK_4	Stakeholder cooperation			0.697		2.324	16.598	74.281
Funds (GR4)	F_1	Fund amount				0.953			
	F_2	Fund management				0.904			
	F_3	Measurement mechanism				0.918	1.189	8.494	82.775

7.4.4.4 Citizen Centricity

Pre-analysis was conducted to check the data suitability for citizen centricity (CC). The KMO test of sampling adequacy value was (0.706), which exceeded 0.6, and the Bartlett's test of sphericity value was significant. This confirmed the suitability of the variables for EFA (see Table 7.10).

Table 7.10: KMO and Bartlett's Test for Citizen Centricity

KMO and Bartlett's Test		
KMO measure of sampling adequacy		.706
Bartlett's test of sphericity	approx. chi-square	362.022
	df	6
	sig.	.000

To determine the number of components (factors to extract), eigenvalues of 1 or more were checked. One component met this criterion, explaining 65.589% of the variance, with values ranging from 0.757 to 0.928. Based on this result, a Varimax rotation was not preformed. The factor analysis results of the uniqueness construct are presented in Table 7.11.

Table 7.11: Factor Analysis Results for Citizen Centricity

			Components	Initial eigenvalues		
Factors	Codes	Variable description	1	Total	% of Variance	Cumulative %
CC	C_1	Citizen focus	0.928			
	C_2	Citizen needs	0.779			
	C_3	Citizen satisfaction	0.763			
	C_4	Citizen understandings	0.757	2.624	65.589	65.589

7.4.4.5 e-Government Program (Yesser)

Pre-analysis was conducted to check the data suitability for the e-Government program (Yesser) (EG). The KMO test of sampling adequacy value was (0.853), which exceeded 0.6, and the Bartlett's test of sphericity value was significant. This confirmed the suitability of the variables for EFA (see Table 7.12).

Table 7.12: KMO and Bartlett's test for e-Government Program (Yesser)

KMO and Bartlett's Test		
KMO measure of sampling adequacy		.853
Bartlett's test of sphericity	approx. chi-square	937.462
	df	15
	sig.	.000

To determine the number of components (factors to extract), eigenvalues of 1 or more were checked. One component met this criterion, explaining 67.852% of the variance, with values ranging from 0.752 to 0.920. Based on this result, a Varimax rotation was not performed. The factor analysis results of the uniqueness construct are presented in Table 7.13.

Table 7.13: Factor Analysis Results for e-Government Program (Yesser)

			Components	Initial eigenvalues		
Factors	Codes	Variable description	1	Total	% of Variance	Cumulative %
EG	Y_1	Yesser integration	0.920			
	Y_2	Yesser GSN	0.755			
	Y_3	Yesser GSB	0.963			
	Y_4	Yesser SSO	0.767			
	Y_5	Yesser NEA	0.752			
	Y_6	Yesser 'Saudi'	0.757	4.071	67.852	67.852

7.4.4.6 Interoperability for t-Government

Pre-analysis to check the data suitability was conducted for interoperability for t-Government (IOP for TG). The KMO test of sampling adequacy value was (0.745), exceeding 0.6, and the Bartlett's test of sphericity value was significant. This confirmed the suitability of the variables for EFA (see Table 7.14).

Table 7.14: KMO and Bartlett's Test for Interoperability for t-Government

KMO and Bartlett's Test		
KMO measure of sampling adequacy		.745
Bartlett's test of sphericity	approx. chi-square	493.442
	df	3
	sig.	.000

To determine the number of components (factors to extract), eigenvalues of 1 or more were checked. One component met this criterion, explaining 86.273% of the variance, with values ranging from 0.826 to 0.936. Based on this result, a Varimax rotation was not performed. The factor analysis results of the uniqueness construct are presented in Table 7.15.

Table 7.15: Factor Analysis Results for Interoperability for t-Government

			Components	Initial Eigenvalues		
Factors	Codes	Variable description	1	Total	% of Variance	Cumulative %
IOP for TG	I_1a	Efficiency	0.912			
	I_1b	Effectiveness	0.826			
	I_1c	Responsiveness	0.936	2.588	86.273	86.273

7.4.5 Test of Common Method Variance

To determine the number of factors, EFA assessed the common method variance using Harman's one factor test, as presented in Table 7.16. In this technique, the presence of a substantial amount of common method variance is indicated when either a single factor emerges from the factor analysis, or one general factor accounts for the majority of covariance in the dependent and criterion

variables (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). EFA was performed on all 64 variables for this text, based on criteria similar to that in the above analysis. The results, presented in Table 7.17, reveal that 14 components (factors) were extracted, with the first factor accounting for only 17.021 %. Thus, no general factor is apparent, suggesting that common method variance was not a concern in this thesis.

Table 7.16: Exploratory Factor Analysis Results for Common Method Variance Test

	Initial eigenvalues			Extraction sums of squared loadings			Rotation sums of squared loadings
Component	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %	Total
1	8.170	17.021	17.021	8.170	17.021	17.021	1
2	5.770	12.021	29.042	5.770	12.021	29.042	2
3	4.726	9.847	38.889	4.726	9.847	38.889	3
4	3.689	7.685	46.575	3.689	7.685	46.575	4
5	2.904	6.050	52.624	2.904	6.050	52.624	5
6	2.638	5.496	58.120	2.638	5.496	58.120	6
7	2.093	4.361	62.481	2.093	4.361	62.481	7
8	1.847	3.848	66.329	1.847	3.848	66.329	8
9	1.638	3.412	69.741	1.638	3.412	69.741	9
10	1.596	3.325	73.066	1.596	3.325	73.066	10
11	1.497	3.119	76.185	1.497	3.119	76.185	11
12	1.285	2.677	78.862	1.285	2.677	78.862	12
13	1.239	2.582	81.443	1.239	2.582	81.443	13
14	1.024	2.134	83.578	1.024	2.134	83.578	14

7.4.6 Exploratory Factor Analysis Results Summary

According to the eigenvalue and percentage of the variance criterion, the constructs (technological compatibility, organisational compatibility, governance readiness, citizen centricity, e-Government program Yesser and interoperability for t-Government) are represented respectively by four, three, four, one, one and one factor/s. This is summarised in Table 7.17.

These factor solutions were supported by the cumulative percentage of the variance extracted from these constructs, which ranged from 65.589 to 86.726%. Five variables from technological compatibility, two variables from organisational compatibility, and seven from governance readiness were removed, as they did not meet the 0.50 cut-off loading. The Cronbach's alpha coefficients of all scales were high and well above the 0.70 threshold level, ranging from 0.797 to 0.920, demonstrating internal consistency. The results confirm that these variables are reliable and valid for further analysis.

Table 7.17: Exploratory Factor Analysis Summary Results

Construct	Variable(s) removed	Factor(s) extracted	Cronbach's alpha	Cumulative variance	Factor description
TC	(S_2, A_1, A_5, D_4, BA_1)	4	0.905	86.726	TC1: IT standards (4 variables) TC2: architecture interoperability (3 variables) TC3: data requirements (3 variables) TC4: back-office systems (3 variables)
OC	(BU_1, BU_2)	3	0.897	84.364	OC1: IT staff (3 variables) OC2: OS (3 variables) OC3: business process (4 variables)
GR	(STA_5, LE_3, LE_4, F_4, L_4, L_5, STAK_1)	4	0.869	82.775	GR1: strategies & regulations (5 variables) GR2: leadership (3 variables) GR3: stakeholder (3 variables) GR4: fund (3 variables)
CC	-	1	0.797	65.859	CC (4 variables)
EG	-	1	0.887	67.852	EG (6 variables)
IOP for TG	-	1	0.920	86.237	IOP for TG (3 variables)

7.5 Confirmatory Factor Analysis

This thesis has used EFA in previous sections to explore the factor structures (number of factors) and to confirm reliability of the model construct's measurement scales. Nevertheless, such analyses are useful only as preparatory techniques, as they do not provide a comprehensive assessment of construct validity and uni-dimensionality. These are critical elements of measurement theory (Anderson & Gerbing, 1988; Hair et al., 2010). Construct validity involves the degree to which measured variables actually reflect the construct, while uni-dimensionality refers to the existence of a single construct underlying a set of measured variables (Anderson & Gerbing, 1988; Hair et al., 2010).

To assess construct validity and uni-dimensionality adequately, this thesis uses Confirmatory Factor Analysis (CFA), sub-set of the Structural Equation Modelling (SEM) technique. CFA is a statistical technique used to test or confirm a pre-specified relationship of observed measures (Hair et al., 2010). It provides a stricter interpretation than those methods employed during exploratory analysis (Anderson & Gerbing, 1988). According to Kline (2011), CFA allows the researcher to test whether the measures assumed for a construct (or factor) are consistent and measure the same factor. CFA validates the hypothesised theoretical constructs (or factors). In this sense, CFA measures the extent to which a set of observed variables (or items) represent the theoretical construct (or factor) they purport to measure. (Hair et al., 2010) argues that combining CFA results with construct validity tests

can enable researchers to understand the quality of their measures. CFA aims to identify a number of items that can explain all hypothesised constructs (or factors) in the model (Elsheikh, 2012). The following sections provide details of this analysis.

7.5.1 Overall Model Fit

The key feature of CFA is its ability to determine how well the specified factor model represents the data. This can be done by examining the model fit indices. If the fit indices prove suitable, the model is accepted. However, a model with unsatisfactory fit indices will usually be re-specified to improve the model fit (Hair et al., 2010). Various measurement fit indices can assess the model fit. These measurement fit indices are commonly classified into three categories: absolute fit, incremental fit and parsimonious fit indices. Absolute fit indices are a direct measure of how well the model specified by the researcher reproduces the observed data (Hair et al., 2010). Incremental fit indices assess how well the estimated model fits relative to some alternative baseline models (Hair et al., 2010). The parsimony fit indices provide information about which model among a set of competing models is preferable, considering its fitness relative to its complexity (Hair et al., 2010). However, no agreement exists among researchers regarding a particular measure of fit for the SEM (Hair et al., 2010). This thesis chose three absolute fit indices: the goodness-of-fit index (GFI), the root mean square error of approximation (RMSEA), and the standardised root mean residual (SRMR). It also uses two incremental fit measures: the comparative fit index (CFI) and the Tucker-Lewis index (TLI). It uses the ratio of X^2 to degree of freedom (X^2/df) to evaluate parsimonious fit index (Elsheikh, 2012) (see Table 7.18).

Table 7.18: The Goodness of fit measures

Category	GOF index	Acceptable GFI levels	References
Absolute fit indices	GFI	≥.90 indicates a good model fit	Hair et al. (2010); Kline (2011)
	RMSEA	<.08 indicates a reasonable fit;	Hair et al. (2010)
	SRMR	≤ .08 indicates a good model fit	Kline (2011)
Incremental fit indices	CFI	≥ .90 indicates a good fit	Kline (2011) Hair et al. (2010)
	TLI	≥0.90 indicates a good model fit	Kline (2011) Hair et al. (2010)
Parsimony fit indices	X2/df	< 3.0 indicates a good model fit	Kline (2011) Hair et al. (2010)

7.5.2 Construct Validity Assessment

After accepting the overall CFA model fit, each construct can be evaluated to examine the construct validity. Construct validity is the extent to which a set of measured items actually reflects the theoretical latent construct those items are designed to measure. Typically, it involves two sub-divisions: convergent and discriminant validity (Hair et al., 2010).

Convergent validity refers to the extent to which indicators of a specific construct converge or share a high proportion of variance to measure the same construct. It confirms that the scale is correlated with other known measures of the concept (Hair et al., 2010). For this thesis, convergent validity assessment focuses on factor loadings: high loadings on a factor would indicate they converge on some common point. Hair et al. (2010) has suggested that factor loadings should be greater than 0.50. However, Anderson and Gerbing (1988) argue that significant *t*-values should suffice to demonstrate convergent validity.

In addition to significant factor loadings, variable reliability, which can be determined by inspecting the square multiple correlation (SMC) R^2 value, also indicate convergent validity. Anderson and Gerbing (1988) recommend that a variable should have an R^2 value greater than 0.50 to demonstrate acceptable reliability.

Discriminant validity refers to the extent to which the measure is indeed novel and not simply a reflection of some other variable (a construct is truly distinct from other constructs) (Hair et al., 2010). For this thesis, discriminant validity is assessed by inspecting the correlation coefficient between each pair of variables. If the value of the correlation coefficient is very high (i.e., greater than 0.850) then the variables of interest might represent the same concept and should be combined as a single variable (Tabachnick & Fidell, 2013).

7.5.3 Confirmatory Factor Analysis Results

In this section, the CFA was run on each construct using AMOS (Version 22.0), which is an extension of SPSS. Based on the assessment of model fit indices' criteria and validity assessment in the last sections, CFA models of six constructs were evaluated. This section also summarises the analysis of the model evaluation process for CFA for each individual construct.

The results for each construct are presented in Tables 7.20 to 7.24. The factor loading, *t*-value and significance level of each variable shown in these tables provides a measure for convergent validity. The value of SMC or R^2 provides a measure by which to assess the variables' reliability. The value of the correlation between factors indicates the discriminant validity. The model fit indices are also presented to assess uni-dimensionality.

7.5.3.1 Technological Compatibility Construct

According to the structure proposed in the conceptual model, the technological compatibility construct (TC) was identified as having four factors: IT standards (TC1), architecture interoperability (TC2), data requirements (TC3), and back-office systems (TC4). The technological capability construct was operationalised with 18 measurement variables. During the EFA, five variables were removed due to their low factor loadings (<0.50) (S_2, A_1, A_5, D_4, BA_1). Therefore, 13 variables were used in designing CFA for the TC construct. IT Standards (TC1) were measured by four observed variables (S_3, S_4, S_5, S_6). Architecture interoperability (TC2) was measured by three

observed variables (A_2, A_3, A_4). Data requirements (TC3) were measured by three observed variables (D_1, D_2, D_3). Back-office systems (TC4) were measured by three observed variables (BA_2, BA_3, BA_4).

The CFA results of the TC construct are presented in Table 7.19. This shows that the model has a good level of fit: GFI = 0.945; RMSEA = 0.042; SRMR = 0.0376; TLI = 0.989; CFI = 0.992; and χ^2/df = 1.379 (Hair et al., 2010; Kline, 2011). All variable loadings above 0.80 were greater than the threshold level of 0.50 and were significant at $p < 0.001$, demonstrating convergent validity. All R^2 values were greater than 0.50, supporting an acceptable reliability of the items. Figure 7.1 also shows that the correlation coefficients between each pair of factors, ranging from 0.35 to 0.53, were less than 0.85, confirming the construct's discriminate validity. Finally, as the fit indices of the re-specified model proved good, uni-dimensionality of this construct was also established.

Table 7.19: Confirmatory Factor Analysis Results of Technological Compatibility

Variable code	Variable description	Factor loadings	*t*-value	R^2
TC1	IT Standards			
S_3	Open standards	0.964	f.p.	0.929
S_4	Common standards	0.853	20.137***	0.728
S_5	Interoperable standards	0.805	17.480***	0.648
S_6	Technical standards	0.846	19.689***	0.715
TC2	Architecture interoperability			
A_4	Program framework	0.820	f.p.	0.672
A_3	interoperability architecture	0.815	14.354***	0.664
A_2	Applications integration	0.973	17.058***	0.946
TC3	Data requirements			
D_3	Data monitoring	0.845	f.p.	0.715
D_2	Data legislations	0.932	18.792***	0.869
D_1	Data ownership	0.945	19.108***	0.893
TC4	Back-office systems			
BA_4	Legacy back systems	0.995	f.p.	0.990
BA_3	Governance of back systems	0.923	32.155***	0.853
BA_2	Integration between back systems	0.924	32.207***	0.853
GOF index		**Value**	**Recommended value**	
GFI		0.945	> 0.90	
RMSEA		0.042	< 0.08	
SRMR		0.038	≤ 0.08	
CFI		0.992	≥ 0.90	
TLI		0.989	≥ 0.90	
X^2/df		1.379	< 3.0	

Note: fp: fixed parameter for estimation; ***$p < 0.001$

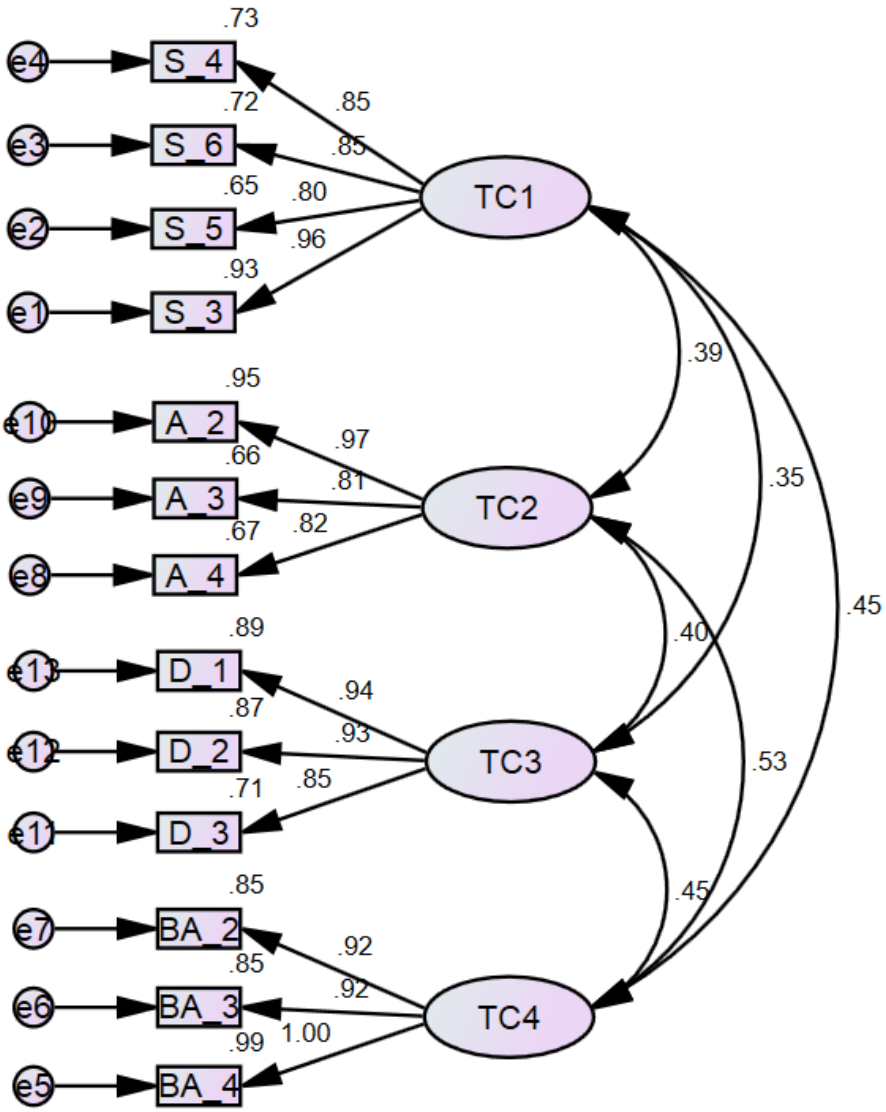

Figure 7.1: Confirmatory Factor Analysis Model of the Technological Compatibility Construct

7.5.3.2 Organisational Compatibility Construct

According to the structure proposed in the conceptual model, the organisational compatibility (OC) construct was identified as having three factors: IT staff (OC1), organisational structure (OC2), and BPM (OC3). This construct was operationalised with 12 measurement variables. During the EFA, two variables were removed due to their low factor loadings (<0.50) (BU_1, BU_2). Therefore, 10 variables were used in designing CFA for the OC construct. IT staff (OC1) were measured by three observed variables (ST_2, ST_3, ST_4). Organisational structure (OC2) was measured by three observed variables (STR_1, STR_2, STR_3). BPM (OC3) was measured by three observed variables (BU_3, BU_4, BU_5, BU_6) (see Figure 7.2).

The CFA results of the organisational compatibility construct are presented in Table 7.20. This shows that the model has a good level of fit: GFI = 0.968; RMSEA = 0.028; SRMR = 0.030; TLI = 0.997;

CFI = 0.998; and χ^2/df = 1.173 (Hair et al., 2010; Kline, 2011). All variable loadings above 0.80 were greater than the threshold level of 0.50 and were significant at $p < 0.001$, demonstrating convergent validity. All R^2 values were greater than 0.50, supporting acceptable item reliability. Figure 7.2 shows that the correlation coefficients between each pair of factors, ranging from 0.37 to 0.46 were less than 0.85, confirming the constructs' discriminate validity. Finally, as the fit indices of the re-specified model proved good, uni-dimensionality of this construct was also established.

Table 7.20: Confirmatory Factor Analysis Results of Organisational Compatibility

Variable codes	**Variable descriptions**	**Factor loadings**	***t*-value**	***R*²**
OC1	IT staff			
ST_4	In-house staff	0.834	f.p.	0.696
ST_3	Staff availability	0.864	16.158***	0.747
ST_2	Staff training	0.986	18.229***	0.936
OC2	Organisational structure			
STR_3	Organisational structure bureaucracy	0.967	f.p.	0.935
STR_2	Suitable organisational structure	0.956	35.848***	0.914
STR_1	Update of organisational structure	0.987	45.168***	0.973
OC3	BPM			
BU_6	Business process expertise	0.889	f.p.	0.791
BU_5	Business process standards	0.837	17.599***	0.701
BU_4	Business process documentation	0.840	17.721***	0.705
BU_3	Business process coordination	0.996	26.195***	0.992
GOF index		**Value**	**Recommended value**	
GFI		0.968	> 0.90	
RMSEA		0.028	< 0.08	
SRMR		0.030	≤ 0.08	
CFI		0.997	≥ 0.90	
TLI		0.998	≥ 0.90	
^{X2}/df		1.173	< 3.0	

Note: f.p.: fixed parameter for estimation; ***$p < 0.001$

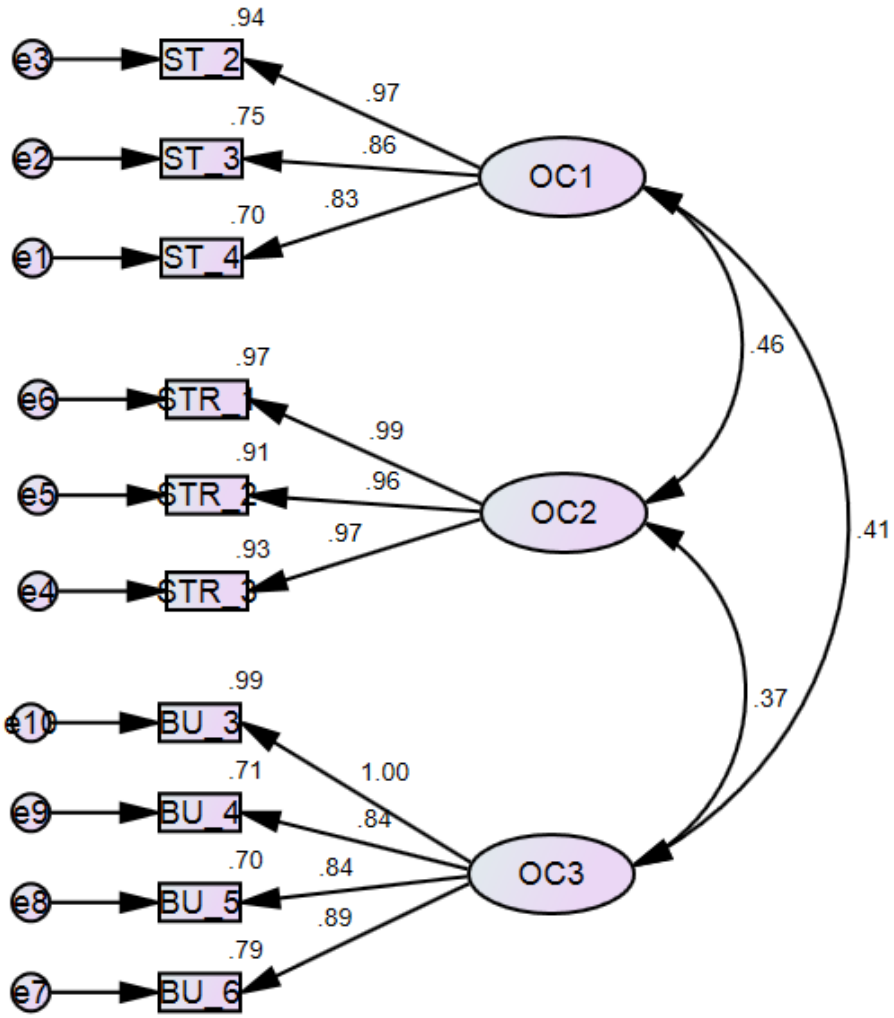

Figure 7.2: Confirmatory Factor Analysis Model of the Organisational Compatibility Construct

7.5.3.3 Governance Readiness Construct

According to the structure proposed in the conceptual model, the governance readiness (GR) construct was identified as having four factors: strategies and regulations (GR1), leadership (GR2), stakeholders (GR3) and funds (GR4). The construct was operationalised with 21 measurement variables. During the EFA, seven variables were removed due to their low factor loadings (<0.50) (STA_5, LE_3, LE_4, F_4, L_4, L_5, STAK_3). Therefore, 14 variables were used in designing CFA for the GR construct. Strategies and regulations (GR1) were measured by four observed variables (LE_2 LE_1, STA_4, STA_3, STA_2). Leadership (GR2) was measured by three observed variables (L_1, L_2, L_3). Stakeholders (GR3) were measured by three observed variables (STAK_1, STAK_2, STAK_4). Funds (GR4) were measured by three observed variables (F_1, F_2, F_3) (see Figure 7.3).

The CFA results of governance readiness are presented in Table 7.21. This shows that the model has a good level of fit: GFI = 0.940; RMSEA = 0.038; SRMR = 0.0326; TLI = 0.992; CFI = 0.993; and χ^2/df = 1.308 (Hair et al., 2010; Kline, 2011). All variable loadings above 0.80 were greater than the threshold level of 0.50 and were significant at the $p < 0.001$ level, demonstrating convergent validity. All R^2 values were greater than 0.50, supporting an acceptable reliability. Figure 7.3 also shows that the correlation coefficients between each pair of factors were less than 0.85, confirming the construct's discriminate validity. Finally, as the fit indices of the re-specified model proved good, uni-dimensionality of this construct was also established.

Table 7.21: Confirmatory Factor Analysis Results of Governance Readiness

Variable codes	Variable descriptions	Factor loadings	*t*-value	R^2
GR1	Strategies & Regulations			
LE_2	Updated regulations	0.855	f.p.	0.730
LE_1	Clear regulations	0.941	19.926***	0.885
STA_4	Strategy goal	0.882	17.551***	0.777
STA_3	Strategy plan	0.873	17.241***	0.763
STA_2	Strategy commitment	0.871	17.170***	0.759
GR2	Leadership			
L_3	Leader cooperation	0.984	f.p.	0.968
L_2	Strong leader	0.915	30.712***	0.837
L_1	Leader support	0.996	71.420***	0.991
GR3	Stakeholders			
STAK_4	Stakeholder cooperation	0.980	f.p.	0.961
STAK_2	Stakeholder management	0.897	25.220***	0.805
STAK_1	Stakeholder involvement	0.900	25.499***	0.810
GR4	Funds			
F_3	Fund management	0.868	f.p.	0.934
F_2	Measurement mechanism	0.829	16.074***	0.687
F_1	Fund amount	0.967	19.372***	0.934
GOF index		**Value**	**Recommended value**	
GFI		0.940	> 0.90	
RMSEA		0.038	< 0.08	
SRMR		0.033	≤ 0.08	
CFI		0.992	≥ 0.90	
TLI		0.993	≥ 0.90	
X^2/df		1.308	< 3.0	

Note: f.p.: fixed parameter for estimation; ***$p < 0.001$

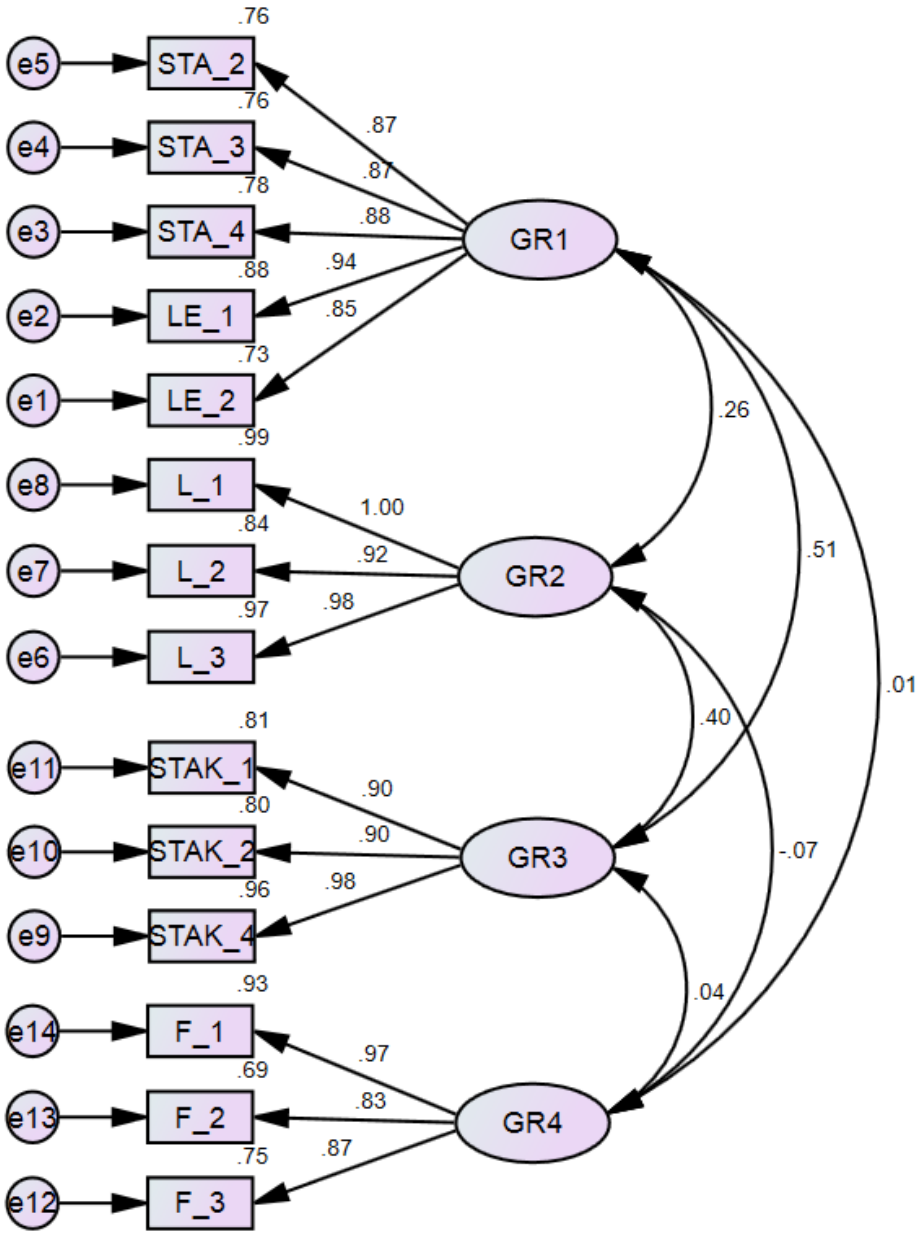

Figure 7.3: Confirmatory Factor Analysis Model of the Governance Readiness Construct

7.5.3.4 Citizen Centricity Construct

According to the structure proposed in the conceptual model and based on the EFA, four observed variables were used in designing CFA for the citizen centricity (CC) construct (C_1, C_2, C_3, C_4).

The CFA results of this construct are presented in Table 7.22. This shows that the model has a good level of fit: GFI = 0.996; RMSEA = 0.002; SRMR = 0.016; TLI = 0.999; CFI = 0.999; and $\chi^2/df = 0.619$ (Hair et al., 2010; Kline, 2011). All variables ranged from 0.64 to 0.99 and were greater than or closer to the threshold level of 0.50. They were significant at the $p < 0.001$ level, demonstrating convergent validity. Three variables were either greater than or close to 0.50 R^2 values; thus supporting an acceptable variable reliability. The variables with low R^2 values were retained as they had substantial

and high significant loadings (see Figure 7.4). As the fit indices of the re-specified model proved good, uni-dimensionality of this construct was also established.

Table 7.22: Confirmatory Factor Analysis Results of Citizen Centricity

Variable codes	Variable descriptions	Factor loadings	*t*-value	R^2
CC	CC			
C_4	Citizen understandings	0.660	f.p.	0.980
C_3	Citizen satisfaction	0.645	8.856***	0.461
C_2	Citizen needs	0.678	9.258***	0.416
C_1	Citizen focus	0.990	12.687***	0.435
GOF Index		**Value**	**Recommended value**	
GFI		0.996	> 0.90	
RMSEA		0.002	< 0.08	
SRMR		0.016	≤ 0.08	
CFI		0.999	≥ 0.90	
TLI		0.999	≥ 0.90	
X^2/df		0.619	< 3.0	

Note: f.p.: fixed parameter for estimation; ***p < 0.001

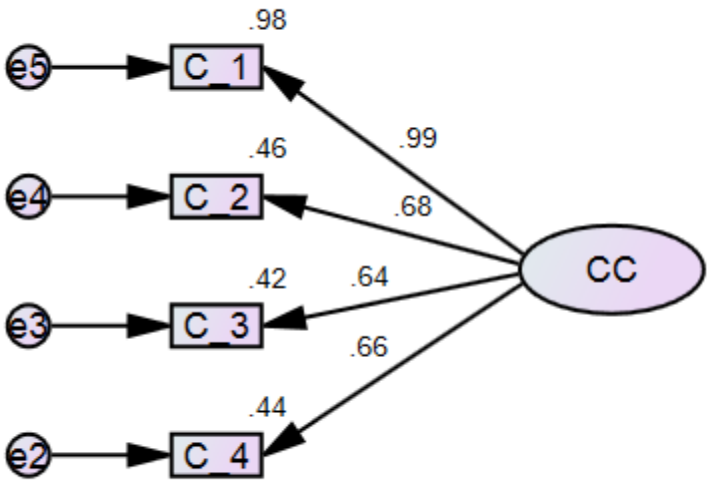

Figure 7.4: Confirmatory Factor Analysis Model of Citizen Centricity

7.5.3.5 e-Government Program (Yesser) Construct

According to the structure proposed in the conceptual model and based on the EFA, six variables were used in designing CFA for the e-Government program construct (Y_1, Y_2, Y_3, Y_4, Y_5, Y_6).

The CFA results of this construct are presented in Table 7.23. This shows that the model has a good level of fit: GFI = 0.977; RMSEA = 0.069; SRMR = 0.0267; TLI = 0.983; CFI = 0.990; and χ^2/df = 2.035 (Hair et al., 2010; Kline, 2011). All variables ranged from 0.70 to 0.99, and were greater than

the threshold level of 0.50. They were all significant at the $p < 0.001$ level, demonstrating convergent validity. With the exception of one variable, all R^2 values were either greater than or close to 0.50, thus supporting an acceptable variable reliability (see Figure 7.5). The variable with low R^2 values was nevertheless retained as it had substantial and high significant loadings. As the fit indices of the re-specified model proved good, uni-dimensionality of this construct was also established.

Table 7.23: Confirmatory Factor Analysis Result of e-Government Program (Yesser)

Variable codes	Variable descriptions	Factor loadings	*t*-value	*R2*
EG	e-Government program			
Y_6	Yesser 'Saudi'	0.700	f.p.	0.490
Y_5	Yesser NEA	0.713	10.341***	0.508
Y_4	Yesser SSO	0.707	10.262***	0.501
Y_3	Yesser GSB	0.997	14.019***	0.994
Y_2	Yesser GSN	0.712	10.330***	0.507
Y_1	Yesser integration	0.890	12.839***	0.793
GOF index		**Value**	**Recommended value**	
GFI		0.977	> 0.90	
RMSEA		0.069	< 0.08	
SRMR		0.027	≤ 0.08	
CFI		0.990	≥ 0.90	
TLI		0.983	≥ 0.90	
X2/df		2.035	< 3.0	

Note: f.p.: fixed parameter for estimation; ***$p < 0.001$

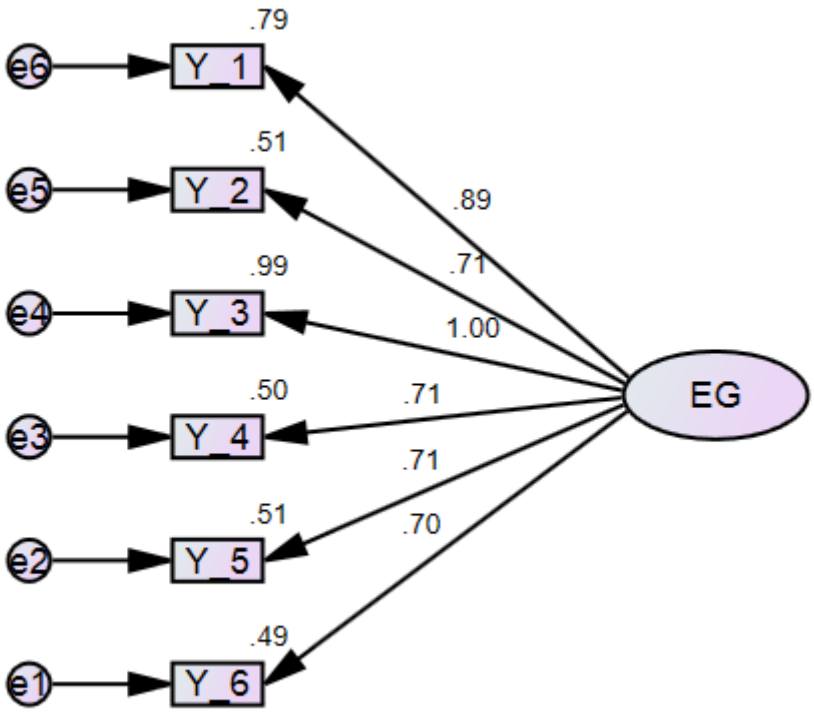

Figure 7.5: Confirmatory Factor Analysis Model of the e-Government Program

7.5.3.6 Interoperability for t-Government Construct

According to the structure proposed in the conceptual model and based on the EFA, three variables were used in designing CFA for the interoperability for t-Government construct (I_1a, I_1b, I_1c).

The CFA results of the interoperability for t-Government construct are presented in Table 7.24. This shows that the model has a good level of fit: GFI = 0.992; RMSEA = 0.079; SRMR = 0.013; TLI = 0.990; CFI = 0.997; and χ^2/df = 2.727 (Hair et al., 2010; Kline, 2011). All variables ranging from 0.843 to 0.939 were greater than the threshold level of 0.50 and were significant at the $p < 0.001$ level, demonstrating convergent validity. All R^2 values were greater than 0.50, supporting acceptable reliability of the variables (see Figure 7.6). As the fit indices of the re-specified model proved good, uni-dimensionality of this construct was also established.

Table 7.24: Confirmatory Factor Analysis Results of Interoperability for t-Government

Variable codes	Variable descriptions	Factor loadings	*t*-value	R^2
IOP for TG	interoperability for t-Government			
I_1c	Responsiveness	0.939	f.p.	0.883
I_1b	Effectiveness	0.843	23.195	0.710
I_1a	Efficiency	0.901	23.195	0.812
GOF index		**Value**	**Recommended value**	
GFI		0.992	> 0.90	
RMSEA		0.079	< 0.08	
SRMR		0.013	≤ 0.08	
CFI		0.997	≥ 0.90	
TLI		0.990	≥ 0.90	
X^2/df		2.727	< 3.0	

Note: f.p.: fixed parameter for estimation; ***p < 0.001

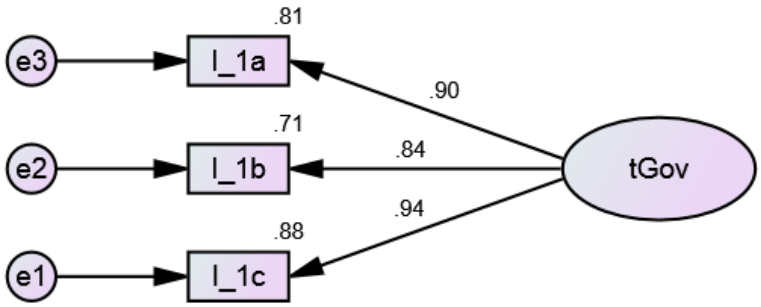

Figure 7.6: Confirmatory Factor Analysis Model of Interoperability for t-Government

7.5.4 Confirmatory Factor Analysis Results Summary

The CFA results confirm that all constructs were derived from the EFA results. As presented in Table 7.25, the CFA examined the constructs to confirm this validity. It shows that all constructs have a good level of fit. The final values of Cronbach's alpha were very high, ranging from 0.797 to 0.920, indicating the reliability of these constructs. Within each construct, all variables significantly and substantially loaded onto their respective factors with acceptable levels of reliability, indicating construct validity. All the fit indices proved satisfactory, which confirmed the model constructs' uni-dimensionality.

Table 7.25: Summary of Confirmatory Factor Analysis Results

Construct factor	Number of variables	Final α	GFI	RSMR	TLI	CFI	χ^2/df	RMSEA
TC		0.905	0.945	0.037	0.989	0.992	1.379	0.042
TC1: IT standards	4							
TC2: Architecture interoperability	3							
TC3: Data requirements	3							
TC4: Back-office systems	3							
OC		0.897	0.968	0.030	0.997	0.998	1.137	0.028
OC1: IT staff	3							
OC2: Organisational structure	3							
OC3: business processes	4							
GR		0.860	0.940	0.038	0.992	0.993	1.308	0.038
GR1: Strategies & regulations	5							
GR2: Leadership	3							
GR3: Stakeholders	3							
GR4: Funds	3							
CC	4	0.797	0.996	0.016	0.998	0.999	0.619	0.002
EG	6	0.887	0.977	0.026	0.983	0.990	2.035	0.069
IOP for TG	3	0.920	0.997	0.013	0.990	0.997	2.727	0.079

7.6 Structural Equation Modelling

Structural Equation Modelling (SEM) is a statistical technique that allows researchers to examine multiple interrelated dependence relationships in a single model (Hair et al., 2010). SEM is a popular statistic technique in social science research (Mueller, 1997). It is flexible and interactions between the theory to be tested and the sample data (Chin, 1998). SEM can also model the relationships between observed and latent variables, and the relationships among a large number of latent variables (Chin, 1998).

SEM consists of two parts: (1) the measurement and (2) a structural model (SM) (Hair et al., 2010). The measurement links observed variables to latent variables with CFA, as performed in the previous sections. SM links latent variables to others through systems of simultaneous equations. The structural and measurement models require an assessment of the model fit indices and parameter estimates; here, these were derived from similar processes and criteria conducted in the CFA performed earlier.

7.6.1 Measurement Model Specification and Assessment Criteria

The measurement model in this thesis was developed by integrating the individual CFA models of all constructs into a single model. The three constructs (technological compatibility, organisational compatibility, and governance readiness) within the model consisted of three layers: 1) indicators,

signifying the measured variables; 2) first-order factors, signifying the factors derived from the factor analysis; and 3) second-order factors, signifying the underlying constructs.

The current model is classified as total disaggregation because each variable is an individual item, where all individual measured variables were included in the analysis. This type of specification can affect the model's parsimony, leading to inaccurate parameter estimates or the calculation of parameters unable to converge (Edwards & Bagozzi, 1998).

Therefore, item-parcelling techniques were deployed for two reasons: to reduce the model's complexity and to unify all constructs into a two-layer model. This aggregation method was applied by summing (or taking) the mean of several variables that measured the same construct (Hair et al., 2010). According to Kline (2011), the assumption of uni-dimensionality must be met before conducting the item-parcelling technique. The construct's uni-dimensionality was established in the previous section. Here, the item-parcelling technique was undertaken for all variables in the technological compatibility, organisational compatibility, and governance readiness constructs to represent their respective factors. As a result, the initial measurement model was developed by integrating the individual CFA models of all constructs (described in last section) into a single initial measurement model. This initial measurement model was simplified into a two-layer model for all constructs. The item-parcelled factors were treated as indicators whereas the constructs were treated as first-order factors (see Figure 7.7). The partial disaggregation model was preferred as it was more parsimonious; it was used as the analysis measurement model. The measurement model, model fit, convergent and discriminant validity, and uni-dimensionality were assessed using the CFA technique as conducted in the previous sections.

Model reliability was assessed using a more accurate measure of 'composite reliability' and 'average variance extracted', rather than the traditional Cronbach's alpha. Composite reliability refers to the degree to which a set of two or more variables share in their measurement of a construct (Hair et al., 2010). A high composite reliability indicates that all variables measure the same construct. As a complementary measure to determine composite reliability, the average variance extracted measures the amount of variance in the variables, accounted for by the latent construct (Hair et al., 2010). The higher values of the variance extracted indicate that the variables truly represent the latent construct. According to Hair et al. (2010), values for composite reliability greater than 0.70 are desirable, and if values for the average variance extracted are greater than 0.50, this is considered adequate.

7.6.2 Measurement Model Results

As presented in Table 7.26, the model exhibits a good level of fit (GFI = 0.910; RMSEA = 0.029; SRMR = 0.053; TLI = 0.979; CFI = 0.982; and χ^2/df = 1.180). All the indicators (factors) had significant loadings greater than 0.50 ($p < 0.001$) on their respective constructs, with the exception

of GR4 (funds): this was lower than 0.50. This result is consistent with the qualitative finding, indicating that funding has no impact on interoperability for t-Government implementation. The next chapter discusses this issue in more detail.

In terms of indicator reliability, some indicators had R^2 values lower than the recommended level of 0.50, suggesting the potential for elimination. However, as their factor loadings were meaningful and highly significant, they were retained in the measurement model. All the constructs were shown to have a composite reliability greater than the threshold level of 0.70 and their reliability was greater than the threshold level of 0.50 (Hair et al., 2010). Figure 7.7 shows that the correlation coefficients between each pair of factors were less than 0.850, suggesting adequate discriminant validity. These results indicate that the measurement model possesses substantial convergent validity and uni-dimensionality.

Table 7.26: Measurement Model Results

Construct/factors	Loading	*t*-value	R^2	Composite reliability	Average variance extracted
TC				0.932	0.810
TC1: IT standards	0.580	7.421***	0.336		
TC2: Architecture interoperability	0.705	7.167***	0.497		
TC3: Data requirements	0.603	6.539***	0.364		
TC4: Back-office systems	0.779	f.p.	0.606		
OC				0.946	0.844
OC1: IT staff	0.719	6.419***	0.517		
OC2: Organisation structure	0.650	6.244***	0.423		
OC3: Business processes	0.597	f.p.	0.357		
GR				0.945	0.835
GR1: Strategies & Regulations	0.593	8.859***	0.351		
GR2: Leadership	0.575	8.858***	0.326		
GR3: Stakeholders	0.880	8.856***	0.773		
GR4: Funds	0.065	f.p.	0.040		
CC				0.824	0.619
C_1	0.990	12.696***	0.981		
C_2	0.679	13.310***	0.461		
C_3	0.645	12.195***	0.416		
C_4	0.660	f.p.	0.436		
EG				0.911	0.634
Y_1	0.892	12.868***	0.796		
Y_2	0.713	13.231***	0.508		
Y_3	0.995	26.239***	0.991		
Y_4	0.708	13.083***	0.501		
Y_5	0.714	13.254***	0.510		
Y_6	0.701	f.p.	0.491		
IOP for TG				0.921	0.795
I_1a	0.913	21.410***	0.834		
I_1b	0.821	16.766***	0.674		
I_1c	0.938	f.p.	0.880		
GOF index	**Value**			**Recommended value**	
GFI	0.910			> 0.90	
RMSEA	0.029			< 0.08	
SRMR	0.053			≤ 0.08	
CFI	0.982			≥ 0.90	
TLI	0.979			≥ 0.90	
X^2/df	1.180			< 3.0	

Note: fp: fixed parameter for estimation; ***$p < 0.001$

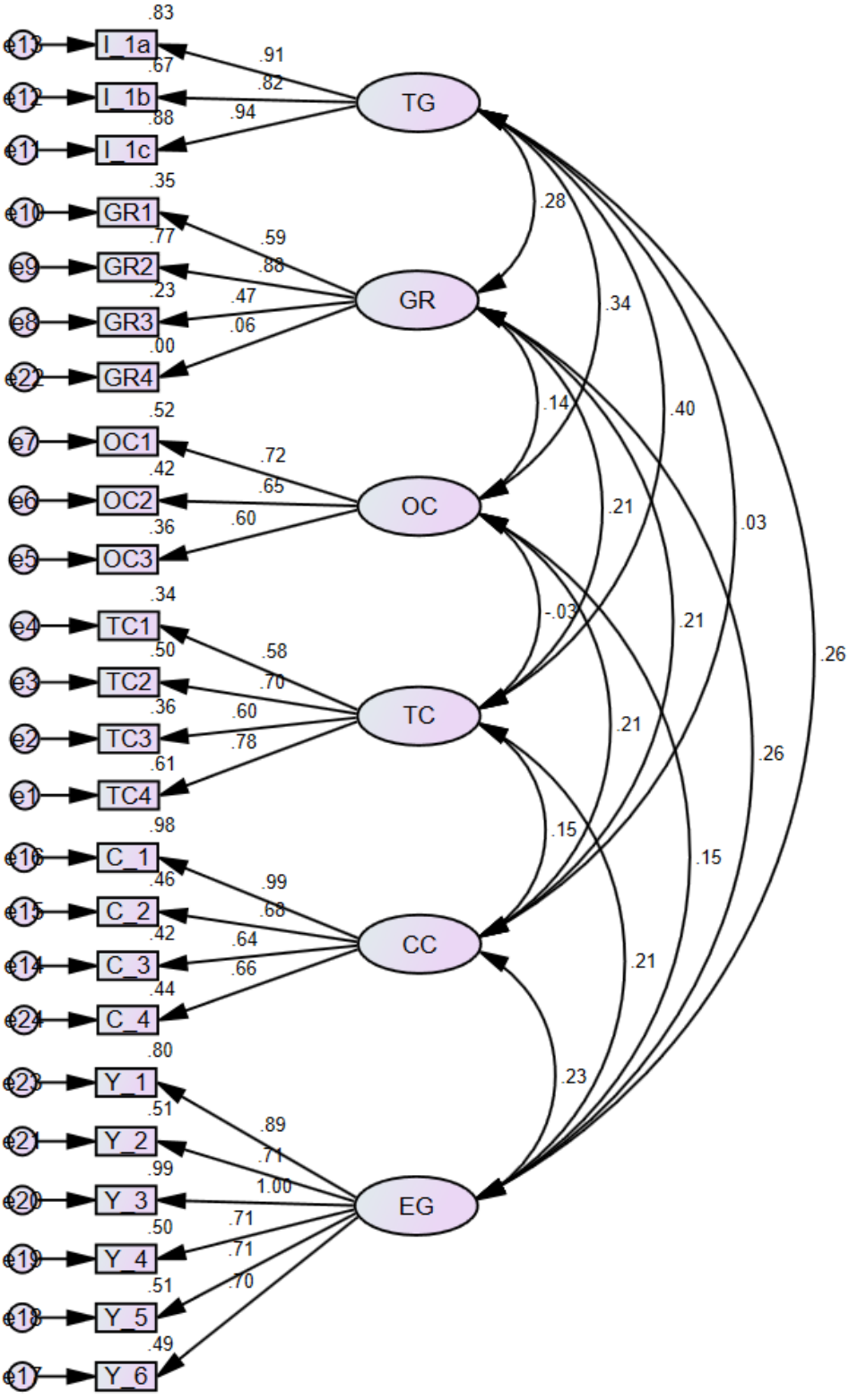

Figure 7.7: The Measurement Model

7.6.3 Structural Model Assessment and Hypotheses Testing

After validating the established measurement model, the next step was to test the Structural Model (SM) by testing the hypothesised conceptual model and the relationships between factors. Testing the hypotheses required developing an SM of all six constructs assessed in the measurement model (see Table 7.27 and Figure 7.8).

The assessment procedure of the SM included an examination of model fit indices and standardised path coefficients to provide a basis upon which to accept or reject the hypothesised relationships. The criteria for the model fit indices adopted in this analysis were similar to those employed in the measurement model assessment (see Section 7.7.1). For the hypothesised relationships (from H1 to H9) to be supported, the important test statistic is the critical ratio (CR/*t*-value). This is calculated by dividing the un-standardised regression weight (URW) by its standard error (SE). A *t*-value higher than + 1.96 and probability (P) values less than 0.05 indicate statistical significance at the level of 0.05 (Byrne, 2013). For the hypothesised relationships (H10, H11), multiple group analysis is supported. The results of running the SM and multiple group analysis are discussed in the following sections.

Table 7.27: Hypothesised Relationships between All Constructs

Hypothesis	Descriptions
H1	Technological Compatibility factors positively influence the level of interoperability required for t-Government implementation
H2	Organisational Compatibility factors positively influence the level of interoperability required for t-Government implementation
H3	Governance Readiness factors positively influence the level of interoperability required for t-Government implementation
H4	Citizen Centricity positively influences the level of interoperability required for t-Government implementation
H5	The e-Government program (Yesser) positively influences the level of interoperability required for t-Government implementation
H6	Citizen Centricity positively influences the e-Government program (Yesser)
H7	The e-Government program (Yesser) positively influences Technological Compatibility
H8	The e-Government program (Yesser) positively influences Organisational Compatibility
H9	The e-Government program (Yesser) positively influences Governance Readiness
H10	Organisation size will moderate relationships among the proposed model constructs
H11	The number of G2G services will moderate relationships among the proposed model constructs

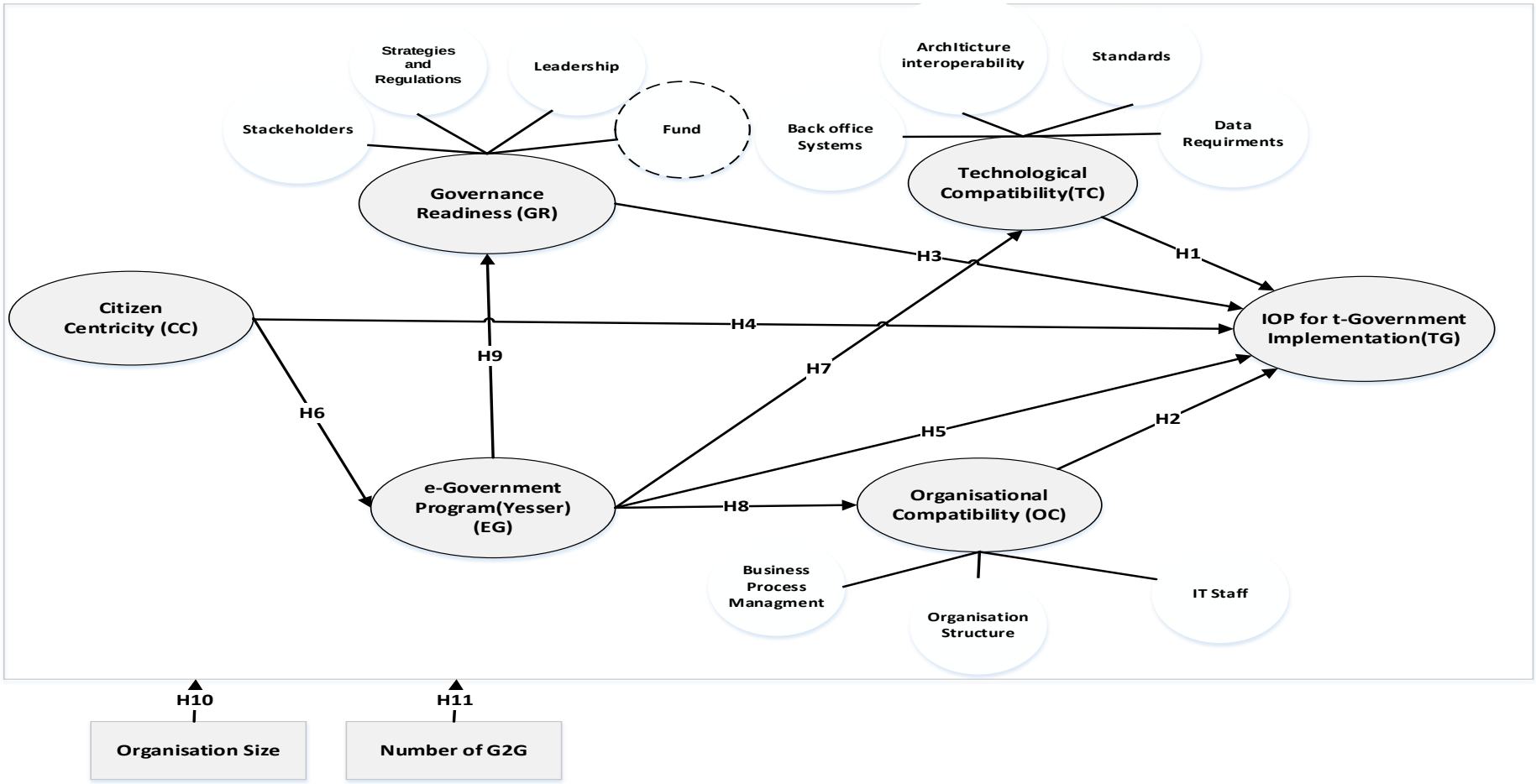

Figure 7.8: Structural Model with the Hypothesised Relationships between all Constructs

As presented in Table 7.28, the fit statistics and indices for the SM showed GFI = 0.905; RMSEA = 0.032; SRMR = 0.059; TLI = 0.977; CFI = 0.975; andχ^2/df = 1.289) (Hair et al., 2010). This result indicates a better overall fit of the proposed model, and the hypothesised SM provides a good fit to the data (Kline, 2011). As shown in Table 7.29, the six CR values are within the acceptable range and the *P* values are close to zero, suggesting that the six hypotheses are supported. The other three path coefficients are statistically insignificant and three hypotheses are not supported.

The Technological Compatibility construct had a positive influence on the interoperability for t-Government construct (0.37, $p < 0.001$), supporting H1. The Organisational Compatibility construct had a positive influence on the interoperability for t-Government construct (0.33, $p < 0.001$), supporting H2. The Governance Readiness construct had a positive influence on the interoperability for t-Government construct (0.18, $p < 0.05$), supporting H3. The Citizen Centricity construct had a negative influence on the interoperability for t-Government construct (-0.13, $p < 0.05$), not supporting H4. The e-Government construct had no influence on the interoperability for t-Government construct (0.12, $p > 0.05$), not supporting H5. The Citizen Centricity construct had a positive influence on the e-Government construct (0.23, $p < 0.01$), supporting H6. The e-Government construct had a positive influence on the Technological Compatibility construct (0.21, $p < 0.01$), supporting H7. The e-Government construct had no influence on the Organisational Compatibility construct (0.15, $p >0.05$), not supporting H8. The e-Government construct had a positive influence on the Governance Readiness construct (0.36, $p < 0. 01$), supporting H9 (see Figure 7.9).

The following section discusses the results from examining the effects of organisation size and the number of G2G services on the research model, using a multi-group analysis technique.

Table 7.28: Structural Model Results

Path (hypothesis)	Standardised path coefficient	*t*-value	Hypothesis testing result
H1: TC → IOP for TG	0.37	4.535***	Supported
H2: OC → IOP for TG	0.33	4.110***	Supported
H3: GR → IOP for TG	0.18	2.425*	Supported
H4: CC → IOP for TG	-0.13	-2.033*	Not supported
H5: EG → IOP for TG	0.12	1.709n.s	Not supported
H6: CC → EG	0.23	3.222**	Supported
H7: EG → TC	0.21	2.623**	Supported
H8: EG → OC	0.15	1.872n.s.	Not supported
H9: EG → GR	0.26	3.016**	Supported

GOF index	Value	Recommended value
GFI	0.905	> 0.90
RMSEA	0.032	< 0.08
SRMR	0.059	≤ 0.08
CFI	0.975	≥ 0.90
TLI	0.977	≥ 0.90
X^2/df	1.289	< 3.0

(***=significance at the 0.001 level, **=significance at the 0.01 level and *=significance at the 0.05 level)

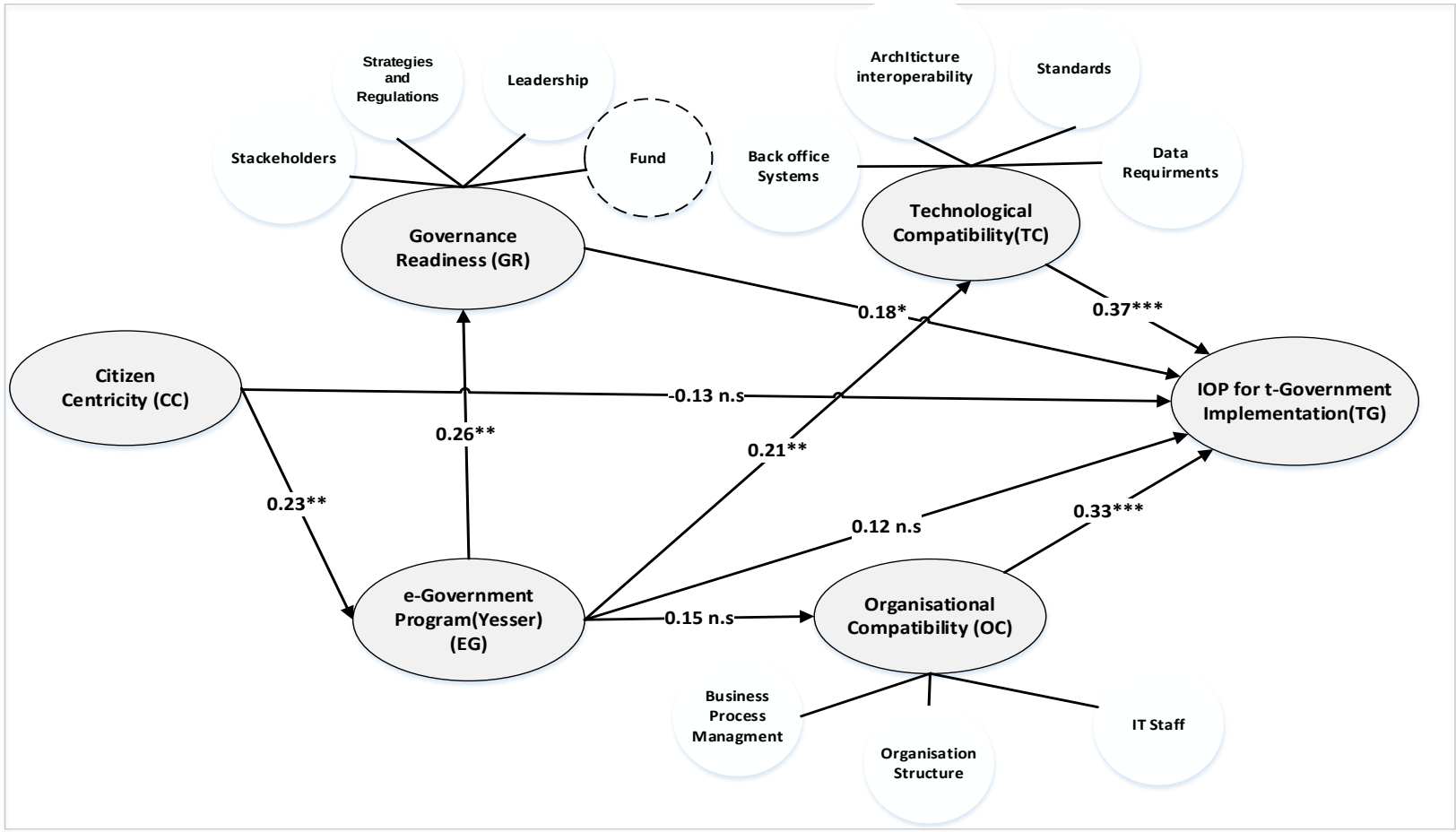

Figure 7.9: Path Coefficients for the Proposed Structure Model

7.7 Multi-Group Analysis

This section presents the statistical analysis undertaken by conducting multiple group analysis to determine the effect of two different moderators on the research model (as shown in Figure 7.8). The moderators investigated here are organisation size and the number of G2G services. This thesis uses multi-group analysis, as recommended by Kline (2011) to achieve this end. It requires the researcher to impose cross-group equality constraints on the path coefficients. By using the manage models function, two models have been established. One is an unconstrained model where all variable relationships were allowed to vary freely, and the other is the constrained model. The model was then run and a chi-square difference test performed between the two models. If the relative fit of the constrained model is much worse than that of the unconstrained model, it can be concluded that the direct effects differ across groups. The structural weights were tested by comparing the path coefficient between each model and determining whether any differences were statistically significant. Significant differences were identified based on an examination of the pairwise parameter comparisons matrix. Each coefficient path was compared using a z-test (two-tail test) with an absolute value greater than |1.96| for the differences between paths. The results will be statistically significant at $p < 0.05$ (Holmes-Smith, 2013). The results of multiple group analysis for each moderator are discussed in the following sections.

7.7.1 Multi-Group Analysis for Organisation Size

In this section, comparisons between and within the data set are made for the first moderator (organisation size). The data set was divided into two groups according to median organisation size (Hair et al., 2010). The first group comprised large organisations (n = 85) and the second group comprised small organisations (n = 132). As presented in Table 7.29, a chi-square difference test of invariant covariance was not significant. This indicates that no difference between the two groups exists. However, the results recorded in Table 7.29 show a significant impact of the e-Government program (Yesser) on technological compatibility and governance readiness in large organisations, while the e-Government program (Yesser) has no impact on technological compatibility and governance readiness in small organisations.

The impact of the e-Government program (Yesser) in large organisations:

- (Technological Compatibility ← e-Government, estimate = 0.169, *p*-value < 0.05),
- (Governance Readiness ← e-Government, estimate = 0.182, *p*-value < 0.05).

The impact of the e-Government program (Yesser) in small organisations:

- (Technological Compatibility ← e-Government, estimate = 0.097, *p*-value >0.05),
- (Governance Readiness ← e-Government, estimate = 0.058, *p*-value >0.05).

Table 7.29: Multi-Group Analysis for Organisation Size

			Large organisation		Small organisation		
			Estimate	**P**	**Estimate**	**P**	**z-score**
Path							
EG	<---	CC	0.257	0.012	0.290	0.039	0.189
GR	<---	EG	0.182	0.011	0.058	0.356	-1.300
TC	<---	EG	0.169	0.020	0.097	0.212	-0.686
OC	<---	EG	0.117	0.110	0.090	0.393	-0.209
IOP for TG	<---	CC	-0.198	0.107	-0.155	0.261	0.231
IOP for TG	<---	EG	0.129	0.291	0.255	0.033	0.742
IOP for TG	<---	GR	0.239	0.172	0.689	0.009	1.419
IOP for TG	<---	TC	0.789	0.000	0.483	0.037	-1.002
IOP for TG	<---	OC	0.661	0.003	0.434	0.006	-0.832

	chi-square	**df**	***p*-value**	**invariant?**
Overall model				
Unconstrained	548.452	446		
Fully constrained	561.949	472		
Number of groups		2		
Difference	13.497	26	0.979	Yes

7.7.2 Multi-Group Analysis for Number of G2G Services

In this section, comparisons between and within the data set are made according to the second moderator (number of G2G services). The data set was divided into two groups according to the median (Hair et al., 2010); the first covers organisations that provide more than 10 G2G services (n = 88) and the second covers organisations that provide less than 10 G2G services (n = 129). As presented in Table 7.30, the chi-square difference test of invariant covariance was not significant. This result indicates no difference between the two groups. However, the results recorded in Table 7.30 show a significant impact of the e-Government program (Yesser) on technological compatibility in organisations providing more than 10 G2G services, while there no impact of the e-Government program (Yesser) (e-Government) is indicated for technological compatibility in the organisations providing less than 10 G2G services (see Table 7.30).

The impact of the e-Government program (Yesser) on organisation has more than 10 G2G services:

- (Technological Compatibility ← e-Government, estimate = 0.201, *p*-value < 0.01).

The impact of the e-Government program (Yesser) on organisation has less than 10 G2G services:

- (Technological Compatibility ← e-Government, estimate = 0.052, *p*-value >0.05).

Table 7.30: Multi-Group Analysis for Number of G2G services

			G2G services more than 10		G2G services less than 10		
Path			**Estimate**	**P**	**Estimate**	**P**	**z-score**
EG	<---	CC	0.286	0.004	0.240	0.111	-0.251
GR	<---	EG	0.156	0.041	0.152	0.047	-0.037
TC	<---	EG	0.201	0.007	0.052	0.432	-1.493
OC	<---	EG	0.078	0.298	0.141	0.141	0.519
IOP for TG	<---	CC	0.583	0.000	0.958	0.008	0.946
IOP for TG	<---	EG	0.738	0.000	0.391	0.090	-1.178
IOP for TG	<---	GR	0.211	0.190	0.613	0.017	1.326
IOP for TG	<---	TC	-0.165	0.127	-0.140	0.418	0.126
IOP for TG	<---	OC	0.232	0.037	0.052	0.713	-1.004

Overall model	**chi-square**	**df**	***p*-value**	**Invariant?**
Unconstrained	542.085	446		
Fully constrained	561.073	472		
Number of groups		2		
Difference	18.988	26	0.837	Yes

7.7.3 Multi-Group Analysis Findings Summary

The multi-group analysis results are concerned with whether or not the final model is equivalent (i.e., invariant) across two moderators: organisation size and the number of G2G services. The analysis shows that the final model is invariant or equivalent across individual level of organisation size and the number of G2G services. Thus, the two hypothesised moderating effects are not supported for the research sample.

7.8 Chapter Summary

This chapter has presented the analysis techniques and assessment results from the conceptual model developed in previous chapters. First, EFA was employed to identify the structure among the set of measurement variables for each construct in the model. It was performed for six constructs (technological compatibility, organisational compatibility, governance readiness, citizen centricity, e-Government program and interoperability for t-Government).

The measurement model was then assessed. Construct reliability and validity were established. CFA was employed for this analysis using AMOS 22 software. The overall measures of the measurement model were established. All exceeded the threshold value suggested in the literature. The assessment results also indicated that the measurement model possessed an acceptable level of fit, convergent validity and discriminant validity.

Significant paths were established and supported hypotheses were revealed as the second step through which to validate the model. This process identified that some relationships were supported in this context, while others were not. Multi-group analysis determined the effect of two different moderators on the research model. Table 7.31 and Figure 7.10 show whether those relationships were supported or not in the context of this thesis. They reveal that 6 out of 11 hypotheses are supported. Technological compatibility, organisational compatibility and governance readiness influenced the interoperability for t-Government implementation construct positively. The citizen centricity construct positively influenced the e-Government program construct. The e-Government program construct positively influenced technological compatibility and governance readiness. The citizen centricity construct negatively influenced interoperability for t-Government implementation. The e-Government construct was not related to the interoperability for t-Government implementation construct. The e-Government program construct was not related organisational compatibility. Finally, no moderator effects resulted from organisation size and the number of G2G services on the proposed model constructs (see Table 7.31 and Figure 7.10).

The next chapter discusses the qualitative and quantitative findings, along with the literature, in more detail.

Table 7.31 Summary of Hypothesised Relationships in the Research Model

Hypotheses	Descriptions	Hypothesis-testing result
H1	Technological Compatibility factors positively influence the level of interoperability required for t-Government implementation	Supported
H2	Organisational Compatibility factors positively influence the level of interoperability required for t-Government implementation	Supported
H3	Governance Readiness factors positively influence the level of interoperability required for t-Government implementation	Supported
H4	Citizen Centricity positively influences the level of interoperability required for t-Government implementation	Not supported
H5	The e-Government program (Yesser) positively influences the level of interoperability required for t-Government implementation	Not supported
H6	Citizen Centricity positively influences the e-Government program (Yesser)	Supported
H7	The e-Government program (Yesser) positively influences Technological Compatibility	Supported
H8	The e-Government program (Yesser) positively influences Organisational Compatibility	Not supported
H9	The e-Government program (Yesser) positively influences Governance Readiness	Supported
H10	Organisation size will moderate relationships among the proposed model constructs	Not supported
H11	The number of G2G services will moderate relationships among the proposed model constructs	Not supported

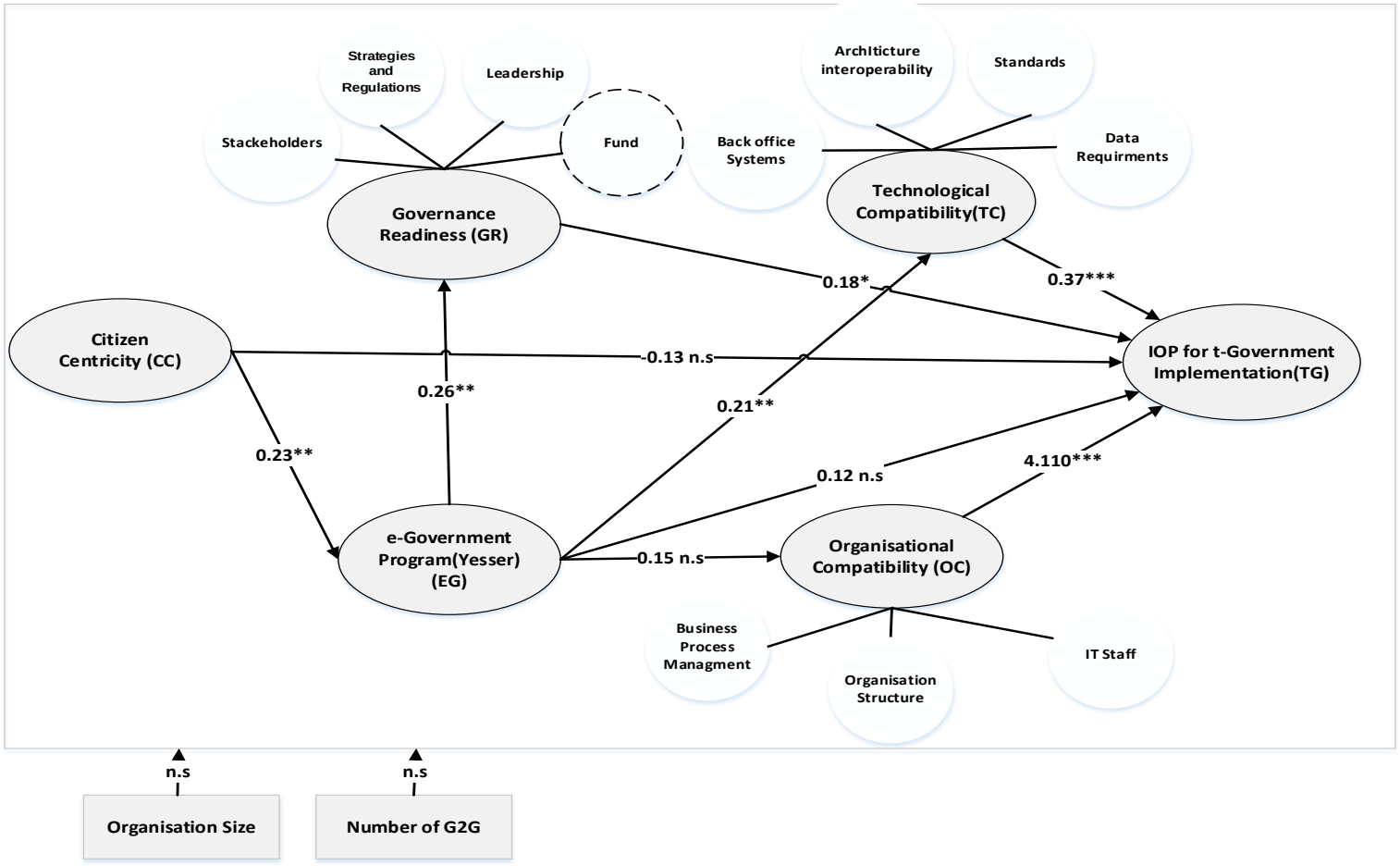

Figure 7.10: Final Path Coefficients for the Proposed Structural Model

CHAPTER 8: DISCUSSION

8.1 Introduction

The literature review presented in Chapter 2 revealed that the literature on interoperability for t-Government implementation is limited. Most models and frameworks fail to reflect the complex grid of interwoven technical, organisational, political and social issues, and the constraints involved. Endeavours to achieve interoperability meet significant challenges and the literature is still relatively limited in scope. It is also poorly understood (Novakouski & Lewis, 2012; Solli-Sæther & Flak, 2012; Van Veenstra et al., 2011). No rigorous research focusing on t-Government implementation in Saudi Arabia has been conducted since the e-Government initiative in Saudi Arabia was launched. This thesis has investigated t-Government to contribute to a better understanding of the influential factors that affect the interoperability level required for t-Government implementation in the Saudi Arabian context.

As described in Chapter 5 (research methodology), this research used a mixed-methods sequential exploratory design consisting of two data collection and analysis phases. Phase 1 adopted a qualitative approach to collect data through a series of semi-structured interviews, while Phase 2 adopted a quantitative approach to collect data through questionnaires.

Phase 1 (Chapter 6) focused on an in depth exploration of the factors affecting the level of interoperability required for t-Government implementation by refining the proposed model in Chapter 4. It attempted to understand the relationships between these factors from e-Government officials and top managers' perspectives. Phase 2 (Chapter 7) tested and validated the model proposed from the literature, which was refined and confirmed from the qualitative approach in Phase 1.

Chapters 6 and 7 presented the qualitative and quantitative analysis results to assess the conceptual model presented in Chapter 4 and to accomplish the study's aim. This chapter seeks to answer the research questions presented in Chapter 1. It provides an in depth explanation and interpretation of the research findings by merging and triangulating the qualitative and quantitative findings with a synthesis of the relevant literature. Through this method, it will identify the critical factors regarding the interoperability required for t-Government implementation in Saudi Arabia. This process will add to and clarify these results by expanding the breadth and range of the research enquiries.

As a result, this chapter proposes a revised conceptual model for interoperability for t-Government implementation. This model can be used by e-Government officials and policy makers to facilitate t-Government implementation.

This chapter is structured as follows. Section 8.2 presents answers to the research questions. Section 8.3 outlines the findings. It discusses the impact of technological compatibility, organisational

compatibility, governance readiness, citizen centricity and the e-Government program (Yesser) on interoperability for t-Government implementation. It also explores the relationship between citizen centricity and the e-Government program (Yesser). In addition, it discusses the impact of the e-Government program (Yesser) on technological compatibility, organisational compatibility and governance readiness. It also discusses the moderating factors' effects on the relationships of the proposed model constructs. Section 8.4 presents the final model. Finally, a brief summary of the chapter is presented in Section 8.5.

8.2 Answering the Research Questions

To achieve the aim and objectives of this thesis, the researcher has answered the main research question presented in Chapter 1 using exploratory sequential mixed-methods. This question is: how can Saudi Arabian organisations implement t-Government through enacting interoperability between government organisations?

This primary research question has been answered through these five secondary research questions:

1. What is the current situation of e-Government in Saudi Arabia?
2. What are the key factors that might influence the interoperability required between government organisations for t-Government implementation in Saudi Arabia?
3. How could these factors influence the interoperability required between government organisations for t-Government implementation in Saudi Arabia?
4. What is the relative importance of these factors and the relationships between them?
5. What is the appropriate model for creating the interoperability required between government organisations for t-Government mplementation in Saudi Arabia?

Answering Q1: this thesis examined the current Saudi e-Government situation in Chapter 3. Additionally, the results of the qualitative analysis in Chapter 6 exposed a more comprehensive picture.

Answering Q2: this question was addressed by providing a critical and comprehensive literature review, discussed in Chapter 2. A research model was developed in Chapter 4. Five constructs were identified as influencing interoperability for t-Government implementation in this research: technological compatibility, organisational compatibility, governance readiness, citizen centricity and the e-Government program (Yesser). Chapter 4 identified a number of factors in each of these five constructs. These were explained in detail to measure their effect on creating interoperability for t-Government implementation.

Answering Q3: to answer this question, a conceptual model was proposed to address the gap regarding t-Government implementation. The hypotheses were designed in Chapter 4, as shown in the hypothesised research model.

Answering Q4: to answer this question, the proposed model included five constructs: technological compatibility, organisational compatibility, governance readiness, citizen centricity and the e-Government program (Yesser). These were refined qualitatively in Chapter 6. As a result, the stakeholder factor was added to the governance readiness construct and two moderators (organisation size and the number of G2G services) were added to the research model. This model was then validated quantitatively using the SEM method in Chapter 7. The findings showed that both the measurements and SM exhibited good model fits to the data. The study showed that all constructs satisfied the construct reliability and convergent and discriminant validity criteria. The results revealed that the research model explained 35% of the variance in creating interoperability for t-Government implementation. The results also revealed that 6 out of 11 hypotheses were supported. Technological compatibility, organisational compatibility, and governance readiness influenced the interoperability for t-Government implementation construct positively. Citizen centricity positively influenced the e-Government program construct. The e-Government program construct positively influenced the technological compatibility and governance readiness constructs. The results also revealed that the citizen centricity construct negatively influenced the interoperability for t-Government implementation construct. The e-Government program construct was not related to the interoperability for t-Government implementation construct. The e-Government program construct was not related to organisational compatibility. Finally, no moderator effects from organisation size and the number of G2G services were found in the proposed model constructs.

Answering Q5: a discussion of the comparison of qualitative and quantitative analyses in the next two sections will accord with these research questions.

8.3 Findings and Discussion

This section discusses the results for the research model presented in Chapter 4, the refinement in Chapter 6 and the statistical test in Chapter 7. Eleven hypotheses were developed for empirical testing to be analysed and determine the significant factors regarding interoperability level for t-Government implementation in Saudi Arabia. The core model factors include technological compatibility, organisational compatibility, governance readiness, citizen centricity and the e-Government program (Yesser). The next sub-sections discuss the hypotheses and results.

8.3.1 The Impact of Technological Compatibility Factors

H1: technological compatibility factors positively influence the level of interoperability required for t-Government implementation.

In this thesis, technological compatibility factors (TC) included IT standards, architecture interoperability, data requirements and back-office systems. The qualitative analysis of H1 found that technological compatibility factors had a significant impact on the interoperability required for t-Government implementation. All interviewees confirmed this finding. Similarly, the quantitative analysis revealed that technological compatibility factors had a significant positive influence on interoperability for t-Government implementation (β = .37, t = 4.535, p < 0.001). This result is consistent with previous studies (Gil-Garcia et al., 2007; Gottschalk, 2009b; Gouscos et al., 2007; Lam, 2005b; Landsbergen Jr & Wolken Jr, 2001; Pardo et al., 2011; Ray et al., 2009; Scholl & Klischewski, 2007; Scholl, 2005; Vernadat, 2010). These studies concluded that t-Government could never be implemented without technological compatibility between government organisations. Technology is an important issue in interoperability and implementing t-Government. Each of the technological compatibility factors is discussed in detail in the next paragraphs.

The qualitative and quantitative analysis results showed that IT standards adoption is very important for interoperability between government organisations and the consequent implementation of t-Government. All interviewees confirmed the importance of IT standards to t-Government implementation; the quantitative analysis revealed that IT standards were highly related to technological compatibility. This result agrees with previous studies (Lam, 2005a; Laskaridis et al., 2007; Pardo et al., 2011; Ray et al., 2011; Ray et al., 2009), which found that IT standards are crucial to successful technical interoperability and t-Government implementation. However, one third of interviewees noted that every organisation has its own system without adopting IT standards, and this will be a significant obstacle to integration between government organisations. The qualitative findings confirmed the suggestion by Altameem et al. (2006) that updating and modifying IT standards is essential. Hence, more attention should be paid by government officials to build, modify and update IT standards to achieve a high order of interoperability among heterogeneous government organisations.

Both the qualitative and quantitative findings showed that architecture interoperability is a critical factor to build interoperability between government organisations. This was confirmed by over three quarters of interviewees. The quantitative findings revealed that architecture interoperability was highly correlated with technological compatibility. This result is consistent with previous studies (Gottschalk, 2009b; Lam, 2005a; Ray et al., 2011; Weerakkody & Dhillon, 2008), which indicated that architecture interoperability is mainly used to establish e-Government interoperability and the consequent feasibility of implementing t-Government. Over half of interviewees commented that each organisation has its own applications and this will increase the challenge of integrating these applications. It is important to have consistent architecture to unify platform differences and facilitate integration between government organisations to provide e-Services. Therefore, more effort will be required to overcome this challenge, including defining architecture interoperability.

A fundamental requirement of any e-Government service is the ability to exchange data seamlessly (Lam, 2005a). This is confirmed by both the qualitative and quantitative findings. Over three quarters of interviewees confirmed that data requirements are vital to the interoperability required for t-Government implementation. Similarly, the quantitative findings indicated that data requirements were highly correlated with technological compatibility. This result is consistent with previous studies (Lam, 2005a; Landsbergen Jr & Wolken Jr, 2001; Pardo et al., 2011; Ray et al., 2009), which pointed out that data requirements comprise a key issue of technological compatibility and a key factor for interoperability and t-Government implementation. Nevertheless, over two thirds of interviewees commented that organisations always seem hesitant to share data with others; they do not share data due to the possibility of losing power. This is consistent with Kurdi (2013), who indicated that data sharing does not exist in many Saudi organisations and new legislation will be required to help organisations benefit from data sharing. This is confirmed by all the interviewees. They noted that the lack of data ownership legislation. Therefore, more effort is needed by policy makers and e-Government officials to address this issue. This can be achieved by defining access rights to data, monitoring sensitive information and passing data ownership legislation. This will facilitate the exchange of data and information in an efficient and safe way.

Qualitative and quantitative analysis revealed that the integration between organisational back-office systems is the most important factor for interoperability. Qualitative analysis provided some insights into why integration between back-office systems is an important factor in technological compatibility, and is critical for t-Government implementation. Quantitative analysis confirmed that back-office systems were highly correlated with technological compatibility. This result is reasonable due to back-office systems being the ‘back bone’ of t-Government implementation between government organisations. The importance of integration between government back-office systems increases in the t-Government stage and all participants should be integrated seamlessly. This result is consistent with previous studies (Gottschalk, 2009b; Herbert & Ralf, 2009; Lam, 2005a; Pardo et al., 2011; Tripathi et al., 2013; Weerakkody & Dhillon, 2008), which found that Back-office system integration is a key factor to technological compatibility and to t-Government implementation. However, over half of interviewees stated that some challenges occur during integration between back-office systems (such as differences in applications and systems, business process and legacy back-office systems), restricting t-Government development. More effort is required from e-Government officials and policy makers. More specifically, back-office streamlining is required to increase compatibility between back-office systems and achieve t-Government implementation.

The qualitative and quantitative analyses of technological compatibility factors’ influence on the interoperability required for t-Government implementation aligned. Technological compatibility factors positively influenced the interoperability required for t-Government implementation. The higher the level of technological compatibility, the more advanced level of interoperability and t-

Government. Therefore, the hypothesis H1 was supported, and e-Government officials and policy makers should pay more attention to technological compatibility factors.

8.3.2 The Impact of Organisational Compatibility Factors

H2: organisational compatibility factors positively influence the level of interoperability required for t-Government implementation.

In this thesis, organisational compatibility (OC) factors include IT staff, organisational structure and Business Process Management (BPM). The qualitative analysis of H2 showed that organisational compatibility factors had a significant impact on the interoperability required for t-Government implementation. All interviewees confirmed this finding. Agreement also existed in the quantitative analysis, which showed that organisational compatibility factors had a significant positive influence on interoperability for t-Government implementation ($\beta = .33$, $t = 4.110$, $p < 0.001$). This result is consistent with previous studies (Gil-Garcia et al., 2007; Gottschalk, 2009a; Gouscos et al., 2007; Lam, 2005b; Landsbergen Jr & Wolken Jr, 2001; Ray et al., 2009; Scholl & Klischewski, 2007; Scholl, 2005; Vernadat, 2010). These studies indicated that t-Government could never be implemented without organisational compatibility between government organisations. Each of the organisational compatibility factors is discussed in detail in the next paragraphs.

The qualitative and quantitative findings indicate that IT staff is an important issue for the interoperability required to implement t-Government. All interviewees agreed that t-Government is a new phenomenon and the lack of in-house IT-knowledgeable staff will affect t-Government implementation. Similarly, the quantitative analysis showed that IT staff was significantly correlated to organisational compatibility. This result is consistent with previous studies (Lam, 2005a; Pardo et al., 2011; Soares & Amaral, 2011; Weerakkody & Dhillon, 2008), which showed that IT staffing is an important factor in interoperability and t-Government implementation, organisations with qualified IT staff will be better equipped to deal with both the initial implementation, and any subsequent issues arising from it. Moreover, the qualitative findings highlighted the need for IT training during the implementation of t-Government projects to help government organisations be aware of and face the challenges that can arise from such projects. Interviewees noted that some organisations did not have enough qualified IT specialists, and this made a difference between organisations when implementing projects. More attention should be paid by e-Government officials and policy makers to this issue, to ensure that government organisations have sufficient numbers of IT staff to help with t-Government implementation. Government organisations must provide training programs for their employees, or employ skilled employees (perhaps outsourced) to fill this gap.

The qualitative and quantitative analysis indicate that organisational structure is closely related to organisational compatibility and consequently to interoperability between government organisations. Three quarters of interviewees noted the importance of organisational structure. This was confirmed

by the quantitative analysis, which showed that organisational structure was highly correlated with organisational compatibility. This result aligns with previous studies in the literature (Kamal et al., 2011; Lam, 2005a; Pardo et al., 2011; Weerakkody & Dhillon, 2008), which pointed out that organisational structure is a major challenge to successful e-Government interoperability and t-Government implementation. The reason for this is that organisational structure can facilitate the organisation's business goals by arranging thousands of employees and managers, who are often split between numerous locations and functions, in an effective and cost-efficient fashion (Altameem, Zairi, & Alshawi, 2006). Over three quarters of interviewees pointed out that government organisations must reform or restructure themselves to prepare for the future and to meet integration needs. A suitable structure will help them to integrate easily. Some interviewees noted that government organisations in Saudi Arabia typically have a hierarchical structure, and this will hinder interoperability. This result is consistent with (Al-Fakhri et al., 2009) study, which indicated that organisation structures not being appropriate to e-Government implementation in Saudi Arabia. Therefore, the council of ministers has called on government organisations to establish their own internal e-Government committees (Yesser, 2015). This committee is required to report to a senior official. It includes members from different backgrounds such as IT, finance and management. More attention should be paid to adopting a more flexible and convenient structure to ensure the success of t-Government implementation projects.

The analysis of qualitative and quantitative data showed that business process management is a very important factor in facilitating interoperability between government organisations and the consequent t-Government implementation. All interviewees supported this statement. The quantitative analysis showed similar results; business process management was highly correlated to organisational compatibility. This result aligns with previous studies' findings (Hellman, 2010; Laskaridis et al., 2007), which pointed out the importance of business process management in e-Government interoperability and t-Government implementation. However, two thirds of interviewees stated that their organisations had not started managing their business processes yet. Some did not have the knowledge or expertise to manage their business processes. Some had not documented their business processes. Therefore, policy makers and e-Government officials should make more effort and escalate government organisation's streamlining and unifying of business processes by establishing a clear strategic for planning, controlling and monitoring business process management. They should also ensure that all participants agree on the final output or result.

The qualitative and quantitative analyses regarding the influence of organisational compatibility factors on the interoperability required for t-Government implementation aligned. They reveal that organisational compatibility factors positively influence t-Government implementation. The higher the level of organisational compatibility, the more advanced the level of interoperability and t-Government. Therefore, H2 was supported, and e-Government officials should pay more attention to organisational compatibility factors.

8.3.3 The Impact of Governance Readiness Factors

H3: governance readiness factors positively influence the level of interoperability required for t-Government implementation.

Governance readiness (GR) factors for this thesis include funding, strategies and regulations, leadership, and stakeholders. The qualitative and quantitative analysis of H3 revealed that all governance readiness factors for this thesis (strategies & regulations, leadership, and stakeholders) have a significant positive influence on interoperability for t-Government implementation. The funding factor is not included, as it does not influence t-Government implementation in the Saudi Arabian context. The qualitative analysis showed a significant impact of the governance readiness factor on the interoperability required for t-Government implementation. Similarly, the quantitative analysis showed that governance readiness factors positively influence interoperability for t-Government implementation ($\beta = .18$, $t = 2.425$, $p < 0.05$). This result is consistent with previous studies (Gil-Garcia et al., 2007; Gottschalk, 2009a; Gouscos et al., 2007; Lam, 2005b; Landsbergen Jr & Wolken Jr, 2001; Pardo et al., 2011; Ray et al., 2009; Scholl & Klischewski, 2007; Scholl, 2005; Vernadat, 2010). These studies pointed out the importance of governance readiness factors in the interoperability required for t-Government implementation. Each of these factors is discussed in detail in the next paragraphs.

Funding is the most important factor for any kind of e-Government project. Many e-Government projects fail or are cancelled for this reason. However, the qualitative and quantitative findings show that the funding factor has only a slight relationship to t-Government implementation. Funding is not an obstacle to t-Government in Saudi Arabia. The qualitative analysis reveals some interesting insights. Interviewees mentioned that funding alone is not an obstacle. Likewise, the quantitative findings show that funding is only slightly related to governance readiness factors. This result is inconsistent with previous studies (Eyob, 2004; Gottipati, 2002; Tripathi et al., 2013), which indicate that funding is the main obstacle to e-Government transformation. This result is not surprising due the level of support from King Abdullah for e-Government transformation. The Saudi government has already invested billions of dollars in developing e-Government services (MCIT, 2014; Yesser, 2015). Interviewees reported that the only concerns relate to delays in the process of receiving required funds. Additionally, interviewees indicated that funds monitoring and management is another concern in the completion of successful e-Government projects. This is consistent with studies that suggest funds alone have a low impact on e-Government implementation projects (Al-Fakhri et al., 2009; Altameem et al., 2006). More effort should be considered to create plans and strategies to speed up the financial support of e-Government projects and to monitor fund allocation. Providing financial support on time could lead to faster implementation and increase the number of e-Government initiatives completed on time (Al-Rashidi, 2013).

The qualitative and quantitative findings show that leadership is an important factor for creating the interoperability required to implement t-Government. All interviewees confirmed this, and the quantitative analysis indicates that leadership is highly correlated to governance readiness. This result agrees with previous studies in the literature (Lam, 2005a; Pardo & Burke, 2008a; Pardo et al., 2011; Scholl & Klischewski, 2007; Tripathi et al., 2013), which pointed out that leadersship plays significant effect on successful t-Government implementation. All interviewees said that leadership is critical to the success of t-Government implementation projects. However, they did note the support from King Abdullah. Government organisations need strong leadership to speed up and follow up on these projects to completion. In addition, two thirds of interviewees noted that knowledgeable leaders who understand the technology, legislation and policy goals play a vital role in the outcome of any e-Government project. A leader will push their organisation to success. Hence, leadership is a crucial factor in t-Government implementation.

The qualitative and quantitative results also pinpoint and identify strategies and regulations as important factors for creating the interoperability required for t-Government implementation. All interviewees confirmed this, and the quantitative analysis indicated that strategies and regulations were highly correlated with governance readiness. This is consistent with previous studies in the literature (Decoster & Zwicker, 2009; Hellman, 2010; Lam, 2005a; Pardo et al., 2011; Ray et al., 2011), which found that strategies and regulations are the most important elements involved in t-Government implementation. However, the qualitative analysis uncovered very interesting insights regarding strategies and regulations: many interviewees mentioned that some organisations did not have clear strategies, plans or regulations for e-Government transformation. Additionally, some organisations did not have a structured approach to e-Government strategy formulation and development. Moreover, some organisations involved only managers in creating and designing their strategies. Organisations may only have strategies on paper that are not implemented. Moreover, interviewees identified gaps between e-Government strategies and real life implementation, with no coordination between government organisations to create a shared vision (Alshehri & Drew, 2010). Al-Solbi and Al-Harbi (2008) found a lack of shared strategies and regulations for e-Government in Saudi Arabia. Strategy and regulations are very important issues; they should cover every aspect of t-Government implementation projects. Although, as mentioned earlier in Section 3.3.3, e-Government officials and policy makers have developed many strategies and regulations to support e-Government implementation, more attention should be paid to define shared goals and vision between government organisations. This will facilitate the goal of t-Government implementation. According to Kurdi (2013), the Saudi government has issued several strategies and regulations; however, most have not been published (as required for e-Government adoption). The strategies and regulations are insufficient. Therefore, e-Government officials and policy makers need to learn from experts in other countries regarding how to design an effective strategy. They also need to compare the current regulations and change them if required, to facilitate t-Government

implementation. They need to involve and coordinate all participants in creating and designing strategies. This will help to overcome the lack of commitment to the strategy. Commitment to a chosen strategy is a greater determinant of that strategy's success than the particular strategy chosen (Lam, 2005a). If each of these steps is considered, strategies and regulations can successfully ensure the sustainability of interoperability required for t-Government implementation.

'Stakeholders' is a new factor derived from the qualitative findings. It refers to any group or individual who can affect, or is affected by, achieving the organisation's objectives (Freeman, 2010). The literature considers this factor important in the e-Government environment (Al-Sebie and Irani, 2005). Stakeholder recognition in e-Government has a significant role to play in ensuring the long-term success of e-Government enterprises (Rowley, 2011). Few studies have examined stakeholder challenges in implementation and integration projects between government organisations (Kamal et al., 2011). The qualitative findings show that e-Government officials and managers have already realised the importance of stakeholders to achieving successful t-Government implementation projects in Saudi Arabia. Therefore, the conceptual model has been revised and the stakeholder factor added to be tested quantitavely. The results of quantitative analysis found that stakeholders were highly correlated with governance readiness. The qualitative analysis stressed the importance of involvement and collaboration between all stakeholders, especially in e-Government projects that require integration, such as t-Government implementation projects. However, some interviewees stated that difficulties remain regarding cooperation between government organisations in Saudi Arabia. As discussed earlier, government organisations in Saudi Arabia are organised in a hierarchical way, which means the top managers of government organisations decide on the policy to be implemented by the remaining stakeholders. The top managers steer stakeholders through detailed regulations and control the implementation of regulations and procedures. This will not help stakeholders, such as qualified IT staff, to participate in the decision-making process. Hence, efforts should be made by policy makers and e-Government officials to address this problem, encouraging and managing government organisation participation, ensuring all stakeholders are involved in the implementation of t-Government. Officials should listen to all stakeholders to obtain their perspectives.

The qualitative and quantitative analyses regarding the influence of governance readiness factors on the interoperability required for t-Government implementation are aligned. They reveal that governance readiness factors positively influence the interoperability required for t-Government implementation. Governance mechanisms are required to give direction to development, coordinate efforts and decision-making processes (Janssen, 2011; Heinrich & Lynn, 2000). The higher the level of governance readiness, the more advanced the levels of interoperability and t-Government. Therefore, H3 was supported. It is clear that e-Government officials and policy makers should pay more attention to their governance readiness. They need to cooperate to ensure that their strategies, regulations, policies and governance frameworks are compatible. They need to review frameworks

and evaluate them at least every two years, updating as necessary. Governance must be agreed between collaborating organisations. The more compatible the governance between government organisations, the more advanced the level of e-Government interoperability.

8.3.4 The Impact of Citizen Centricity Factors

H4: citizen centricity positively influences the level of interoperability required for t-Government implementation.

The qualitative analysis reveals the significant impact of citizen centricity (CC) on the interoperability required for t-Government implementation. The quantitative analysis of H4 shows that citizen centricity has a negative influence on t-Government implementation (β = -.13, t = -1.990, $p < 0.05$). This is contrary to the research literature's expectation as its direction is proposed as a positive one (Gottschalk, 2009b; Gouscos et al., 2007; Irani et al., 2007; Scholl, 2005; Weerakkody & Dhillon, 2008), which identified citizen centricity as a critical success factor for t-Government implementation. The qualitative findings present different results, as the majority of interviewees identified the importance of a citizen-centric perspective in t-Government implementation. Government organisations should implement e-Government according to their citizens' needs, not government needs. The results of the quantitative analysis align with Reddick (2005), who concluded that citizen centricity has not been explored yet. The survey participants were not able to recognise the relationship between citizen centricity and t-Government.

The qualitative analysis has revealed many possible reasons for the statistically negative relationship between citizen centricity and t-Government implementation. Over three quarter of the interviewees noted that many organisations still do not know about the concept of citizen centricity. This confirms a previous finding by Al-Sobhi et al. (2010) and Alateyah et al. (2013) who indicate that little attention has been paid to citizen centric perceptions and usability, accessibility and the availability of e-Government services in Saudi Arabia. Alshehri and Drew (2010) note that 55% of participants in their study were not satisfied with current e-Government services. This is also consistent with Alzaheani and Goodwin (2012), who argue that e-Government services in Saudi Arabia are still at an early stage in terms of citizen centricity. This aligns with Al-Nuaim (2011) who has reported that Saudi ministry websites are still in the early stages regarding citizen centricity. Many interviewees also mentioned that no measurement of citizen satisfaction exists with Saudi e-Government. This is consistent with the UN report findings of their e-Government survey, as discussed in Chapter 3. The UN report noted the e-participation index (EPI) indicates that Saudi Arabia achieved 85.19% in Stage 1, 27.27% in Stage 2, and 11.11% in Stage 3. This means there is a gap in the citizen-centric focus (UN, 2014). Many interviewees said that government organisations in Saudi Arabia do not implement their services according to citizens' needs. This is consistent with Abanumy and Mayhew (2007), and Chatfield and AlAnazi (2015). These researchers suggest that government organisations in Saudi Arabia do not meet their citizen's expectations.

Little interaction exists between citizens and government organisations on social media platforms. According to Alfirm (2014), although social media increases levels of satisfaction and enhances the chances of e-Government service success by giving the e-Government user the ability to communicate and interact with government organisations easily, the majority of Saudi government organisations do not use social media to deliver services. Therefore, it is important to use social media effectively. Government organisations should increase their investment in social media. This is consistent with a previous study (Alateyah et al., 2013).

These above reasons may be evidence for why citizen centricity had a negative impact on the interoperability required for Saudi t-Government implementation in the quantitative survey.

Based on the discussion of the comparison between the qualitative and the quantitative analyses, H4 is supported. To achieve the t-Government stage, e-Government services should be citizen centric. Users need to access one single point to obtain services. This requires government organisations to be interoperated seamlessly to provide these e-Services. Users should also be able to access e-Government services through computer-mediated tools such as social media. Therefore, policy makers and e-Government officials should pay more attention to citizens' needs and satisfaction, and these should be measured regularly. They should also pay attention to the importance of implementing social media to strengthen interaction with citizens. Designers can develop services that meet the goals of the government and the needs of the citizens, but if the target users do not consider them accessible and usable, they may not adopt those services. In turn, the services will not realise their full potential (Novakouski & Lewis, 2012).

8.3.5 The Impact of e-Government Program (Yesser) Factors

H5: the e-Government program (Yesser) positively influences the level of interoperability required for t-Government implementation.

The qualitative findings show a significant impact of the e-Government program (Yesser) on t-Government implementation, while the quantitative analysis reveals that this program has an insignificant influence on t-Government implementation of t-Government ($\beta = .12$, $t = 1.705$, $p > 0.05$). This result is inconsistent with previous studies (Irani et al., 2007; Weerakkody & Dhillon, 2008), which pointed that central government is important in t-Government implementation.

The possible reason for this is that most of survey participants had been involved in e-Government development government organisations and may have had negative experiences with the e-Government program (Yesser). They did not think Yesser was important. This is consistent with Almahroqi's (2012) study, where he indicates that there is lack of knowledge about Yesser; many interviewees confirmed this. Three quarters of interviewees agreed that the e-Government program was designed to enhance government organisation productivity and should help in terms of methodologies, data, standards and knowledge to enable easy integration successful t-Government

implementation. Despite this, many were not satisfied with Yesser's outcomes. They noted that Yesser and its integrity with other e-Government projects was lacking; they felt that Yesser was responsible for delays in the integration between government organisations. This is consistent with Alghamdi et al. (2013) findings. They stated a delay existed regarding connections with Yesser and this will lead to a decrease in e-Government readiness levels. An e-Government team member also noted that Yesser did not have enough power to force government organisations to implement the initiatives and products in their organisations. Therefore, many organisations failed to follow Yesser's initiatives. All of these above reasons may be evidence that Yesser has had no significant quantitative impact on t-Government implementation. Based on the discussion of the comparison between the qualitative and quantitative analyses, H5 is supported. More power should be invested in Yesser, enabling initiatives to be followed up. The e-Government program (Yesser) should encourage more effort to help government organisations benefit from Yesser's initiatives. More coordination is needed to facilitate the integration between government organisations. More effort is also required from e-Government officials and policy makers to obtain advantage from Yesser's initiatives.

8.3.6 Other Inter-Relationships

This section discusses the other relationships, including those between citizen centricity and the e-Government program (Yesser), the e-Government program (Yesser) and technological compatibility, the e-Government program (Yesser) and organisational compatibility and the e-Government program (Yesser) and governance readiness. It also discusses the effect of moderator factors on relationships between the proposed model constructs. These are covered in the following sections.

8.3.6.1 The Impact of Citizen Centricity on the e-Government Program (Yesser)

H6: citizen centricity positively influences the e-Government program (Yesser).

The qualitative findings show that citizen centricity (CC) has a significant impact on the e-Government program (Yesser). Similarly, the quantitative analysis of H6 reveals that citizen centricity had a positive influence on the e-Government program (Yesser) (β = .23, t = 3.238, p < 0.01). This is consistent with one of the objectives for creating Yesser, which was to provide better, more convenient and more seamlessly integrated e-Government services for citizens (Yesser, 2015). Many interviewees agreed with this point. As discussed earlier in Chapter 3, this point was confirmed by the e-Government strategy in Saudi Arabia. The rate of citizen-centric focus promoted an e-Government program in Saudi Arabia that encouraged citizen-centric integrated interoperable e-Government services, starting with the Saudi e-Government national portal as a central hub for all government services. The Saudi e-Government national portal 'Saudi' was launched in 2006. The aim of this was to improve government transparency in public services radically and to empower citizens by providing enhanced accessibility to existing e-Government services through the internet (Yesser, 2015). This result is consistent with previous studies (Al-Shehry et al., 2006; Alanazi, 2013;

Ebrahim & Irani, 2005; Layne & Lee, 2001; Moon, 2002; OECD, 2003). Therefore, H6 is supported. It is essential to take a citizen-centric approach as a guideline to implementing e-Government services; that is, to understand the needs and requirements of citizens when building up and processing the technology.

8.3.6.2 The Impact of the e-Government Program (Yesser) on Technological Compatibility, Organisational Compatibility and Governance Readiness

H7: the e-Government program (Yesser) positively influences technological compatibility.

The qualitative findings show that the e-Government program (Yesser) had a significant impact on technological compatibility. Similarly, the quantitative analysis of H7 reveals that the e-Government program (Yesser) has a positive influence on technological compatibility ($\beta = .23$, $t = 3.238$, $p < 0.01$). This result is consistent with previous studies (Alanazi, 2013). As discussed in Chapter 3, Yesser was so that organisations could build reliable infrastructure that facilitated e-Government implementation and enabled data exchange between government organisations. Many interviewees agreed with this. Therefore, H7 is supported. More power should be invested in Yesser to enable follow up regarding initiative implementation. The e-Government program (Yesser) should also enable government organisations to benefit from Yesser initiatives.

H8: the e-Government program (Yesser) positively influences organisational readiness.

The qualitative findings show that the e-Government program (Yesser) has a negligable impact on organisational readiness. Similarly, the quantitative analysis of H8 reveals that the e-Government program (Yesser) had an insignificant influence on organisational readiness ($\beta = .15$, $t = 1.872$, $p > 0.05$). This result is consistent with previous studies (Alanazi, 2013). The reason for this could be that Yesser does not address organisational issues such as BPM and organisational structure properly. Many interviewees confirmed that Yeseer is concerned with technical issues, but there is no tangible effort regarding organisational issues. Therefore, H8 was not supported. More effort related to organisational issues is required to help government organisations become compatible organisationally to achieve the interoperability level required for t-Government implementation

H9: the e-Government program (Yesser) positively influences governance readiness.

The qualitative findings show that the e-Government program (Yesser) had a minimal impact on governance readiness. However, the quantitative analysis of H9 reveals that the e-Government program (Yesser) had a positive influence on governance readiness ($\beta = .26$, $t = 3.017$, $p < 0.01$). This result conflicts with the qualitative analysis. Most interviewees were not satisfied with what had been undertaken by Yesser. They noted that many government organisations still did not have an e-Government strategy, plan or regulations to move towards and implement e-Government. Therefore, H9 was not supported. More effort is needed from Yesser to help government

organisations achieve governance readiness. This result is inconsistent with Alanazi's (2013) study. This thesis highlighted that the e-Government program in Saudi Arabia used a national e-Government strategy for improving governance at the national level, to motivate and facilitate e-Government implementation across all Saudi government agencies, and to provide better, more convenient and more seamlessly integrated e-Government services for citizens and business customers (Yesser, 2015). The reason for this could be the lack of sharing and agreement on creating e-Government strategies between government organisations and Yesser. Most interviewees noted that there no coordination from Yesser existed at all. This is a major drawback.

The establishment of Yesser (as discussed in Chapter 3) is undoubtedly the most significant Saudi e-Government initiative (Al-Shehry et al., 2006). Clearly, many initiatives provided by Yesser have improved the efficiency and effectiveness of government organisations and created interoperability between government organisations to achieve t-Government implementation and provide better services to citizens. However, Yeseer has not met all the goals addressed in Chapter 3. Yesser failed to meet its first vision established in 2005, so it developed the second action plan with a completion date of 2016. More attention has been given to this second action plan (Almahroqi, 2012).

The qualitative and quantitative findings indicate that what Yesser has undertaken is not enough and the initiatives and products are poorly delivered. This will not help government organisations to interoperate and achieve t-Government implementation. Some organisations benefit from Yesser but some do not. This approach has not connected all government organisations to Yesser. More effort from Yesser programs, with effective coordination and more cooperation from government organisations, is required. Yesser must give government organisations a clear picture of what it can provide. Yesser should force government organisations to follow them or take advantage from their important resources. program. According to Snijkers (2006), the only possible way to connect government organisations to Yesser is through coercion. This must be combined with Yesser's advantages to motivate government organisations to interoperate. Formal evaluation and assessment will help the e-Government program (Yesser) to meet its goals efficiently and effectively. According to Hellman (2010), the lack of proper evaluation and assessment has a negative effect on the planning, execution and evaluation of organisational interoperability.

8.3.6.3 Effect of the Moderator Factors on Relationships among the Proposed Model Constructs

H10: organisation size will moderate relationships among the proposed model constructs.

H11: the number of G2G services will moderate relationships among the proposed model constructs.

The qualitative findings show that e-Government officials and top managers feel that organisation size and the number of G2G services will moderate relationships among the constructs in the proposed model. Therefore, these moderator factors have been added to the conceptual model to

be tested quantitatively. Unpredictably, the measurement invariance testing for both moderators resulted in invariance on the measurement weight and the structural weight level. This indicates that organisation size and the number of G2G services are not moderators for t-Government implementation in the Saudi Arabian context. Therefore, H10 and H11 are not supported. This result is inconsistent with a previous study by Alsalloum (2005), who indicated the IT adoption depends mainly on organisation size. The size and complexity of government structures, along with the amount of information agencies often maintain, poses challenges related to capturing and storing information and to retrieving it (Skiftenes, 2006).

With respect to organisation size, the multi-group analysis results found that organisation size had no significant effect on the relationships among constructs in the proposed model. However, the analysis indicated that the e-Government program (Yesser) impact on technological compatibility and governance readiness differed between small and large organisations. No significant relationships existed between the e-Government program (Yesser) and technological compatibility and governance readiness in small organisations. In large organisations, the e-Government program (Yesser) exhibited a strong positive effect on technological compatibility and governance readiness. The reason for this could be that Yesser is more concerned with large organisations. This result was mentioned by some interviewees.

With respect to the number of G2G services, the multi-group analysis results found no significant effect of the number of G2G services on the relationships among constructs in the proposed model. However, the results did indicate that the e-Government program (Yesser) impact on technological compatibility differed between organisations with less than ten G2G services and organisations with more than ten. Organisations with less than ten G2G services showed no significant relationship between the e-Government program (Yesser) and technological compatibility. In organisations with more than ten G2G services, the e-Government program (Yesser) exhibited a strong positive effect on technological compatibility. A possible explanation for such a result is that the Yesser program shows more concern and attention for organisations with more than ten G2G services. This result was noted by some interviewees.

These results could indicate that what the Yesser program has achieved is intangible. Obviously, the Yesser program shows more attention and concern to large organisations and organisations with more than ten G2G services.

8.4 The Final Model

A comparison of the qualitative and quantitative analyses has shown that a number of factors influence the level of interoperability required for t-Government implementation. These factors are summarised in Tables 8.1 and 8.2. The tables compare the qualitative and quantitative findings. The

degree to which each factor and hypothesis is valued by the number of stars associated with each factor. A single star (*) represents the factor is inadequately valued, two stars (**) represent that it is valued, three stars indicate that it is highly valued (***) and four stars represent that it is very highly valued (****).

Table 8.1: The Comparison of Qualitative and Quantitative Results

Constructs	Factors	Qualitative analysis	Quantitative analysis	Result
H1: Technological Compatibility (TC)	IT standards	***	****	Supported
	Architecture interoperability	****	****	
	Data ownership	****	****	
	Back-office systems	***	***	
H2: Organisational Compatibility (OC)	IT staff	****	****	
	Organisational structure	****	****	
	Business processes	***	****	
H3: Governance Readiness (GR)	Funding	*	*	Supported
	Leadership	****	***	
	Strategy & Regulations	****	****	
	Stakeholders	****	***	
H4: Citizen Centricity (CC)	CC	****	*	Supported
H5: e-Government (Yesser)	e-Government (Yesser)	****	*	Supported

Table 8.2: The Other Hypotheses Identified from Qualitative and Quantitative Results

Hypotheses	Qualitative analysis	Quantitative analysis	Result
H6: CC → e-Government program	****	*	Supported
H7: e-Government program → TC	***	***	Supported
H8: e-Government program → OC	*	*	Not Supported
H9: e-Government program → GR	*	**	Not Supported

The conceptual model presented in Chapter 4 (Figure 4.2), and Chapter 7 (Figure 7.10) has been revised. Only 7 of the 11 hypotheses were validated, as shown in Figure 8.1. All constructs were significant, except the constructs between the e-Government program (Yesser) and governance readiness, and between the e-Government program (Yesser) and organisational compatibility. Organisation size and the number of G2G services were not moderators for t-Government implementation in the Saudi Arabian context.

This model is one of the first to explore and understand technological, organisational, social and political challenges facing t-Government implementation. It illustrates the factors that affect t-Government implementation in Saudi Arabia. The revised model can be used by academics and researchers to understand and analyse the challenges and factors facing t-Government implementation. The model can also be used by e-Government officials and policy makers to facilitate t-Government achievement.

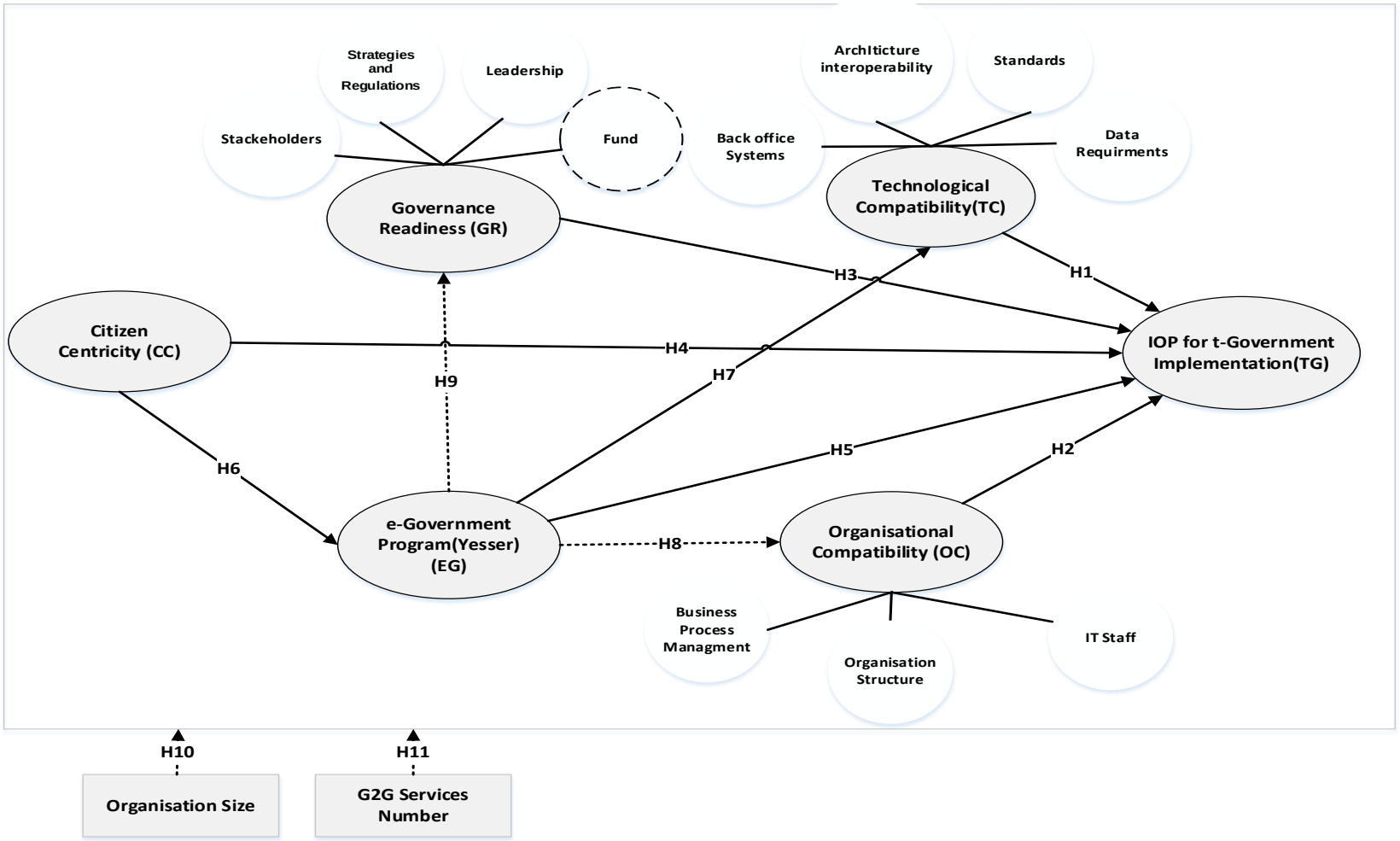

Figure 8.1: The Final Model

8.5 Chapter Summary

The main purpose of this chapter was to discuss and compare the results provided in Chapters 6 and 7. It did this by triangulating the quantitative and qualitative findings with the literature regarding the research questions and hypotheses proposed to identify the critical interoperability factors required for t-Government implementation in Saudi Arabia. It discussed the validity of the research hypotheses presented in Chapter 7. Finally, this chapter has revised the research model proposed in the study. In the light of this discussion, the next chapter revisits the research's aims and objectives. It also detailed the research contribution and implications. The next chapter also details the study's limitations and future research directions.

CHAPTER 9: CONCLUSION

9.1 Introduction

This chapter will present the thesis's conclusions. In addition, this chapter presents the research overview, the main findings, contributions, implications, and limitations and gives some directions for future research. The chapter begins by providing a summary of the thesis in Section 9.2. The aims and objectives of this research are examined in Section 9.3. Section 9.4 presents the research contributions. Section 9.5 presents the implications of this thesis for practice. This is followed in Section 9.6 by a discussion of the limitations; directions for future research are suggested in Section 9.7.

9.2 Research Overview

The purpose of this thesis was to develop a model that examined the critical factors affecting interoperability for t-Government implementation.

Chapter 1 identified the research background to the research problem, the research context and scope, and its significance. It also stated the study's aim, which was to develop a model for t-Government implementation in the Saudi Arabian context.

In attempting to meet the aim of this thesis, a systematic literature review was conducted in Chapters 2 and 3 (background theory). Chapter 2 discussed the issues related to e-Government in general, to identify the scope for implementing t-Government. It started by presenting a brief summary of e-Government concepts and definitions, proposing e-Government definitions from different perspectives. It also discussed e-Government categories (G2C, G2B, G2G, and G2E). Chapter 2 examined the various models of e-Government implementation stages. It further discussed some international interoperability frameworks. Motivations for t-Government implementation were presented. Finally, the literature on information sharing, information integration, G2G, interoperability and t-Government models and frameworks was reviewed to summarise the key findings from previous studies. Relevant factors that affect the implementation of t-Government were identified, and justification for using these factors, in conjunction with institutional theory, was presented.

Chapter 3 discussed the background of e-Government in Saudi Arabia to understand the current situation. This chapter gave overview of e-Government in Saudi Arabia. It then discussed the development and initiatives of e-Government in Saudi Arabia. In particular, this chapter investigated the role of the e-Government program (Yesser) in facilitating the implementation and adoption of e-Government in Saudi Arabia. It reviewed related studies in e-Government in Saudi Arabia.

Chapter 4 (focal theory) presented the conceptual model derived from the research objectives mentioned in Chapter 1. It concentrated on the research issues in Chapters 2 and 3. Chapter 2 indicated that there comprehensive studies regarding this issue are lacking, and the researcher identified a gap in the literature: the absence of a theoretical model for understanding the factors influencing interoperability for t-Government implementation in the Saudi Arabian context. Chapter 4 developed a model that would be appropriate for this thesis, by the t-Government challenges for government organisations in Saudi Arabia in detail. This model was influenced by institutional theory. It contained a set of technological, organisational, political and social challenges facing t-Government implementation, and enabled understanding of the factors and issues influencing the use and implementation of t-Government. This model will provide better support to e-Government officials and policy makers for facilitating t-Government implementation. The proposed model also made a novel contribution at the conceptual level for t-Government implementation.

Chapter 5 (data theory) outlined a detailed procedural examination of the methodology employed to obtain the required information for empirical research. It was organised into six major topics of methodology: research paradigm, research design, research strategy, data collection method, reliability and validity of the measures and data analysis.

Qualitative research was conducted in Chapter 6 (data theory) to determine and refine the relevant factors and a causal model for implementing t-Government in the Saudi Arabian context. This was done by interviewing the top managers and e-Government officials and reviewing government documents using the thematic analysis technique. This also enabled the researcher to understand the current situation of e-Government in Saudi Arabia in depth, along with the factors influencing t-Government implementation in the Saudi Arabian context from a managerial perspective.

Chapter 7 (data theory) presented the results of testing and analysing the relationships proposed in the conceptual model. These relationships determined the factors influencing interoperability levels for t-Government implementation in Saudi Arabia. The data were collected through a questionnaire; a web-based survey conducted in Saudi Arabia. The results were obtained through many stages of data analysis. First, demographic analysis was conducted using age, education level, occupation, organisation size, and the number of G2G services. Appropriate data were then subject to screening procedures and a scale reliability test was applied. The statistical assessment was conducted in two phases: EFA and CFA. EFA was applied to uncover the number of factors that conceptually and statistically underlay the set of items in each model construct. CFA was conducted to validate the measurement model. Finally, SEM was conducted to confirm the construct validity of the proposed model and report the findings for the hypothesised relationships. The effects of moderators on the relationships among the proposed model were also presented.

Chapter 8 (novel contribution) discussed the findings from the literature along with the findings of the data analysis. This chapter mainly discussed results from the theoretical background presented in Chapters 2, 3 and 4, as well as the results obtained from data analysis in Chapters 6 and 7. It then presented the discussions of the key findings, and revised and validated the conceptual model proposed for t-Government implementation. The current chapter (Chapter 9 [novel contribution]) explains the contributions, implications, limitations and directions for future research and offers some reflections.

9.3 Fulfilling the Research Aim and Objectives

The main aim of this research was to develop an integrated model that will assist government organisations in Saudi Arabia increase their interoperability level to that required for t-Government implementation. This aim was achieved in Chapter 8 through interpreting and comparing the findings of the research's qualitative and quantitative phases to determine the critical factors facilitating the transition to t-Government in the Saudi context.

The first objective of this thesis was to identify the factors that influence the level of interoperability required for t-Government implementation and understand the current initiatives of e-Government in Saudi Arabia. This task was accomplished by reviewing the literature on e-Government and on t-Government in particular to represent the factors that influence the interoperability level required for t-Government implementation. Chapters 3 and 6 also provided an in depth understanding of the current e-Government initiatives and determined the critical factors influencing the interoperability level required for t-Government implementation in Saudi Arabia.

The second objective was to develop a model based on previous and related frameworks and models, by identifying the major critical technical, organisational, political and social factors influencing interoperability levels required for t-Government implementation in the Saudi Arabian context, based on institutional theory. A model was developed from gathering initial information through a literature review. A model was proposed in Chapter 4 (see Figure 4.2) to address the gap regarding t-Government implementation in Saudi Arabia. The proposed model adopted an institutional theory lens. The critical factors were organised under four themes: a) organisational, b) technological, c) political, and d) social.

The third objective was to examine the effect of these factors and the relationships between them empirically. This task was accomplished by refining, validating and modifying an innovative proposal for t-Government implementation. This was attained successfully through the thematic analysis of interviews in Chapter 6, which helped refine the suggested conceptual model. This was then tested and validated with SEM in Chapter 7. The final stage of this objective was completed in Chapter 8 by interpreting the qualitative findings along with the quantitative findings.

Finally, the fourth objective was to help and guide e-Government officials and policy makers to facilitate t-Government implementation in the Saudi Arabian context. This task was accomplished in Chapter 8. The revised model can be recommended and used as a guide by e-Government officials and policy makers. This will enable researchers to understand t-Government implementation success factors. Chapter 8 provided a final version of the model that identified the critical factors for interoperability for t-Government implementation. Chapter 8 also presented a guideline and recommendations to e-Government officials and policy makers regarding how to deal with each factor.

9.4 Contributions of the Research

While there have been numerous researches have explored the adoption and implementation of t-Government services in many countries, no study exists that examines t-Government implementation from the perspective of four key areas: organisational, technological, social and political. No research could be found that examines the interoperability level required for t-Government implementation in the Saudi Arabian context. Clearly, the model presented in this research provides a more detailed and descriptive level of analysis along organisational, technological, social and political dimensions in the Saudi Arabian context.

This research has made significant contributions. It has contributed to critical discussions on the contribution of various methodologies to address the interoperability gap in implementing t-Government projects in Saudi Arabia. It has done this by developing a model outlining the key factors influencing the interoperability level required for t-Government implementation, considering organisational, technological, social and political themes from an institutional theory lens, and demonstrating the mixed-methods approach applicability.

The outcomes and knowledge of this research are vital for t-Government diffusion and implementation. The study has contributed to different aspects of e-Government, from the contextual information presented in Chapters 1, 2, 3 and 4, to the research methodology presented in Chapter 5, the data analysis Chapters 6 and 7 and, finally the examination of data and revision of the research model and hypotheses for t-Government implementation in Chapter 8. Through these efforts, this thesis has made a significant contribution to the existing research on t-Government implementation. The following section will outline this research's main innovative contributions:

The proposed model (presented in Chapter 4 and revised in Chapters 6, 7, and 8) offers a contribution that illustrates the factors affecting the interoperability level required for t-Government implementation from four key areas: organisational, technological, social and political. The model uses institutional theory as a lens. This research is concerned with implementing the interoperability between government organisations to achieve t-Government. It has done this by focusing only on

the factors that affect interoperability between government organisations; the research has focused only on internal categories and in particular, G2G factors, which represent the relationship between governments collaborating to achieve t-Government. This includes central G2G strategies that represent the relationship between a central coordinating or consultative body. Therefore, this thesis contributes to the body of knowledge by identifying the five factors that influence the interoperability level required for t-Government implementation in the Saudi Arabian context. These factors are technological compatibility, organisational compatibility, governance readiness, citizen centricity and the e-Government program (Yesser). This thesis found that all constructs were significant, except between the e-Government program (Yesser) and governance readiness, and between the e-Government program (Yesser) and organisational compatibility.

This thesis has revealed that organisation size and the number of G2G services are not moderators for t-Government implementation in Saudi Arabia. However, the results also showed that large organisations exhibited a strong positive effect between the e-Government program (Yesser) and technological compatibility and governance readiness. It also showed that organisations with more than ten G2G services exhibited a strong positive effect between the e-Government program (Yesser) and technological compatibility. This clearly indicates that if the e-Government program (Yesser) works closely with small organisations and organisations with a minimal number of G2G services, the e-Government program (Yesser) impact on technological compatibility and governance readiness will increase.

This thesis showed that the funding factor has only a slight relationship to t-Government implementation. Funding is not an obstacle to t-Government in Saudi Arabia. This result is not surprising, due the level of support from King Abdullah for the transformation to e-Government.

This thesis has contributed to the literature on the mixed-methods approach and its role in e-Government research. More specifically, this research has combined qualitative and quantitative methods to fulfil the exploratory and confirmatory research objectives. It provides insights into how various procedures and strategies followed in the sequential mixed-methods research methodology (for formulating research questions, collecting and analysing qualitative and quantitative data and triangulating quantitative findings) can be used to fulfil research objectives. This research therefore exemplifies the applicability of this mixed-methods approach to t-Government for obtaining a comprehensive understanding of the research phenomenon.

This thesis has contributed to academic knowledge by proposing and testing research regarding the complex area of e-Government interoperability, and by providing the research agenda with theoretical support. It also allows e-Government officials and policy makers to know which factors they should focus their energies on to ensure the most influence when creating interoperability and moving towards t-Government implementation.

9.5 Practical Implications

From a practical perspective, the model proposed in (Figure 8.1) suggests a generic, usable and comprehensive picture of the key factors influencing t-Government implementation. This model is useful in practice as it can help e-Government officials and policy makers to become more proactive, creating a holistic view to understand the factors that hinder interoperability between government organisations and t-Government implementation in Saudi Arabia. It helps them identify the gaps they need to fill, determine the weaknesses they need to improve and define their exact target in implementing t-Government. Using institutional theory also offers practitioners conceptual tools and techniques for understanding complex change-management scenarios (Shoib, Nandhakumar, & Currie, 2009). This will enable effective planning for organisational change. It also can help government organisations to develop roadmaps and strategies by warning them of the key factors that stimulate or impede t-Government implementation.

Further implication, this research could help e-Government programs (Yesser) to evaluate, assess, review and diagnose interoperability efforts, and to foster concern about important issues in t-Government. In addition, this model can help to facilitate and guide the development and planning of t-Government projects. It helps to identify organisational capability gaps (and those in an organisation's prospective partners) and then use this knowledge to guide both design efforts and the search for relevant best practices. It may also help them to use their resources more effectively and improve their position regarding central government targets.

9.6 Limitations

Despite the significant contribution of this thesis to e-Government research, like all research dealing with new phenomena, this thesis has some limitations.

The first limitation is the sample size: 217 participants. A larger sample size would be preferable, augmented by more samples from government organisations in Saudi Arabia. This would strengthen the results.

Another limitation is that this research had to be completed within the timeframe allocated for PhD research (3–4 years). The time factor and the difficulty of data collection is one limitation of this thesis. More time could have added further value; more detail could have been obtained. The proposed roadmap needs to be verified and tested after application in the real world, which will take a long time. The e-Government field is subject to rapid changes. Therefore, a longitudinal study would give more insight into t-Government implementation, whereas a 'snapshot' observation cannot.

As this research was only distributed as an online questionnaire, a hard copy of the instrument is recommended to approach people in top management positions who are often over 50 years old and may be less likely to participate in an online survey.

Another limitation is related to geographical location. Although a revised model has been presented, based on validation through data collection and analysis in Saudi Arabia, it might be difficult to generalise to other countries (such as Gulf or Arab countries) due to different environments and contexts until it is tested and validated in each country. Therefore, further study in different countries would most likely reinforce and validate this model.

Despite its limitations, the findings of this thesis provide a platform for future investigation. This thesis has produced valuable insights into the importance of a number of issues related to t-Government implementation projects. The acknowledged limitations of this thesis indicate directions for future research.

9.7 Directions for Future Research

Some hypotheses in this thesis were not supported, possibly due to the small sample size. To ensure that this lack of support for these hypotheses is valid, this thesis should be replicated with a different and larger data sample. Using the same method with a different data set is likely to provide valuable, objective and statistically precise outcomes that will show whether any differences in the hypothesis results exist in the Saudi Arabian context. Future research may give more insight into these hypotheses.

One of the main issues in any e-Government research is generalisation. Therefore, to increase generalisation, a repetition of the current study in different settings and different countries would definitely increase its generalisability and contributions.

More improvements to, and extension of, the proposed model may identify other factors that influence interoperability required for t-Government implementation. For example, as this research is limited to implementation within G2G perspectives, it only includes citizen centricity based on organisational requirements. The citizens' perspectives have not been addressed systematically from the demand-side. Further research from citizen perspectives might lead to exploring additional factors to address in relation to t-Government. This research focused on G2G perspectives and did not include G2B involvement; hence, further study from G2B perspectives might lead to exploration of more factors facing the interoperability level required for t-Government implementation.

This research used a mixed-methods approach that combined qualitative and quantitative methods. It also used interviews and documentation to collect data for the qualitative phase and questionnaires for the quantitative phase. Further research should employ new tools to collect data, such as focus

groups to provide insights into participant's shared understandings and further explanations of the factors influencing t-Government implementation.

This thesis has extended the knowledge of interoperability between government organisations and t-Government implementation by investigating the impact of technological, organisational, governance and social factors using an institutional theory lens. The study has confirmed that some of these factors exert influence in a Saudi Arabian context.

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APPENDICES

Appendix A

Ethics Approval

FINAL APPROVAL NOTICE

Project No.:	**6277**
Project Title:	Toward a T-Government: Interoperability model for e-government in Saudi Arabia
Principal Researcher:	Mr Sameer Shetewi
Email:	sameer.shetewi@flinders.edu.au
Address:	School of Computer Science, Engineering and Mathematics
Approval Date:	6 November 2013
Ethics Approval Expiry Date:	**17 September 2015**

The above proposed project has been **approved** on the basis of the information contained in the application, its attachments and the information subsequently provided.

RESPONSIBILITIES OF RESEARCHERS AND SUPERVISORS

1. **Participant Documentation**
   Please note that it is the responsibility of researchers and supervisors, in the case of student projects, to ensure that:

   - all participant documents are checked for spelling, grammatical, numbering and formatting errors. The Committee does not accept any responsibility for the above mentioned errors.
   - the Flinders University logo is included on all participant documentation (e.g., letters of Introduction, information Sheets, consent forms, debriefing information and questionnaires – with the exception of purchased research tools) and the current Flinders University letterhead is included in the header of all letters of introduction. The Flinders University international logo/letterhead should be used and documentation should contain international dialling codes for all telephone and fax numbers listed for all research to be conducted overseas.
   - the SBREC contact details, listed below, are included in the footer of all letters of introduction and information sheets.

   This research project has been approved by the Flinders University Social and Behavioural Research Ethics Committee (Project Number 'INSERT PROJECT No. here following approval'). For more information regarding ethical approval of the project the Executive Officer of the Committee can be contacted by telephone on 8201 3116, by fax on 8201 2035 or by email human.researchethics@flinders.edu.au.

2. **Annual Progress / Final Reports**
   In order to comply with the monitoring requirements of the *National Statement on Ethical Conduct in Human Research (March 2007)* an annual progress report must be submitted each year on the **6 November**(approval anniversary date) for the duration of the ethics approval using the annual / final report pro forma available from Annual / Final Reports SBREC web page. *Please retain this notice for reference when completing annual progress or final reports.*

   If the project is completed *before* ethics approval has expired please ensure a final report is submitted immediately. If ethics approval for your project expires please submit either (1) a final

been submitted, reviewed and approved. This is to protect the student in the event that reviewers recommend some changes that may include the collection of additional participant data.

Your first report is due on **6 November 2014** or on completion of the project, whichever is the earliest.

3. Modifications to Project

Modifications to the project must not proceed until approval has been obtained from the Ethics Committee. Such matters include:

- proposed changes to the research protocol;
- proposed changes to participant recruitment methods;
- amendments to participant documentation and/or research tools;
- change of project title;
- extension of ethics approval expiry date; and
- changes to the research team (addition, removals, supervisor changes).

To notify the Committee of any proposed modifications to the project please submit aModification Request Form to the Executive Officer. Download the form from the website every time a new modification request is submitted to ensure that the most recent form is used. Please note that extension of time requests should be submitted prior to the Ethics Approval Expiry Date listed on this notice.

Change of Contact Details

Please ensure that you notify the Committee if either your mailing or email address changes to ensure that correspondence relating to this project can be sent to you. A modification request is not required to change your contact details.

4. Adverse Events and/or Complaints

Researchers should advise the Executive Officer of the Ethics Committee on 08 8201-3116 or human.researchethics@flinders.edu.auimmediately if:

- any complaints regarding the research are received;
- a serious or unexpected adverse event occurs that effects participants;
- an unforseen event occurs that may affect the ethical acceptability of the project.

Mikaila Crotty
Ethics Officer and Joint Executive Officer
Social and Behavioural Research Ethics Committee

c.c Dr Robert Goodwin

Mrs Andrea Fiegert and **Ms Mikaila Crotty**
Ethics Officers and Joint Executive Officers, Social and Behavioural Research Ethics Committee
Telephone: +61 8 8201-3116 | Andrea Fiegert (Monday – Wednesday)
Telephone: +61 8 8201-7938 | Mikaila Crotty (Wednesday – Friday)
Web: Social and Behavioural Research Ethics Committee

Manager, Research Ethics and Integrity – Dr Peter Wigley
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Research Services Office | Union Building Basement
Flinders University
Sturt Road, Bedford Park | South Australia | 5042
GPO Box 2100 | Adelaide SA 5001

Appendix B

Information Sheet (English Version)

Dr Robert Goodwin
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INFORMATION SHEET

Title: "Toward a t-Government: Interoperability model for e-Government in Saudi Arabia"

Investigators:
Mr Sameer Alshetewi
School of Computer Science, Engineering and Mathematics
Flinders University, Australia
Ph: +61 8 8201 2297
Email: sameer.shetewi@flinders.edu.au

Description of the study:

This study is part of the project entitled "*Toward a t-Government: Interoperability model for e-Government in Saudi Arabia*". This project will investigate the critical factors (major barriers) of transformation government, examine and analyse the effect of these factors and the relation between them. On the basis of this information, I will develop solutions to help government organisations in Saudi Arabia to achieve the transformation. This project is supported by Flinders University School of Computer Science, Engineering and Mathematics.

Purpose of the study:

It is expected that the outcome of the research will enable government organisations to create interoperability, and to support and guide collaborative activities between them. It will also help senior executives in government organisations who wish to collaborate with other governments in transforming public services and ensuring that the technologies and services which the private sector provides make the best impact in terms of meeting public policy objectives.

What will I be asked to do?

You are invited to attend a one-on-one interview with a PhD student who will ask you a few questions about the key factors or barriers which affect the transition to transformation government in Saudi Arabia. The interview will take about 35 - 45 minutes and survey will be of 10 - 20 minutes duration.
The interview will be recorded to help with collecting the results. The interview will be transcribed (retyped-up) and stored as a computer file and then destroyed once the results have been finalised. This is voluntary.

What benefit will I gain from being involved in this study?

The sharing of your experiences will help to identify and classify the major barriers to transformation government. It will help in developing a roadmap to help government organisations in Saudi Arabia to create interoperability and to support and guide collaborative activities between government organisations.

Will I be identifiable by being involved in this study?

We do not need your name and you will be anonymous. Once the interview has been typed-up and saved as a file, the voice file will then be destroyed. Any identifying information will be removed and the typed-up file stored on a password protected computer that only the Investigator (Sameer Alshetewi) will have access to. Your comments will not be linked directly to you.

Are there any risks or discomforts if I am involved?

Other group members may be able to identify your contributions even though they will not be directly attributed to you. The investigator anticipates few risks from your involvement in this study. If you have any concerns regarding anticipated or actual risks or discomforts, please raise them with the investigator.

How do I agree to participate?

Participation is voluntary. You may answer 'no comment' or refuse to answer any questions and you are free to withdraw at any time without effect or consequences. A consent form accompanies this information sheet. If you agree to participate please read and sign the form.

How will I receive feedback?

Outcomes from the project will be summarised and given to you by the investigator if you would like to see them.

Thank you for taking the time to read this information sheet and we hope that you will accept our invitation to be involved.

Appendix C

Information Sheet (Arabic Version)

Dr Robert Goodwin
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ورقة معلومات

عنوان البحث: "الحكومة التحولية: نموذج للتوافق للحكومة الإلكترونية بالمملكة العربية السعودية"

الباحث:
السيد سمير الشتيوي
طالب دكتوراه تخصص علوم الحاسب
كلية علوم الحاسب والهندسة والرياضيات
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هاتف: +٨٢٠١٢٢٩٧ ٦١٨
البريد الالكتروني: sameer.shetewi@flinders.edu.au

وصف الدراسة:

هذه الدراسة هي جزء من مشروع بعنوان "الحكومة التحولية: نموذج للتوافق للحكومة الإلكترونية بالمملكة العربية السعودية". وهذا المشروع لإكتشاف العوامل المؤثرة في الحكومة التحولية، ودراسة وتحليل أثر هذه العوامل والعلاقة بينهما.وعلى أساس هذه المعلومات سيتم وضع حلول لمساعدة المؤسسات الحكومية في المملكة العربية السعودية لتحقيق هذا التحول. وهذا المشروع مدعوم من قبل كلية علوم الحاسب الآلي والهندسة والرياضيات في جامعة فلندرز بأستراليا.

الغرض من هذه الدراسة:

من المتوقع أن نتائج البحث ستساعد المؤسسات الحكومية في المملكة العربية السعودية من التكامل فيما بينها. وسوف يساعد أيضا كبار المديرين التنفيذيين في المؤسسات الحكومية الذين يرغبون في التعاون والإشتراك مع المؤسسات الحكومية الأخرى في تطوير وتسهيل الخدمات المقدمة للمستفيدين.

inspiring achievement

ماهو المطلوب؟

أنت مدعو لحضور مقابلة مع طالب دكتوراه و سوف يطرح عليك بعض الأسئلة حول العوامل التي تؤثر على التحول إلى الحكومة التحولية في المملكة العربية السعودية. سوف تستغرق المقابلة حوالي ٣٥ إلى ٤٥ دقيقة، والإستبيان من ١٠إلى ٢٠ دقيقة. وسيتم تسجيل المقابلة للمساعدة في جمع النتائج. وفي حال الانتهاء من النتائج سيتم التخلص من نتائج المقابلة.

ما الفائدة من الإنضمام لهذه الدراسة؟

الإستفادة من الخبرات يساعد على تحديد وتصنيف العوائق التي تؤثر على التحول إلى الحكومة التحولية. وهذا سوف يساعد في تطوير خارطة طريق لمساعدة المدراء التنفيذيين في المؤسسات الحكومية في المملكة العربية السعودية لتحقيق هذا التحول.

هل سيتم التعريف بهويتي في هذه الدراسة؟

نحن لسنا بحاجة لهويتك وسوف تكون مجهولة المصدر وفي حال الانتهاء من النتائج سيتم التخلص من نتائج المقابلة..

هل هناك أي مخاطر أو مضايقات نتيجة الإنضمام للدراسة؟

سوف يكون التركيز في هذا البحث على البيانات بشكل عام وجماعي لذلك فإن اي بحث منشور من هذه الدراسة سيتم اخفاء هوية المشارك وسيتم الإحتفاظ بالمعلومات التي قدمتها في هذا الإستبيان بشكل يحافظ على الخصوصية وسيتم التخلص منها عند انتهاء الدراسة.

الموافقة على المشاركة؟

يوجد نموذج مرفق مع ورقة المعلومات هذه، فإذا كنت موافق على المشاركة في الإجابة على الأسئلة يرجى التوقيع على النموذج، وأنت حر في رفض الإجابة على اي سؤال والإنسحاب في اي وقت.

كيف يمكنني تلقي ردود الفعل؟

سيتم تلخيص نتائج البحث و بالإمكان الاطلاع على النتائج إذا رغبت في ذلك من خلال التواصل مع الباحث بواسطة البريد الإلكتروني .

شكراً على وقتك ومساعدتك ونأمل بأن تقبل دعوتنا للمشاركة.

Appendix D

Skewness and Kurtosis Tests

Descriptive Statistics

	N	Skewness		Kurtosis	
	Statistic	Statistic	Std. Error	Statistic	Std. Error
I_1a	217	-.092	.165	-.570	.329
I_1b	217	-.110	.165	-.688	.329
I_1c	217	-.171	.165	-.575	.329
Valid N (listwise)	217				

Descriptive Statistics

	N	Skewness		Kurtosis	
	Statistic	Statistic	Std. Error	Statistic	Std. Error
Y_1	217	.568	.165	.674	.329
Y_2	217	-.230	.165	-.645	.329
Y_3	217	.138	.165	-.591	.329
Y_4	217	.055	.165	-.799	.329
Y_5	217	-.050	.165	-.755	.329
Y_6	217	-.079	.165	-.800	.329
Valid N (listwise)	217				

Descriptive Statistics

	N	Skewness		Kurtosis	
	Statistic	Statistic	Std. Error	Statistic	Std. Error
S_1	217	2.078	.165	8.364	.329
S_2	217	1.206	.165	1.479	.329
S_3	217	-.107	.165	-.636	.329
S_4	217	.988	.165	-.022	.329
S_5	217	-.298	.165	-.524	.329
S_6	217	-.348	.165	-.734	.329
Valid N (listwise)	217				

Descriptive Statistics

	N	Skewness		Kurtosis	
	Statistic	Statistic	Std. Error	Statistic	Std. Error
D_1	217	.052	.165	-1.088	.329
D_2	217	-.001	.165	-.946	.329
D_3	217	-.212	.165	-.929	.329
D_4	217	1.362	.165	.901	.329
Valid N (listwise)	217				

Descriptive Statistics

	N	Skewness		Kurtosis	
	Statistic	Statistic	Std. Error	Statistic	Std. Error
BU_1	217	1.383	.165	1.732	.329
BU_2	217	1.416	.165	.899	.329
BU_3	217	-.310	.165	-.310	.329
BU_4	217	-.535	.165	-.228	.329
BU_5	217	-.476	.165	-.433	.329
BU_6	217	.017	.165	-.606	.329
Valid N (listwise)	217				

Descriptive Statistics

	N	Skewness		Kurtosis	
	Statistic	Statistic	Std. Error	Statistic	Std. Error
ST_1	217	3.123	.165	16.286	.329
ST_2	217	.025	.165	-.992	.329
ST_3	217	-.236	.165	-.923	.329
ST_4	217	1.320	.165	1.668	.329
Valid N (listwise)	217				

Descriptive Statistics

	N	Skewness		Kurtosis	
	Statistic	Statistic	Std. Error	Statistic	Std. Error
STR_1	217	.508	.165	-.435	.329
STR_2	217	.580	.165	-.472	.329
STR_3	217	.610	.165	-.435	.329
STR_4	217	2.444	.165	8.624	.329
Valid N (listwise)	217				

Descriptive Statistics

	N	Skewness		Kurtosis	
	Statistic	Statistic	Std. Error	Statistic	Std. Error
F_1	217	.521	.165	.121	.329
F_2	217	.262	.165	-.263	.329
F_3	217	.116	.165	-.513	.329
F_4	217	.242	.165	-.332	.329
Valid N (listwise)	217				

Descriptive Statistics

	N	Skewness		Kurtosis	
	Statistic	Statistic	Std. Error	Statistic	Std. Error
STA_1	217	2.983	.165	17.666	.329
STA_2	217	-.436	.165	-.564	.329
STA_3	217	-.387	.165	-.548	.329
STA_4	217	-.465	.165	-.530	.329
STA_5	217	1.467	.165	2.267	.329
LE_1	217	-.094	.165	-.881	.329
LE_2	217	-.246	.165	-.655	.329
LE_3	217	.996	.165	.869	.329
LE_4	217	.901	.165	.640	.329
Valid N (listwise)	217				

Descriptive Statistics

	N	Skewness		Kurtosis	
	Statistic	Statistic	Std. Error	Statistic	Std. Error
L_1	217	-.122	.165	-.942	.329
L_2	217	-.118	.165	-.802	.329
L_3	217	-.105	.165	-.805	.329
L_4	217	1.178	.165	1.045	.329
L_5	217	2.109	.165	6.942	.329
Valid N (listwise)	217				

Descriptive Statistics					
	N	Skewness		Kurtosis	
	Statistic	Statistic	Std. Error	Statistic	Std. Error
C_1	217	.391	.165	.522	.329
C_2	217	.011	.165	-.782	.329
C_3	217	-.172	.165	-.449	.329
C_4	217	-.180	.165	-.729	.329
Valid N (listwise)	217				

Descriptive Statistics					
	N	Skewness		Kurtosis	
	Statistic	Statistic	Std. Error	Statistic	Std. Error
STAK_1	217	-.009	.165	-.587	.329
STAK_2	217	.000	.165	-.603	.329
STAK_3	217	1.533	.165	3.839	.329
STAK_4	217	.104	.165	-.666	.329
Valid N (listwise)	217				

Kolmogorov-Smirnov (K-S) Test

	Kolmogorov-Smirnov[a]		
	Statistic	df	Sig.
I_1a	.179	217	.000
I_1b	.190	217	.000
I_1c	.187	217	.000
Y_1	.296	217	.000
Y_2	.194	217	.000
Y_3	.247	217	.000
Y_4	.175	217	.000
Y_5	.173	217	.000
Y_6	.185	217	.000
S_1	.371	217	.000
S_2	.345	217	.000
S_3	.217	217	.000
S_4	.394	217	.000
S_5	.258	217	.000
S_6	.253	217	.000
BA_1	.247	217	.000

	Kolmogorov-Smirnov[a]		
	Statistic	**df**	**Sig.**
BA_2	.182	217	.000
BA_3	.182	217	.000
BA_4	.182	217	.000
A_1	.289	217	.000
A_2	.225	217	.000
A_3	.247	217	.000
A_4	.246	217	.000
A_5	.256	217	.000
D_1	.193	217	.000
D_2	.202	217	.000
D_3	.222	217	.000
D_4	.438	217	.000
BU_1	.409	217	.000
BU_2	.458	217	.000
BU_3	.215	217	.000
BU_4	.244	217	.000
BU_5	.226	217	.000
BU_6	.185	217	.000
ST_1	.472	217	.000
ST_2	.188	217	.000
ST_3	.201	217	.000
ST_4	.334	217	.000
F_1	.283	217	.000
F_2	.242	217	.000
F_3	.192	217	.000
F_4	.234	217	.000
STR_1	.231	217	.000
STR_2	.238	217	.000
STR_3	.238	217	.000
STR_4	.296	217	.000
STA_1	.415	217	.000
STA_2	.230	217	.000
STA_3	.228	217	.000
STA_4	.220	217	.000
STA_5	.423	217	.000
L_1	.211	217	.000
L_2	.204	217	.000
L_3	.207	217	.000
L_4	.383	217	.000

	Kolmogorov-Smirnov[a]		
	Statistic	**df**	**Sig.**
L_5	.412	217	.000
LE_1	.180	217	.000
LE_2	.195	217	.000
LE_3	.372	217	.000
C_1	.306	217	.000
C_2	.175	217	.000
C_3	.188	217	.000
C_4	.198	217	.000
LE_4	.241	217	.000
STAK_1	.176	217	.000
STAK_2	.173	217	.000
STAK_3	.285	217	.000
STAK_4	.188	217	.000

Scale Reliability

	Cronbach's Alpha if Item Deleted
I_1a	.863
I_1b	.864
I_1c	.863
Y_1	.863
Y_2	.863
Y_3	.862
Y_4	.865
Y_5	.863
Y_6	.865
S_2	.866
S_3	.864
S_4	.864
S_5	.865
S_6	.865
BA_1	.868
BA_2	.863
BA_3	.863
BA_4	.862
A_1	.868
A_2	.864
A_3	.865
A_4	.865
A_5	.867
D_1	.862
D_2	.863
D_3	.864
D_4	.867
BU_1	.867
BU_2	.867
BU_3	.864
BU_4	.864
BU_5	.865
BU_6	.865
STR_1	.865
STR_2	.865
STR_3	.865
STA_2	.863
STA_3	.863
STA_4	.863
L_1	.864

	Cronbach's Alpha if Item Deleted
L_2	.864
L_3	.864
L_4	.867
L_5	.868
C_1	.864
C_2	.865
C_3	.866
C_4	.866
LE_1	.863
LE_2	.863
LE_3	.866
LE_4	.868
ST_1	.867
ST_2	.865
ST_3	.866
ST_4	.866
F_1	.867
F_2	.866
F_3	.868
F_4	.867
STAK_1	.863
STAK_2	.863
STAK_3	.867
STAK_4	.863