CHALLENGES FACING TRANSACTIONAL E-GOVERNMENT SYSTEMS

A thesis submitted for the degree of Doctor of Philosophy

by

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PhD Abstract

A review of normative literature, in the field of e-government, indicates that the transactional stage of e-government is one of the most important to the implementation of an e-government system as it represents the highest level of interaction within organisations and between customers and government organisations. Due to the importance of the transactional stage of the e-government system and its positive impact, not only in making the delivery of external services quicker, but also in increasing the efficiency of internal government processes, government organisations might seek to reach this stage.

In fact, in the literature, there appears to be an absence of theoretical models for the technical and organisational challenges facing transactional e-government systems. Furthermore, there is a lack of studies focusing on identification of the importance, categorisation and presentation of strategies for overcoming technical and organisational challenges. Consequently, this dissertation attempts to fill the information gap based on empirical data derived from two case studies.

This work proposes a novel model for the technical and organisational challenges facing transactional e-government systems. In moving from the conceptual to the empirical, the work is based on a qualitative case study approach to examine the proposed model for the technical and organisational challenges facing transactional e-government systems. In doing so, two case studies were conducted, presented and analysed. During the empirical research, additional technical and organisational challenge(s) facing transactional e-government systems emerged, which resulted in modifications being made to the previously presented conceptual model.

However, this dissertation proposes the conceptual model, identifies the importance, categorisation, and presentation of the strategies for overcoming, technical and organisational challenges facing a transactional e-government system. This results in the development of a frame of reference that will lead to a model that can be used to enhance decision-making.

Keywords: technical and organisational challenges; transactional e-government; government organisations.

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Declaration

This thesis gives an account of the research undertaken by the author. Some of the material contained here has been presented in the form of the following publications

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Chapter 1: Introduction

1.1 An Overview of E-government

As a result of the prevalence of the information age, the starting point of the concept of e-government came about in the early 1990s (Kei Ho, 2002). E-government can be considered the newest (e) evolution since e-commerce. The difference is that e-government is intended to provide services to all customers (citizens, businesses and public administrations) while the services of e-commerce focus on specific customers.

E-government is a relatively young field and, among academics and researchers, the concept of e-government itself is still an arguable issue, as are issues such as definitions and models of the stages of e-government that have appeared. E-government can be seen from different perspectives, for example on the one hand Sharma and Gupta (2002) argue that e-government has the greatest potential to revolutionize the performance of government through increasing efficiency and speeding-up transactions. Abie *et al.* (2004) add that e-government could be considered a powerful tool that could effectively manage and integrate the huge amount of existing information and seamlessly integrate citizen interaction into its services. On the other hand, Shiver (2000), cited in Doty and Erdelez (2002), argues that an e-government system could lead to public services becoming worse because government workers will be responsible for providing simultaneous services, that is, services via the internet and also via traditional channels i.e. phones, paper work and face to face transactions. However, other scholars, such as Chandler and Emanuels (2002), believe that e-government itself does nothing, that it is just a tool. The importance of e-government comes from its applications. Riley (2001) argues that e-government is a tool that has limited value in itself; its value comes from the ability to apply it to specific goals and objectives.

Scholars of e-government, such as Riley (2001) and Moon (2002), argue that the concept of e-government is without a specified definition. There are two main reasons why the definition of e-government is an arguable issue. The first is that the definition of e-government has different sectors or dimensions, which includes applications (see Section 1.4) such as government to citizens (G2C), government to businesses (G2B), government to employment (G2E) and government to government (G2G). It can also be viewed from different perspectives, for example, those of societies, businesses, economies, services, organisations and politics. The second reason is that the definition of e-government varies according to the values, goals and cultures of a community. Although there are many definitions of e-government in the literature review, such as Silcock (2001), Duffy (2000), Aldrich (2002), Katzen (2000) and Tyndale (2002), according to Metaxiotis and Psarras (2005, p.78, 79):

> "*E-government is simply using information technology to deliver public services directly to the customer.*"

1.2 E-government Services

Aichholzer and Schmutzer, (1999), cited in Dridi *et al.* (2001) note that services that can be provided by government electronically can be classified into three types according to their functions:

- Information services, which enable citizens to obtain information about education, laws, culture, etc.
- Communication services, which give the opportunity of interaction with groups of people or individuals, for example, politicians and civil servants.
- Transaction services, which include submitting data or getting products or services online.

Chandler and Emanuels (2002) argue that e-government is only useful when it does not exclude citizens from access to public services. Timonen *et al.* (2002) have suggested that some strategies can be adopted in order to make e-government services more

accessible and reduce the exclusion of citizens from these services, some of which are listed below:

- Paying attention to and improving the levels of computer literacy; this strategy can be done by adopting a plan of computer literacy training in primary schools, workplaces, social centres etc.
- Making e-government services available to citizens free of cost – if that is possible - in public places such as shopping centres, schools, hospitals, libraries etc.
- Taking into account those who have few or no computer skills and making the use of e-government services simple.
- Making sure that e-government services meet the highest international standards and ensuring that they can be used by disabled people.

Morris (2002) compared the traditional and electronic paths of government services. Traditional public services can be delivered by direct interaction between a citizen or business and representatives or agents of government who are considered transaction processors or gatekeepers to the desired transactions and/or information. On the other hand, delivering of public services electronically leads to a change in the role of government representatives from gatekeepers to problem solvers or service providers. Furthermore, electronic public service delivery enables citizens and businesses to serve themselves.

Howard (2001) argues that e-government services at all levels will increasingly be delivered through electronic methods, but this will not replace the traditional ways of delivering government services. Instead, electronic channels will be additional paths of delivery for e-government services. Morris (2002) claims that governments still need to provide citizens and businesses with public services through traditional channels because not all services are suited to electronic delivery; additionally, not all citizens and businesses have the desire or the ability to access public services via electronic channels.

However, there are several characteristics that allow us to differentiate between electronic and traditional delivery of government services (Warkentin *et al.* 2002). These characteristics include wide use of communication technology, smooth collection and processing of information, the development of communication mediums, the impersonal feature of the online environment, and the full benefit of using a high standard of technological infrastructure for transactions.

1.3 Critical Success Factors of E-government

There is no doubt that successful implementation of e-government is a significant issue; Warkentin *et al.* (2002, p.161) argue that:

> *"successful implementation of e-Government in all its forms will be an important issue for the coming decade."*

Chandler and Emanuels (2002) claim that strong e-government will lead to increased and improved interaction between citizens, businesses and other government agencies and will also support the efficiency of government services. Layne and Lee (2001) argue that three main issues must be taken into account by government to ensure the efficiency and effectiveness of e-government for citizens:

1) Universal access: for various reasons some people are unable to access government services online, therefore, government has to provide citizens with the same services outside the web whilst seeking to encourage access to the Internet through public services.
2) Privacy and confidentiality: citizens worry a great deal about privacy and confidentiality issues when they submit personal data through the Internet as part of the process of obtaining government services. Governments must, therefore, adopt practical steps and find technical solutions to provide government websites with high levels of security.
3) Citizen focus on government management: by adopting an e-government system, government has to seek not only efficiency within the system but also seek convenience and meet the needs and wishes of its citizens.

Timonen *et al.* (2002) argue that the successful e-government has to reach at least the level of combination between the guarantee of security and privacy of personal data of users, efficiency of services for citizens and efficiency of delivery services for government. They also argue that to be accepted by citizens, e-government services must not be of a lower standard than service delivery via traditional methods. Hughes *et al.* (2002) claim that there are some factors that can lead to successful e-government, these include enabling citizens to make online transactions conveniently saving them time, effort, and cost; enabling integration across different functions and departments by re-engineering the internal processes effectively and providing IT skilled workers; building the trust of citizens towards Internet use by adopting technical solutions to security and privacy issues so that they feel safe transmitting personal data.

Successful e-government initiatives rely on an e-government infrastructure that satisfies the following criteria (e-government strategy and solutions team, IBM Public Sector, 2001):

- Flexibility that enables the addition of new applications of technology to support rapidly evolving e-government models.
- Scalability that leads to accommodate unexpected public demand and user workload.
- Reliability that is required to help ensure the security and availability of government services to users.

However, Metaxiotis and Psarras (2004) claim that achieving e-government success requires not only active partnerships between the government, citizens and the private sector, but also changes in how a government works, how it deals with information, and how officials see their jobs and interact with the public. However, Tambouris *et al.* (2001, p.13) claim

> *"...essential ingredients of a successful transformation from government to e-government include a vision, relevant policies, mission, strategic objectives and frameworks. Careful planning, strong and committed leadership and guaranteed funding are also critical factors for success."*

1.4 Sectors of E-Government

There are many studies in the literature, such as Bonham. *et al.* (2000); General Accounting Office (2001) and Office of Management and Budget (2002) that discuss the sectors of e-government. E-government is responsible for delivery of the full range of government activities such as internal processes, the development of policy and services to citizens electronically (Metaxiotis and Psarras, 2004). Bonham *et al.* (2001) argue that although there are many activities provided by e-government, three different sectors can be positively identified:

1) Government-to-Government (G2G). This sector is considered to be the backbone of e-government where governments at all levels need to support and update their own internal systems and procedures before electronic transactions with businesses and citizens can be successfully established.
2) Government-to-Business (G2B). This sector receives a high level of attention where the business sector seeks to reduce costs via improved procurement practices and increased competition.
3) Government-to-Citizen (G2C). This sector can be considered as the primary purpose of e-government. G2C initiatives are built to enable citizens to access high quality government services and seek to make transactions, such as obtaining certification and renewing licenses, easier and less time consuming.

The Inter-American Development Bank (2001) has discussed another sector of the e-government system, which is a government-to-employee system. It argues that there are four different possible clients in an e-government system: the employees (G2E), the private sector (G2B), the citizenship (G2C) and the government itself (G2G).

Other studies have resulted in similar categorisations of the sectors of e-government. The GAO (General Accounting Office) (2001) identifies four categories in the sector of e-government: G2C that allows citizens to access high-quality government services easily; G2E that enables governments to interact with employees more efficiently and therefore supports productivity and human resources management; G2G that allows the government agencies and departments to interact with each other easily, and G2B that leads to reduce the government's burden on businesses through providing better

leveraging e-business technologies for communication. Furthermore, the Office of Management and Budget (OMB) (2002) classifies the sectors of e-government into G2C, G2B, G2G and IEE. Instead of G2E, OMB includes IEE (Internal Efficiency and Effectiveness) as a fourth sector of e-government. IEE leads to better use of new technology to reduce costs and improve effectiveness and efficiency of government administrations by eliminating delays in processing and improving employee satisfaction.

Hiller and Belanger (2001) categorise the sectors of e-government into six types: Government Delivering Services to Individuals (G2IS) that enables citizens to interact with government; Government to Individuals as a part of the political process (G2IP) that refers to the relationship between the government and its citizens regarding the political aspects; Government to Business as a Citizen (G2BC) enhances capabilities such as paying fines and filling-in forms online; Government to Business in the Marketplace (G2BMKT) refers to e-procurement; Government to Employees (G2E), and Government to Government (G2G). However, Carter and Belanger (2004) noted that Hiller and Belanger's (2001) G2IS and G2IP are comparable to the G2C sector, while G2BC and G2BMKT are comparable to G2B. Furthermore, the G2E and G2G categories are comparable to those identified by GAO and OMB.

1.5 E-Government Around the World

There is no doubt that e-government has become a reality and in many countries is developing very rapidly, especially in the developed countries (Riley, 2002). Layne and Lee (2001) have divided e-government systems into four stages, namely: cataloguing, transaction, vertical integration and horizontal integration (see Section 2.7, Table 2.13). According to this division, Ronaghan (2002), cited in Hughes *et al.* (2002), claims that the result of classifying the 190 UN member states has revealed that 97 have reached stage 1, 55 have reached stage 2 and only 17 have arrived at stage 3 while none have reached stage 4.

Hughes *et al.* (2002) argue that the United States is the leader and innovator of e-government initiatives; the federal states offered over 1,300 independent initiatives between 1993 and 2001. The IDC (International Data Corporation) study categorised

Finland as currently the most advanced provider of e-government services in Europe (Sharma and Gupta, 2002) followed by Italy, Spain and France (Internet Business News, 2001, cited in Sharma and Gupta, 2002). The Global Information Technology Report (GITR) surveyed 75 countries, including all the world's industrialized economies and the Asian countries, the result revealed that Singapore was the nation best prepared for e-government. The same study found that other Asian countries are in the bottom half of the list, Thailand was categorised at 41, Malaysia at 45, the Philippines at 57, Indonesia at 62, and Vietnam at 65 (Wong, 2002, cited in Sharma and Gupta, 2002).

West (2002) studied the features of 1,197 government websites in 198 different countries. This study revealed that there are wide differences in the percentage of government sites with services that are only fully executable online. The Bahamas, Vanuatu, Chile, and South Korea are first with 100% of their websites providing some types of services. Furthermore, the performance of e-government differs from country to country. Taiwan has the top ranking at 72.5 percent. This means that every analysed website for that country has around three-quarters of its features, which include citizen access, service delivery, information availability and portal access. Taiwan is followed by South Korea (64.0 percent), Canada (61.1 percent), and the United States (60.1 percent). This study also revealed that there are major regional differences in the performance of e-governments. The highest score was in North American countries (60.4 percent), followed by Asia (48.7 percent), Western Europe (47.6 percent), Eastern Europe (43.5 percent), and the Middle East (43.2 percent). Overall, these ratings are higher than those for the 2001 regional figures.

The United Nations – DPEPA (2002) surveyed 190 UN Member States. The results of this survey revealed the following important points:

- There are 169 national governments that use the Internet to provide services and information.
- As discussed (see Section 2.7, Table 2.13) the stages of e-government have been divided by the United Nations (DPEPA, 2002) into five stages namely: emerging, enhanced, interactive, transactional, and seamless or fully integrated.

The survey found that 32 governments were at the emerging stage, 65 governments at the enhanced stage, 55 governments at the interactive stage, 17 governments at the transactional stage; no country has reached the final stage, i.e. fully integrated or seamless.

- According to the classification of e-governments by geographic region, North America was the leader followed by Europe, South America, the Middle East, Asia/Oceania, Africa, the Caribbean, and Central America.
- The survey also revealed that, among countries, the United States was the leader followed by Australia, New Zealand, Singapore, Norway, Canada, the UK, the Netherlands, Denmark and Germany.

The survey carried out by the United Nations (UNPAN, 2003) revealed that the number of member states that used the Internet to provide services and information (a website presence) increased from 143 out of 191 member states in 2001 and 169 in 2002 to 173 in 2003. The United States is the world leader, followed by Sweden, Australia, Denmark, the UK, Canada, and Norway. In the developing countries, the leader is Singapore, followed by the Republic of Korea, Estonia, and Chile.

However, one of the most recent reports provided by the United Nations (UNPAN, 2004) revealed that in the past years, governments worldwide have made rapid progress in embracing ICT technologies for e-government. While the UN e-government survey, in 2001, listed 143 member states as using the Internet in some capacity; by 2004, 93 % or 178 out of 191 member states had a website presence.

1.6 Background to the Research Problem: Transactional E-government Systems

E-government is a relatively new topic. It is a multidisciplinary area, since the scope of e-government is very wide and interrelated with other areas. E-government is a complex issue that touches on and involves many aspects including technological, political, administrative, social, economic and business perspectives.

E-government systems pass through stages until they reach the highest potential of providing customers (citizens, businesses and public administrations) with full online interaction with their governments, thus enabling them to obtain government

information and services from a single point of access. The transaction stage of e-government is one of the most important to the implementation of an e-government system as it represents the highest level of internal interaction between customers and governments. It can be viewed from the perspective of the author of this thesis as follows: the transaction stage of e-government systems is the stage that enables customers (citizens, businesses and public administrations) to carry out complete transactions, such as obtaining visas, passports and renewing licenses with specified government organisations, online, safely and (almost) without the need to go to the office of the appropriate organisation. The implementation of this stage is within the scope of any one (specific) organisation.

There are several reasons that might push government organisations to reach the transactional stage of an e-government system, for example: saving of time, effort, and cost of delivery of services by making the delivery of external services quicker, and enabling customers to implement a complete transaction electronically, also increasing the efficiency of the internal government process.

In order to reach a transactional e-government system, government organisations face interrelated and complex challenges. These challenges could be: political, technical, social, organisational and/or economic. There is an absence of theoretical models for different challenges (specifically technical and organisational) facing transactional e-government systems. Furthermore, there is a lack of studies that focus on identification of the importance of categorisation of and presenting of the strategies for overcoming technical and organisational challenges facing transactional e-government systems.

1.7 Research Aim and Objectives

1.7.1 Research Aim

Because this dissertation focuses on the challenges (technical and organisational) facing transactional e-government systems, the author has suggested that there are a number of criteria that could be used to identify government organisations reaching the transaction stage of their e-government system. These criteria are: (a) enabling

customers to fill in and electronically submit different types of forms such registrations and payments; (b) providing a secure connection by enabling customers to complete their transaction with the required government organisation online, safely and with trust in the system. For this reason, government organisations should ensure: (i) the security of any confidential data stored in government databases and, (ii) the privacy of transactions of personal data provided by citizens as part of obtaining government services; (c) allowing customers to perform online financial transactions (if applicable) such as payment of bills and fines; (d) enabling customers to create online accounts with their own usernames and passwords within government organisations and, (e) providing customers with instant decisions, meaning that as soon as a customer has completed a transaction such as filling in a form or paying a bill online, a message will appear that confirms the process has been executed successfully.

As discussed earlier, there is an absence of theoretical models for the technical, economic, political, social and organisational challenges facing a transactional e-government system. Due to the limitation of time, this dissertation focuses only on technical and organisational challenges facing a transactional e-government system. Moreover, there is a lack of studies that focus on identification of the importance of, categorisation of, and presentation of the strategies for overcoming of technical and organisational challenges facing transactional e-government systems. Consequently, this dissertation aims to:

identify the importance, categorisation, and presentation of the strategies for overcoming, technical and organisational challenges facing a transactional e-government system; resulting in the development of a frame of reference that leads to a model that can be used to enhance decision-making.

1.7.2 Research Objectives

To meet the research aim, the research objectives of this dissertation are:

- To conduct a comprehensive literature review in the e-government area with particular focus on challenges and stages of e-government.
- To identify the importance of technical and organisational challenges facing transactional e-government systems.
- To categorise technical and organisational challenges facing transactional e-government systems based on their levels of importance.
- To identify the strategies used (suggested) to overcome technical and organisational challenges facing transactional e-government systems.
- To develop and propose a frame of references that can be translated into a model for technical and organisational challenges facing transactional e-government systems.

1.8 Dissertation Outline

The structure of this research is divided according to the methodology described by Phillips and Pugh (2000), into four elements namely: (a) background theory, (b) focal theory, (c) data theory and (d) novel contribution. Background theory (Chapter 2) focuses on identifying the domain of the problem based on a comprehensive literature review. Focal theory (Chapter 3) concentrates on developing a conceptual model. The data theory deals with issues such as: (a) identifying and developing an appropriate research strategy (b) identifying an appropriate research method and (c) developing a research protocol. These issues are discussed in Chapter 4 of this research. The data theory also deals with the process of collecting and analysing data (Chapter 5). The novel contribution (the fourth element) will be the results of this research (Chapters 6 & 7). The outline of the dissertation is illustrated in Figure 1.1 and is explained in the following paragraphs.

Chapter 1: Introduction

Chapter 1 starts by providing an introduction to some issues regarding e-government, focusing on e-government services, characteristics and factors of successful e-government, and e-government around the world. This is followed by concentration on the research problem. Thereafter, the aim and objectives of this dissertation are stated. Finally, the outline of this dissertation is provided.

Chapter 2: Literature Review – Background Theory

After providing a brief introduction to the area of research and establishing the scope of the dissertation, a literature review on e-government is presented. Chapter 2 begins by giving a brief history of the emergence of e-government before discussing definitions of e-government. This is followed by a classification of motivations for e-government (into: change of traditional government methods for delivery of services, technological, economic and social forces). Thereafter, benefits, costs and risks of e-government are discussed. The challenges of e-government are also discussed. Then different models of the stages of e-government are briefly considered. Finally, the relationships between stages of e-government, types of online services and the benefits to the public (citizens and businesses) are clarified.

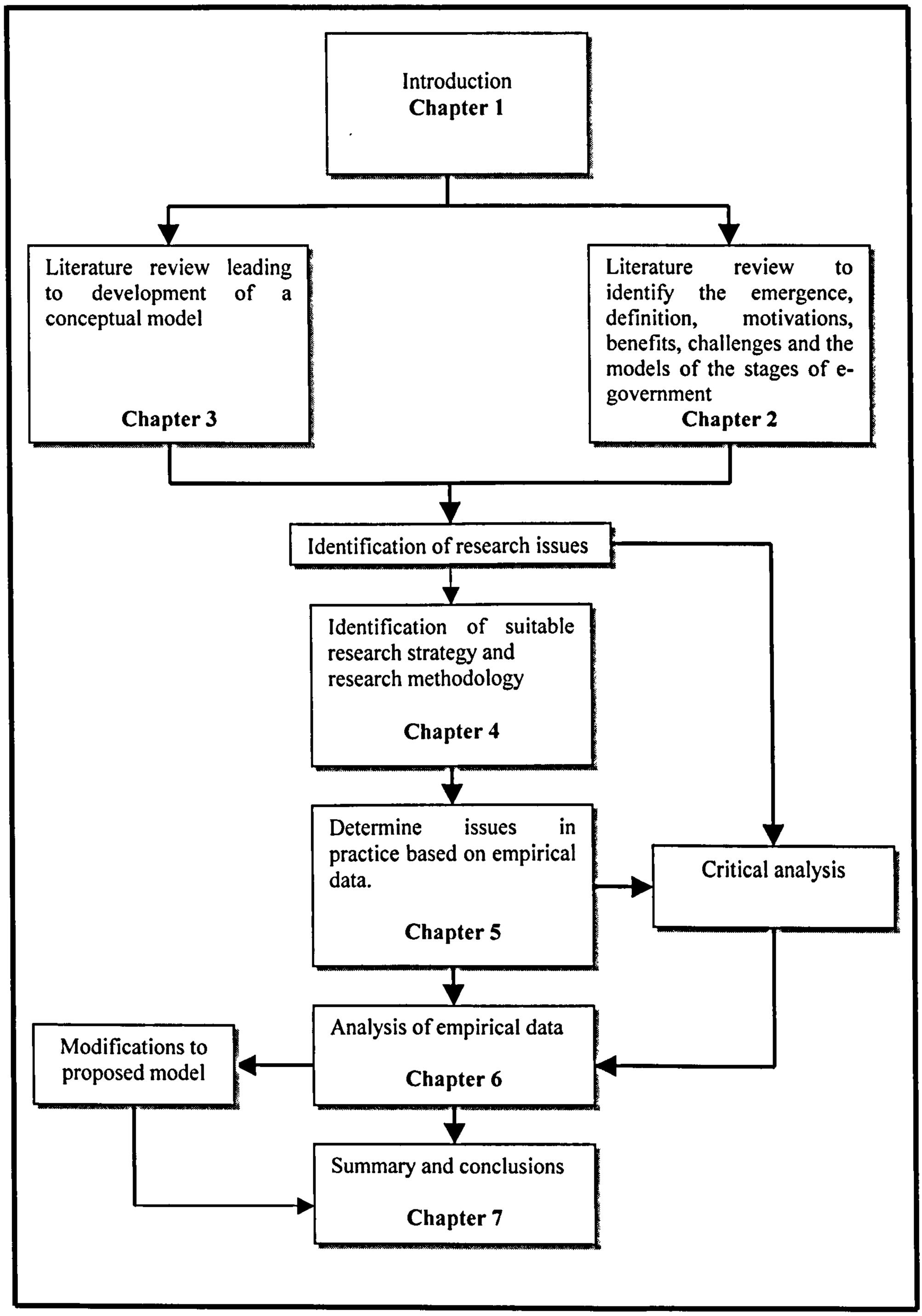

Figure 1.1: Dissertation Outline

Chapter 3: Conceptual Model for Technical and Organisational Challenges – Focal Theory

Chapter 2 revealed that: (a) political, technical, economic, social and/or organisational issues are interrelated and complex challenges faced when reaching the transaction stage of an e-government system. There is an absence of theoretical models for different challenges (specifically technical and organisational) that face the emergent transactional stage of an e-government system, as well as a lack of studies that focus on identifying of the importance of, categorisation of, and presentation of the strategies for overcoming technical and organisational challenges faced in reaching the transactional stage of an e-government system; and (b) there is a surprising lack of detail regarding the transactional stage, i.e. its location among different models of the stages of e-government, its importance and the need for government organisations to reach it, its scope of implementation and criteria identifying government organisations reaching this stage.

Chapter 3, therefore, aims to: clarify the confusion surrounding the transaction stage of an e-government system, develop a framework for this dissertation, and develop a conceptual model of technical and organisational challenges facing transactional e-government systems. As a result a framework for this dissertation is developed in first part of this chapter. Thereafter, a novel model of technical and organisational challenges facing transactional e-government system is developed and analysed. The proposed conceptual model attempts to classify technical and organisational challenges facing transactional e-government systems based on common characteristics. Consequently, technical challenges are categorised into: (a) challenges faced after installation of software that enables government organisations to reach a transactional e-government, including: maintaining high levels of performance and service availability and trouble shooting technical problems; (b) setting technical standards for all e-services; (c) showing the capability of the infrastructure in terms of handling the range and number of transactions; (d) security challenges including: ensuring the security of confidential data stored in government organisation databases and e-government sites from attack and misuse, and ensuring privacy of personal data that is provided by citizens as part of obtaining government services; (e) Financial challenges

that include: finance required to install a software system and finance required to provide more computers; (f) the back–end servers (communication failures between internal systems and the external web–server); (j) compatibility of e-government technology available to the internal system; and (h) vendor challenges, including: vendor pressure to buy their solutions, false promises of vendors, and exaggerated vendor prices.

Organisational challenges are categorised into: (a) employee challenges - these included the lack of IT skilled employees, resistance to change (from traditional to electronic ways working) by the employees, and changing the culture of employees (government processes should be organised for the convenience of the citizens rather than the convenience of the department); (b) re-engineering of internal process challenges, including: the transforming of existing off-line data to digitalisation, double process front–end (interaction between government organisations and their customers needs to be offered in both a traditional manner and also through the internet), time required to reengineer and change the internal business processes and structure of the organisation, and finance required to reengineer and change the internal business processes and structure of the organisation; (c) adopting new legislation to deal with new issues such as electronic receipts and digital signatures; and (d) change of organisational structure.

The proposed conceptual model makes a novel contribution at three levels: (a) it combines the challenges (which can be classified into technical and organisational) of an e-government system identified separately in previous studies; (b) it attempts to categorise technical and organisational challenges facing transactional e-government systems based on their common characteristics; and (c) it could be used as a frame of reference by government organisations that seek to reach a transactional e-government system. It can also be used as a decision-making tool to support management when taking the decision to reach a transactional e-government system. Furthermore, the model can be used by researchers to analyse and understand technical and organisational challenges facing transactional e-government systems.

Chapter 4: Research Methodology- Data Theory

Chapters 2 and 3 led the author to understand and identify research issues. To deal with the research that focuses on these issues, a research methodology had to be adopted. Chapter 4, therefore, provides the justification for using an appropriate methodology for this dissertation based on the inherent problems within different research philosophies. The research strategies existing in the IS area are described within this chapter.

Chapter 5: The Issues in Practice (Case Studies and Preliminary Research Findings) – Data Theory

After understanding of the issues relevant to this research, this chapter provides a description of the case studies scrutinised for this dissertation. In this context, two government organisations were studied and the background to these organisations is presented here. Chapter 5 also describes and analyses the main issues including: (a) the importance of technical and organisational challenges facing transactional e-government systems and (b) the strategies used (suggested) to overcome technical and organisational challenges facing transactional e-government systems. However, this chapter provides an empirical analysis of the perspectives offered by different case studies that describe human and organisational behaviour and perceptions during the implementation of an e-government system when attempting to reach a transactional e-government system.

Chapter 6: Model of Technical and Organisational Challenges Facing Transactional E-government Systems – Novel Contribution

Chapter 6 seeks mainly to revise the conceptual model (proposed in Chapter 3) for technical and organisational challenges facing a transactional e-government system based on empirical data derived from Chapter 5. Consequently, a novel conceptual model for technical and organisational challenges facing a transactional e-government system will be proposed. Such a model could benefit government organisations through using it as a tool for decision-making when implementing an e-government

system and attempting to reach a transactional e-government system. Furthermore, to satisfy the aim of this dissertation, chapter 6, based on empirical data, seeks to: (a) identify the importance of technical and organisational challenges facing a transactional e-government system (which are included in the revised model); (b) categorise technical and organisational challenges facing transactional e-government systems (which are included in the revised model), based on the level of importance; and (c) provide strategies used (suggested) to overcome technical and organisational challenges facing a transactional e-government system, which are included in the revised model.

Chapter 7: Summary and Conclusions - Novel Contribution

Chapter 7 aims mainly to: (a) provide a summary of the research presented in this dissertation, (b) present the novel contribution identified in this chapter, and (c) suggest areas for further work. This chapter begins by giving a summary of the thesis and offering conclusions derived from the literature review and the empirical data presented. Thereafter, the novelty claimed in this dissertation is summarised. Finally, recommendations for further research in the area of technical and organisational challenges facing a transactional e-government system are provided.

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Chapter 2: Literature Review

Summary

This chapter aims to present a critical review of e-government systems; to do so it mainly presents: (a) a brief history of the emergence of e-government; (b) a novel taxonomy for classification of the main characteristics of the definition of e-government; (c) a categorisation of motivations for e-government; (d) a discussion of the benefits, costs and risks of e-government; (e) a discussion of challenges of e-government systems; (f) a brief analysis of different models of the stages of e-government; and (g) a relationship between the stages, types of online services and benefits of e-government.

2.1 Introduction

This chapter seeks to discuss the issues related to the e-government area in order to identify the domain of the research problem. In doing so, firstly, a brief history of the emergence of e-government will be offered; secondly, a definition of e-government will be discussed and the reasons that have made it a contentious issue among scholars. The characteristics of a definition of e-government will also be explored and a novel taxonomy for classification of the main characteristics of the definition of e-government will be developed. Thirdly, motivations for e-government will be classified into: changes of traditional government methods for delivery of services, technological, economic and social forces; fourthly, the benefits, costs and risks of e-government will be discussed, the benefits of e-government will be divided into citizen benefits, government benefits and business benefits; fifthly, the challenges of e-government will be discussed and categorised into social, technical, political, organisational and economic challenges. This section will conclude by articulating the fact that although an e-government system may have many benefits, it also leads to new kinds of challenges, with comparisons between benefits and challenges of e-government and will focus on various issues including money, employees, accessibility/digital divide, single point of access/security and efficient relationship/ gap between expectations and awareness. Different models of the stages of e-government will then be discussed. Discussion of the challenges of e-government and models of the stages of e-government will lead to enhancement of the identification of research issues that should be studied. Finally, the relationship between stages of e-government, the types of online services and the benefits to the public (citizens and businesses) will be clarified.

2.2 The Emergence of E-Government

E-government has become the new wave of technology application in the public sector now that e-commerce in the private sector is maturing (Eyob, 2004). The evolution of e-government can mainly be attributed to the prevalence of the information age (Tian and Tainfield, 2003).

Sharma (2004) argues that since the mid-1990s, governments around the world have been making extraordinary efforts to allow services and information to become available over the Internet. The emergence of information and communication technology (ICT) has affected the functions and roles of governments (Palanisamy, 2004). Akman *et al.* (2002) argue that during the 1990s the proliferation of information and communication technologies has not only affected the daily life of people but has also affected the nature of relationships between governments and citizens. These changes have led to new forms of government called "e-government". Kei Ho (2002) claims that the early 1990s were the starting point of the concept of e-government. The reason for this was the use by city governments of electronic mail, listserv and the World Wide Web to deliver services and information to its citizens. Im and Seo (2005) claim that the first emergence of the concept of e-government took place in the USA. However, the concept of e-government can be expressed in different ways, e.g. transparent government, one-stop-shops, integrated services delivery (Bannister, 2005). By the end of the 1990s, governments were pushing the projects of e-government to provide information and services to citizens and businesses electronically (Chen and Gant, 2001).

Atallab (2001) claims that there have been two primary effects of e-government. The first has been the transformation of government operations, which has benefited citizens, businesses and the government itself. This means that the needs of citizens are more likely to be met, and allows businesses to benefit by making them both consumers of government services and providers of services and goods to the government. It also benefits the government by reducing operational costs via increasing the efficiency of internal operations. The second effect has been the transformation of governance, positively affecting the relationship between citizens and governments via improving the interactivity between government and citizens and making it smoother, faster and more responsive.

Backus (2001) argues that the difference between internal objectives of e-governments that concentrate on processes and external objectives of e-government that focus on services should be noted. From the front-office perspective, the external objective of e-government concentrates on delivery of government services efficiently and effectively

by using ICT in a way that meets and satisfies the needs and desires of the public. The internal objectives of e-government, from the back-office perspective, focuses on government operations that lead to cost saving (per transaction) through increasing the efficiency in performing the activities of government administration.

E-government and e-governance are interrelated concepts; defined as follows: e-government concentrates on processes that enable citizens to benefit from information and services through electronic channels, while e-governance means giving opportunities to citizens to participate in the activities of government, express their true needs and desires by using e-government as a tool. It can therefore, be said that the term e-governance is more comprehensive and beyond the scope of the term of e-government (Inter-American Development Bank, 2001). However, e-government is a tool that leads to achievement of the target of e-governance. Bonham *et al.* (2001) argue that e-government tries to evoke the goals of governance to reinforce participation of citizens and to aid the global information media.

Bose (2004) points out that e-government is called by various names in different countries, for example, in Australia it is called 'government online', in Hong Kong it is called 'electronic service delivery', and in India as well as in the UK it is called 'electronic government'; however, all these terms refer to the same thing, that is providing government services and information through the web. Sometimes, e-government is called *digital government*; however, there is a small difference between e-government and digital government. The term e-government often refers to the application of information technology (IT) to government services, while the term digital government refers to the larger concept of government that is based on IT to achieve basic missions (Marchionini, 2003, cited in Tian and Tainfield, 2003).

Moreover, sometimes, e-government is defined as a comparison with e-commerce; in other words, e-government provides services for the whole community (industries, agencies and all citizens), while e-commerce provides services to specified customers (Elmagarmid, 2001, cited in Tian and Tainfield, 2003). Barnes and Vidgen (2004) argue that unlike e-commerce, e-government must be accessible to all in most

societies. On the other hand, Carter and Belanger (2004) identify the similarity between e-government and e-commerce. They argue:

> *"Both e-commerce and e-government are based on Internet technology designed to facilitate the exchange of goods, services and information between two or more parties."*

2.3 Definition of E-Government

The definition of e-government is a debatable issue among the scholars of e-government. Jain (2002, p.238) claims that e-government is a suggestive, illusory, confusing term. In accordance, this section seeks to: (a) discuss briefly the reasons that have made the definition of e-government an arguable issue among scholars, and (b) explore the characteristics of a definition of e-government. At the end of this section, the taxonomy for classification of the main characteristics of the definition of e-government will be developed.

There is no doubt that e-government is in its infancy, with scholars such as Riley (2001) and Moon (2002) arguing that the concept of e-government is without a specified definition, i.e. there is no agreed definition. There are two main reasons for this, which are as follows:

1. The definition of e-government has different sectors or dimensions, which includes government to citizens (G2C), government to businesses (G2B), government to employment (G2E) and government to government (G2G). It can also be viewed from different perspectives, for example, those of societies, businesses, economies, services, organisations and politics. Seifert and Peterson (2002) define e-government from perspectives of a very basic level, a technical level and a political level. Other observers, such as Tambouris *et al.* (2001) define e-government from the technological and business perspectives. Tian and Tainfield (2003) argue that the definition of e-government can be seen from four viewpoints: (a) information technology; (b) government service; (c) government efficiency;

and (d) a political view. Schedler and Scharf (2001) claim that the term e-government comprises heterogeneous elements and multiple dimensions, and no common definition can be found.

2. The definition of e-government varies according to the values, goals and cultures of a community. For example, the United Nations – DPEPA (2002) argues that due to cultural and economic conditions, the goal of adopting an e-government programme in some developing countries is only just reaching stage three or even stage two (see Table 2.13), which should ensure reasonable online response. The situation in developed countries is, however, completely different.

The following tables illustrate different classifications of definitions of e-government. Each table of the following six includes definitions of e-government that have common characteristics. The author of this thesis notes – as shown in the following six tables - that the definitions that concentrate on the characteristic of putting the needs of citizens at the centre, providing government services from a single point of access and considering e-government as a phenomenon (see Tables 2.4, 2.5 and 2.6) are very few in comparison with the definitions that focus on the characteristics of using technology for delivery of government services, the process of transaction and transformation of e-government services and the benefits of delivery of e-government services electronically (see Tables 2.1, 2.2 and 2.3). The reason for this might be that the concept of e-government is still in its infancy. Scholars are therefore seeking to focus on simple issues of e-government and to upgrade citizens' awareness of the e-government system and its importance. However, the purpose of this classification of definitions of e-government is reaching an identification of the main characteristics of a definition of e-government.

1) Many definitions of e-government, as with the following, focus on the use of technology to deliver government services electronically.

Table 2.1: Definitions Emphasising Use of Technology for Delivery of Government Services Electronically

Definition	Characteristics	Reference
Broadly defined, e-government includes the usage of all information and communication technologies from fax machines to wireless palm pilots, to facilitate the daily administration of government.	Focus on ICT. Emphasis on effective delivery of services through ICT.	UN and ASPA (2001), cited in Moon (2002)
E-government is the use of technology to enhance the access to and delivery of government services to benefit citizens, business partners and employees.	Focus on delivery of government services via technology.	Silcock, 2001
Electronic government refers to government's use of technology particularly Web-based Internet applications to enhance the access to and delivery of government information and service to citizen, business partners, employees, other agencies, and government entities.	Focus on use of applications of technology, especially web-based Internet, to deliver government services.	McClure (2000), cited in Layne and Lee (2001)
E-government is simply using IT to deliver government services directly to the customer 24/7. The customer can be a citizen, a business or even another government entity.	Focus on delivery of government services to the customer anytime through IT.	Duffy, 2000
E-government is the use of information technology to support government operations, engage citizens, and provide government services.	Focus on use of IT to deliver government services.	Cook *et al*, 2002

2) The main characteristic of the following definitions is the process of transaction and its transformation of e-government services.

Table 2.2: Definitions Emphasising The Process of Transaction and Transformation of E-government Services

Definition	Characteristic	Reference
Electronic government, or "e-government," is the process of transacting business between the public and government through the use of automated systems and the Internet network, more commonly referred to as the World Wide Web.	Strong focus on process of transaction between the public and government via the Internet.	Legislative Analyst's Office, 2001
E-government means exploiting the power of information to help transform the accessibility, quality and to help revitalize the relationship between customers and citizens and public bodies who work on their behalf.	Focus on taking advantage of power information for transformation of accessibility.	Aldrich, 2002
Electronic Government (government) refers to the processes and structures pertinent to the electronic delivery of government services to the public.	Focus on the process of delivery of e-government services.	Okot-uma, 2001

3) Some definitions of e-government, as with the following, concentrate on the benefits of delivery of government services and information electronically to citizens, businesses and employees.

Table 2.3: Definitions Emphasising Benefits of Delivery of Government Services Electronically for the Public

Definition	Characteristics	Reference
E-government has been defined as: implementing cost-effective models for citizens, industry, federal employees, and other stakeholders to conduct business transactions online. The concept integrates strategy, process, organisation, and technology.	Focus on benefits of e-government through reduction of cost. Emphasis on integration of concept of e-government.	Lieber (2000), cited in Whitson and Davis (2001)
E-government involves access to government information and services 24 hours a day, 7 days a week, in a way that is focused on the needs of our citizens and businesses. E-Government relies heavily on agency use of the Internet and other emerging technologies to receive and deliver information and services easily, quickly, efficiently, and inexpensively.	Strong focus on benefits of delivery of government services electronically. Emphasis on the desires of citizens and businesses.	Katzen, 2000

4) A few definitions of e-government, such as the following, consider citizens and their needs one of the most important goals of e-government, which seeks to put citizens at the centre of everything.

Table 2.4: Definitions Placing Citizens and their Desires at the Centre

Definition	Characteristics	Reference
An e-government is a government that makes full use of the potential of technology to help put its citizens at the centre of everything it does, and which makes its citizens its purpose.	Strong focus on putting citizens and their desires at the centre.	Waller et al, 2001

5) A few definitions of e-government, as with the following, focus on the delivery of government services through a single point of access on the Internet.

Table 2.5: Definitions Emphasising Delivery of Government Services Electronically Through a Single Point of Access

Definition	Characteristics	Reference
E-government is usually explained as a way of improving the delivery of government services by making them available through a single point of access on the Internet -- so-called "one-stop shopping.	Strong focus on delivery of government services via single point of access on Internet.	Mitchinson, 2001

6) A few definitions, as shown in the following table, consider e-government to be a social, economic and political phenomenon without specified definition that delivers government services in an alternative way.

Table 2.6: Definitions Considering E-government as Phenomenon and Alternative Way of Delivery of Government Services

Definition	Characteristic	Reference
Indeed, e-government is a concept that exists without a firm definition. To some it represents traditional government "with an 'e'", providing an alternative delivery method for government services. For others, it is a social, economic and political phenomenon, which promises to re-engineer the nature of democratic government itself.	Alternative delivery method, social, economic and political phenomenon.	Riley, 2001

As a result of the above six classifications the author of this thesis concludes that there are six main characteristics of a definition of e-government. These characteristics are: (1) Use of technology to deliver e-government services and information. (2) Process of transformation and transaction e-government services and information to public. (3) Benefits of using electronic channels for delivery of e-government services and information. (4) Placing the needs of citizens at the centre. (5) Delivery of government services through a single point of access. (6) Social, political and economic phenomena that enable citizens to get government services by alternative methods. These different characteristics of e-government definitions can be shown in the following matrix:

1.Technology Using of technology as tool to deliver government services and information. **Source**: table 2.1	**2.Process** Process of transaction and transformation of e-government services and information to public. **Source:** table 2.2	**3.Benefits** Benefits of delivery of government services and information through electronic channels. **Source:** table 2.3
4. Citizens at centre Putting the needs and desires of citizens at the centre of everything. **Source:** table 2.4	**5.Single point** Enables citizens to obtain government services and information from a single point. **Source:** table 2.5	**6. Phenomenon** Social, economic and political phenomenon that provides citizens with alternative ways to obtain government services. **Source:** table 2.6

Figure 2.1: The Main Characteristics of the Definition of E-Government

2.4 Motivations for E-Government

Many governments, globally, are moving to adopt an e-government system and provide electronic services (Sharma and Gupta, 2002). Qwentes (2002) argues that there are five reasons for the growth of e-government. The first is accessibility where the availability of new technology in communication makes services more accessible; the second is simplicity, which means eliminating the routine of paperwork and getting the desired government information and services in a simple and convenient way; the third is transparency, the possibilities of the Internet that enable citizens to access government services and information whenever and wherever they want ensure that the government becomes more transparent; the fourth is traceability, which comes with transparency through time. Traceability is a kind of knowledge management. The final reason is cost-effectiveness that leads to a reduction in the operating costs of delivering government services.

Following the comprehensive literature review, the author of this thesis discusses, in this section, the interrelated and integrated motivations that might have pushed and led to the adoption of e-government. These motivations can be identified as follows:

- **Technological force**: there is no doubt that the evolution of technology has affected different aspects of life such as society, business, education and government. Silcock (2001, p.88) has pointed out that:

  "the explosive entry of technology into every aspect of life has changed how people live, how they work, how companies do business - and how governments serve their people."

  Budhiraja (2001) argues that as Information Technology is going to dominate the next century, government has to take this fact into account and create smart governance (moral, accountable, simple, responsive and transparent government). Consequently, the evolution of information technology and the desire of governments to benefit from the advantages and characteristics of new technology to deliver services and information efficiently and effectively (see

Section 1.2) can be considered one of the strongest motivations for the adoption of e-government. However, Chandler and Emanuels (2002) claim that technology itself is just a tool that can be used to facilitate the process of development; although Jain (2001) claims that technology is the main source of change and power and thus an enabling force for e-government.

- **Changes of traditional government methods for delivery of services**: there is no doubt that government plays an important role in any society and can be considered as the main provider of information and services. Tian and Tainfield (2003) argue that government is a complex system that involves all sectors of a society. Government provides not only the political, legal and economic infrastructure to enhance other sectors, but also exerts important influences on social factors (Elmagarmid, 2001, cited in Tian and Tainfield, 2003). Metaxiotis and Psarras (2004) argue that the traditional model of government is no longer functional. Furthermore, Chandler and Emanuels (2002) point out that traditional forms of government are failing because their hierarchical structure is based on central systems that have been unable to reflect the needs and beliefs of its citizens and have been unable to solve social problems effectively. So, this deficit in the traditional model of government may be another motivation for governments to adopt e-government, where, as argued by Larson (2001) e-government has an opportunity to improve the delivery of government services and create significant cost-savings, this can lead to governments becoming more efficient and more effective. Evaristo and Kim (2001, p.111) claim that:

> "*For centuries government has endeavoured to serve its different constituents. Bureaucracy and lengthy delays in communication have been one of the unfortunate consequences of many of the services provided by the government to the public and to the other organisations, be they private or governmental at different levels. Now this situation is changing, partly due to the use of advanced applications of information technology. Much of this can be seen with the newest e-government solutions available for federal, state, and municipal agencies.*"

However, Atallab (2001) claims that e-government cannot be considered as a solution for failed development and routine systems. The author of this thesis argues that e-government, if it is implemented successfully (see Section 1.3, Chapter 1), can be considered to be a significant tool that can help to overcome the shortcomings of traditional systems and increase the efficiency and effectiveness of government.

- **Social force**: the demands of citizens, who want information about government services and a convenient method of obtaining such information whenever and wherever they want it, can be considered as another motivation for e-government. Morris (2002) argues that modern day citizens have high demands and expectations for the delivery of information and services. Heath (2000, p. 11) also argues that

"Business and citizens demand better services, and as technology use spreads so does the expectation that government should use it to deliver better services more conveniently."

According to Microsoft E-Government Initiatives (2001), by adopting an e-government system, citizens expect a lot from their governments. Citizens want to be able to access information and public services 24 hours a day, 7 days a week. They also want to access services from home, from work or any other place. Citizens have no desire to know which agency or officials are responsible for public services, but they expect all information and services to be accessible with no limitation on how it is provided, i.e. mobile phone, PC, wireless device or Web TV.

- **Economic force**: in addition to technical, political and social forces for adoption of an e-government system, economic forces can be considered another motivation for adoption of an e-government system; where governments can support local businesses they gain competitive advantage by not only stimulating demand but also by furnishing key statistics for decision-making (Lee-Kelley and Kolsaker, 2004).

However, Bonham *et al.* (2001) suggest that the motivating forces behind e-government can be discussed according to the sectors of e-government:

- The G2G sector forces an increase in the efficiency of delivery of services and reduces the cost by increasing the speed of transactions and reducing the number of personnel needed to complete a task. (Trattner, 2000, cited in Bonham *et al.* 2001)
- G2B sector forces: there are two main forces motivating the G2B sector. The first is the desire of companies to expand cost savings to their businesses as realised in their electronic B2B transactions with national, provincial, and local governments. The second reason is the increasing demand and pressure by policy makers for cost cutting and more efficient procurement.
- The G2C sector includes increasing pressure from citizens who require cheaper and more effective government services, which would lead to the saving of time and effort.

In light of the above discussion, the motivating forces behind adoption of e-government can be shown in the following figure (2.2).

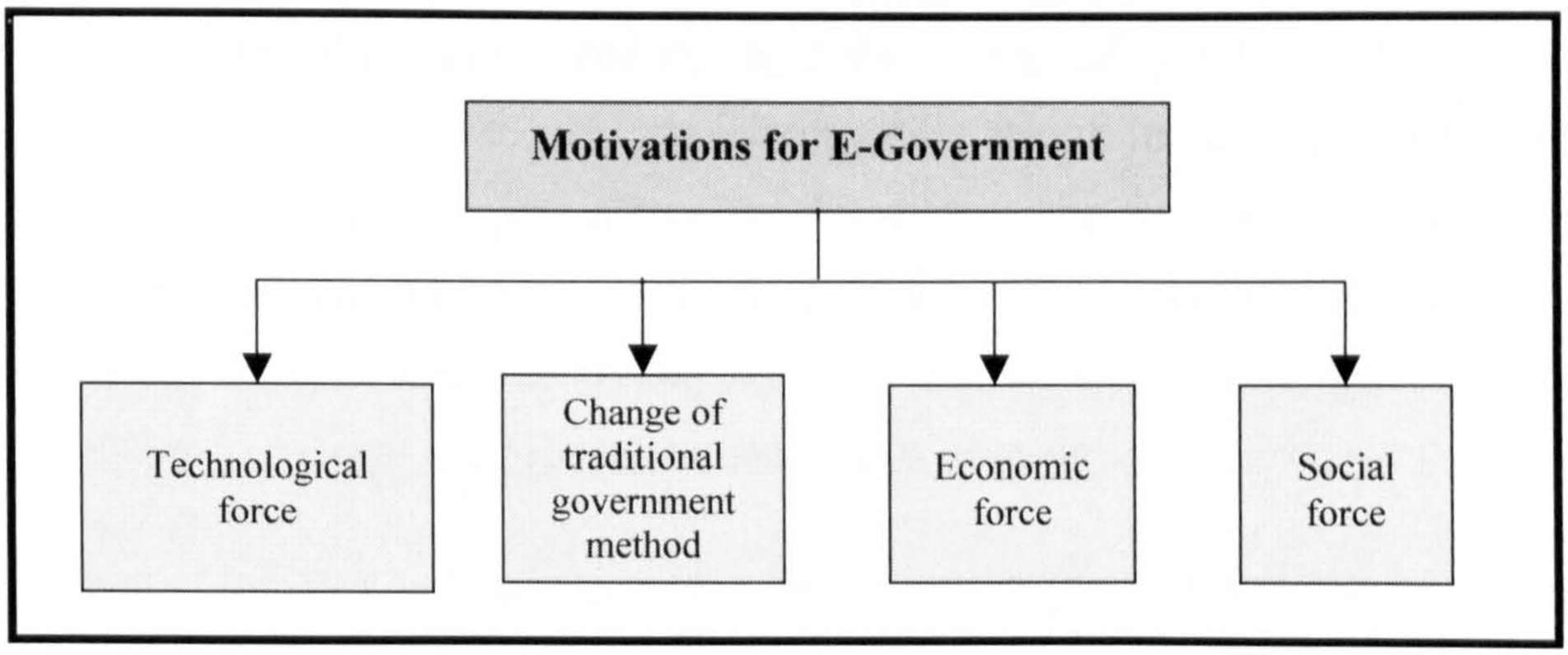

Figure 2.2: Motivations for E-government

2.5 Benefits, Costs and Risks of E-government

2.5.1 Benefits of E-government

There is no doubt that e-government brings with it many benefits. Jaeger (2002, p.366) claims that:

> *"The E-government is merely an extension of the government, with the potential to produce benefits in speed, accessibility and convenience of information access, along with many other benefits."*

E-government allows governments to provide better services to their customers (Chircu and Lee, 2005). It enables governments to deliver services and information cost effectively and more efficiently (World Markets Research Centre, 2001). Additionally, citizens can receive government services and information anywhere, anytime, saving both time and effort. E-government could enable citizens to interact with and receive services from the government 24 hours a day, seven days a week, making this more convenient, dependable, and less costly (Bonham *et al.* 2001). McDaniel (2005) argues that e-government not only provides opportunities to streamline business processes and communication but also seeks to deliver better services to, and engagement of, citizens. Furthermore, e-government can lead to more efficient and effective conduct of business transactions between citizens, employees, businesses and government agencies (Wang and Rubin, 2004).

E-government is about transforming the method of interaction between the government and the governed (Mextaxiotis and Parras, 2004). Yang and Paul (2005) argue that e-government is anticipated to play a more important role in the lives of people in the future. E-government can play a significant role, not only in improving services to citizens and developing business, economy and society, but also in renewing the role of government itself. Bose (2004) argues that e-government can open up many possibilities to upgrade and bring about innovation of government services.

A Project of InfoDev and The Centre For Democracy & Technology (2002) argues that e-government includes:

- Providing greater access to government information;
- Supporting civic engagements by enabling the public to interact with government officials;
- Making government more accountable by making its operations more transparent and thus reducing the opportunities for corruption; and finally

- Providing developmental opportunities, especially benefiting rural and traditionally underserved societies.

Ebrahim *et al.* (2003) clarify the characteristics of the most important benefits of e-government for government organisations (see Table: 2.7).

Table 2.7: Characteristics of Benefits of E-government. Source: Ebrahim *et al.* (2003)

Benefits	Characteristics
Improve efficiency of government service	Reducing delivery time, speeding transactional time and quick process and response of citizen's needs and expectations
Reducing layer of organisational administration processes within government	Re-engineering of services and operating procedures
Develop new skills and motivations for employees	Reducing amount of time spent on repetitive tasks
Better management and control of government procurement systems	Digitising procurement services from and to business sectors
Increase understanding of public services and procedures by employees	Enhance availability and access to government information
Improve cross-organisational cooperation and coordination	Strengthen connections within government departments and agencies
Reduce operations cost of services delivery and communications between government and citizens, business and employees	Reducing government operation expenditures and manpower
Increase transparency of government operating and decision-making processes	Monitoring and controlling performance of process resources, e.g. human and financial

Although most studies focus on discussing the benefits of e-government generally researchers such as Chandler and Emanuels (2002) & Heath (2000) argue that there are several expected benefits that can be gained from e-government; for example it:

- Increases the response to the citizens' needs and demands;
- Provides different choices of access to government services leading to improved access to information;
- Provides new models, more open and transparent ways of decision-making, delivery of services and more interactivity between government and their citizens;
- Leads to an increase in international interaction on issues related to regulation, trade and joint policy delivery and law enforcement;
- Improves cost-effectiveness that can be diverted to provide better public services;
- Leads to making internal government processes more efficient and the delivery of external services quicker;

- Breaks down the barriers of geography, ability to pay, and individual skill and knowledge.

Some studies, including those of Morris (2002), Zahran (2003), Yuan *et al.* (2004), and Microsoft E-Government Initiatives (2001) divide the benefits of e-government into those for citizens, those for the government and those for business. For example, Morris (2002) argues that electronic delivery of services leads to many benefits for both government and citizens, and Microsoft E-Government Initiatives (2001) also says that e-government benefits businesses in different ways. These benefits can be classified as shown in Table 2.8 below.

Table 2.8: Benefits of E-Government

Benefits of E-Government		
Morris (2002); Zahran, (2003) and, Yuan *et al*, (2004)		Microsoft E-Government Initiatives, (2001) & Zahran, (2003) and, Yuan *et al*, (2004)
Citizens Benefits	**Government Benefits**	**Business Benefits**
• Saving time and money. • Multiple services from a single point. • Availability of services whenever and wherever. • More convenient access to public services. • Quicker responses to enquiries. • Better responses to feedback. • Services in terms of Personalization should make it possible to be more inclusive in offering services in more languages and in ways, which are accessible to those who have a disability.	• Reductions of administration processes • Less cost for services' delivery. • Increasing understanding of public services. • Quicker Process of adopting citizens needs. • Improving services by dealing with community feed back more efficiently. • Improving staff efficiency. • Leads to support of efficiency and effectiveness from better use and management of information. • Less corruption. • Increased transparency. • Growth of revenue.	• The delivery of integrated, single-source public services can make the relationship between business and government more efficient and lead to partnerships with each other. • Governments can provide businesses with a healthy environment in which to carry out their tasks more easily. • An e-government system enables businesses to conduct transactions with government online thus overcoming previous routines and simplifying the regulatory processes. For example, businesses can apply online for schedule inspections and building permits. • Reducing the cost and better procurement. • Reducing the effect of regulations on businesses. • Improving Interaction between government, businesses and industries.

The benefits of e-government (as discussed above) are enormous. Some of these benefits to be gained from an e-government system will be discussed in more detail from the following perspectives:

- Services and information can be available anytime and anywhere, thus services will be improved and citizens can access information smoothly and quickly. Carter and Belanger (2004) argue that e-government enables the citizens to benefit from government services and information conveniently and provides more accessibility. So, citizens can receive quicker, more convenient services from a more responsive and informed government.
- Citizens can gain services from a single point, so there is no need to know which agency provides which service; time and effort is therefore saved and the delivery of services is vastly improved. This benefit of e-government could also positively affect the economic aspects.
- As a result of e-government, operating costs will be reduced. Brannen (2001) argues that e-government leads to reduced expenditure, for example by reducing the number of staff (personnel) and reducing the number of officers. This benefit of e-government shows one of the advantages of using technology, i.e. saving money by decreasing the number of employees.
- The relationship between citizens and government will be more effective. West (2000) claims this can be considered one of the most promising aspects of e-government, enabling citizens to become more aware of their governments.
- Employees of government will be provided with better tools to do their work more easily and efficiently. They will be enabled to concentrate on the delivery of services rather than on bureaucratic processes (Duffy, 2000).

The above discussion reveals that the benefits of e-government could be classified into citizens' benefits, government benefits and business benefits. However, as will be shown (see Table 2.14) there is a positive correlation between the level of the stages of e-government maturity and the benefit levels of e-government.

2.5.2 Costs of E-government

Improving the ability to identify all cost categories and estimate specific costs is a growing concern in both public and private sector IT (La vigne, 2001). Costs that are related to the adoption of technology were discussed in literature such as Irani and Love (2001), Irani (1998) and Irani *et al.* (1998). They were classified into direct and indirect cost factors. Direct costs, that may include hardware and software costs, maintenance costs, system development costs etc., are financially tangible and are those that can be attributed to the implementation and operation of IT costs. Indirect costs are financially tangible/intangible and non-financial in nature. They can be divided into indirect human costs and indirect organisational costs. Indirect human costs could include employee training, employee motivation and management effort while indirect organisation costs may include business process reengineering, losses in productivity, organisational restructuring etc.

E-government may bring unexpected additional costs that result, for example, from delivering government services online and educating staff to deal with new technology (Heath, 2000). La vigne (2001) argues that the costs of e-government are often underestimated for two reasons: (a) under–appreciation the complexity of e-government (see Section: 2.6) - more ability to break down the complexity of e-government leads to more ability to predict the resulting costs; and (b) lack of guides for identifying all costs factors.

However, based on the above analysis and in the light of classification of EAI (Enterprise Application Integration) costs (Themistocleous, 2002), the e-government costs could be classified as shown in the following Table.

Table 2.9: Classification of E-government Costs

Dimension	Sub-Dimension
Direct Costs	▪ Hardware costs ▪ Software costs ▪ Development costs ▪ Maintenance costs ▪ Consultancy costs
Indirect Human Costs	▪ Employees training ▪ Changing culture ▪ Management efforts
Indirect Organisational Costs	▪ Business process re-engineering ▪ Organisational restructuring ▪ Strategy redesign

2.5.3 Risks of E-government

British Standards Institute (2000), cited in Evangelidis and Macintosh (2003) define risk management as:

> *"systematic application of policies, procedures, methods, and practices to the tasks of identifying, analysing, evaluating, treating and monitoring risk."*

The risk management process provides a framework for not only identifying risks but also deciding how to manage them (Abie *et al.* 2004). Evangelidis and Macintosh (2003) suggest implementing e-government projects may involve many factors of risks that could affect the success of the project negatively. Heeks (2003) argues that most e-government projects fail, so identifying the risks of e-government may stop e-government projects failing. Adequate risk assessment and management procedures may assist to avoid major risks, though sometimes failures cannot be expected appropriately (Evangelidis and Macintosh, 2003).

Aichholzer (2003) argues that risks correlate with the complexity of a project. E-government projects have a broad scope, so risks can be found in various areas, which may be related to social, technological or even political factors. Consequently, risk management in e-government should be viewed in a very multidisciplinary and broad environment in order to have reasonably adequate positive effects (Evangelidis and Macintosh, 2003). Abie *et al.* (2004) argues that successful risk management leads to

enhanced sense of confidence in and safety of e-government services available to citizens.

Evangelidis (2004) categorise the main risk factors that surround e-government projects into social, technical, economical, political and security risks. Kertesz (2003) classifies the risks of e-government as follows:

- Political risks that are related to the lack of political support.
- Organisational risks, which refers to work-process change within the organisation such as resistance to change from employees and fear of new technology on part of employees, leading to delays in the implementation of a project.
- User risk, which refers to a low level of user acceptance of the new delivery method for services, which can lead to decrease all the benefits expected from the project of e-government.
- Technological risks that arise from the adoption of new technology to deliver government services.
- Vendor risks that arise from dealing with companies that provide the technology, where all of the hardware and most of the software required for e-government projects are outsourced from local or multinational vendors.
- Execution risks that associated with the implementation of the e-government project (lack of funding, shortage of skilled employees, exceeding the budget etc.)

2.6 Challenges to Government of E-Government

The previous section focused mainly on the benefits of e-government. However, it can be said that although the e-government system has many benefits, it can also lead to new kinds of challenges (see sub-section: 2.6.1). Seifert and Peterson (2002, p.203) claim that:

> *"Despite the potential opportunities for the implementation of e-government initiatives, there are a number of challenges that could prevent the realization of these anticipated benefits."*

However, e-government is a complex issue because the scope of e-government is very wide and interrelated with other areas. Wimmer and Traunmuller (2002) claim that e-government is a multidisciplinary and multidimensional area; it is not only about using the technology for delivery of government information and services; it also touches on and involves many other issues including political, administrative, social, economic and business aspects. Chandler and Emanuels (2002) claim that adopting an e-government system is a long-term challenge that touches on all aspects of government.

In fact, the process of efficient delivery of electronic government services and information requires some changes in the role of officials and their relationships with government, businesses and citizens (Pacific Council on International Policy, 2002). Sharma (2004) argues that the implementation of e-government requires not only many changes at the government level but also at the cultural level. The challenge of a change of culture could be considered the greatest e-government challenge because it involves people and their attitudes. Consequently, governments in the information and communications technology age must deal with new ways of thinking and new kinds of difficulties. Riley (2001) argues that in evolutionary times, such as the current era, governments have to deal with new challenges related to adoption of new ways of thinking, innovations, new strategies and new structures. E-government involves new ways of accessing services, new ways of listening to citizens and communities, new ways of transacting business and new ways of organising and delivering information and services (Metaxiotis and Psarras, 2004).

Backus (2001) divides the challenges of e-governance in developing countries into four groups as shown in the following table. However, the author of this thesis notes that this study is unique in that it classifies the challenges of e-government into political, economic, social and technological areas. It is also a comprehensive study giving a complete description and guidelines to points of challenges of e-government.

Table 2.10: Aspects of E-Governance Challenges in Developing Countries

Dimension	Sub-Dimension
Political aspects	Include strategies and policies, law and legislation, leadership, decision-making processes, funding issues, and political stability.
Economic aspects	Include funding, cost-savings, business models, and E-commerce.
Social aspects	Include level of education, income, employment, literacy, Digital divide and IT skills.
Technological aspects	Related to infrastructure, software and hardware, safety and security issues, maintenance, and IT skilled people.

Although this study shows the challenges of e-government in developing countries, these challenges also exist in developed countries; the differences lie only in the degree of these challenges. A lack of money and knowledge in most developing countries, as well as the wide gap between developing and developed countries in technological aspects, are factors which make the challenges of e-government in developing countries much more complicated than in developed ones. Al Maktoum (2001) notes that the technological issue is the greatest challenge standing between the majority of developing and industrial countries.

The challenges of e-government system have been categorised into various types. Chesi *et al.* (2005) and Oreste *et al.* (2005) argue that challenges of e-government can be classified into technical, economical and social challenges. However, Layne and Lee (2001) have discussed another type of challenge to e-government, which they call the organisational challenge.

Although many studies have discussed the challenges restricting e-government, there appears to be a complete lack of studies focusing on the challenges of e-government in the light of the stages of an e-government system. For example, Layne and Lee (2001), from their observations and experience with e-government in the USA, have provided a unique study and discussed the challenges of each stage of an e-government system separately. Layne and Lee (2001) claim that challenges restricting e-government systems differ from one stage to another. They focused their study on the organisational and technical challenges of each stage of an e-government system. They came to the conclusion that e-government systems could be divided into four stages, namely: (1) cataloguing, (2) transaction, (3) vertical integration, (4) horizontal

integration. The characteristics and challenge(s) of each stage are classified in Table (2.11) below.

Table 2.11: The Definition, Benefit(s) and Challenge(s) of each Stage of E-government

Stage	Characteristics	Challenge(s)
Stage1: Cataloguing	▪ The demands from citizens and businesses are some of the most important reasons pushing governments to move to this stage. ▪ Creating websites and making the government information and services available online. ▪ Enabling the citizens to obtain limited government services and information such as printing and downloading forms in convenient ways and saving the time and effort of both citizens and employees.	The technology that is used at this stage is not complicated, so the challenges will be limited. However, these challenges include resource allocation and maintaining of website information.
Stage 2: Transaction	▪ After publishing the government website and realizing the importance of getting government services and information via the Internet, citizens' demands will increase for more efficient and interactive government services. ▪ This stage is the real beginning of changing the nature of interaction between people and their governments. ▪ This stage enables citizens to complete their work electronically in convenient ways, whenever and wherever instead of having to go to a specified agency or department.	The challenges of this stage will increase in comparison with stage one. These challenges include security issues and policy issues such as confidentiality and authentication.
Stage 3: Vertical integration.	▪ This stage appears as a natural result after online transactions have become mature. ▪ The purpose of this stage is to concentrate on transforming government services and combining and integrating scattered systems at different levels.	Although this stage may provide more efficiency, confidentiality and privacy issues are still challenges. Integration and automation of the system leads to changes to the roles of employees.
Stage 4: horizontal integration.	▪ This stage can be considered top of the information technology leading to integration of government services for different functions horizontally.	This stage includes technical and management challenges. The main challenge facing any government reaching this stage is the conflict between databases across different functions.

However, there is a shortcoming in Layne and Lee's study because the practical implementation of an e-government system does not follow the theoretical framework as stages can be omitted, added to or combined (see section 3.6).

Timonen *et al.* (2002) have provided a unique study that focused on the challenges faced by policy makers in Ireland before their e-government could move from provision of information and one-way communication (such as downloading forms) towards complete transaction capacity (see Figure 2.3). They claim that although their study concentrated on the challenges facing e-government before it reaches its full potential (complete transaction capacity) in Ireland, policy makers in many other countries face similar challenges before they reach complete transaction capacity.

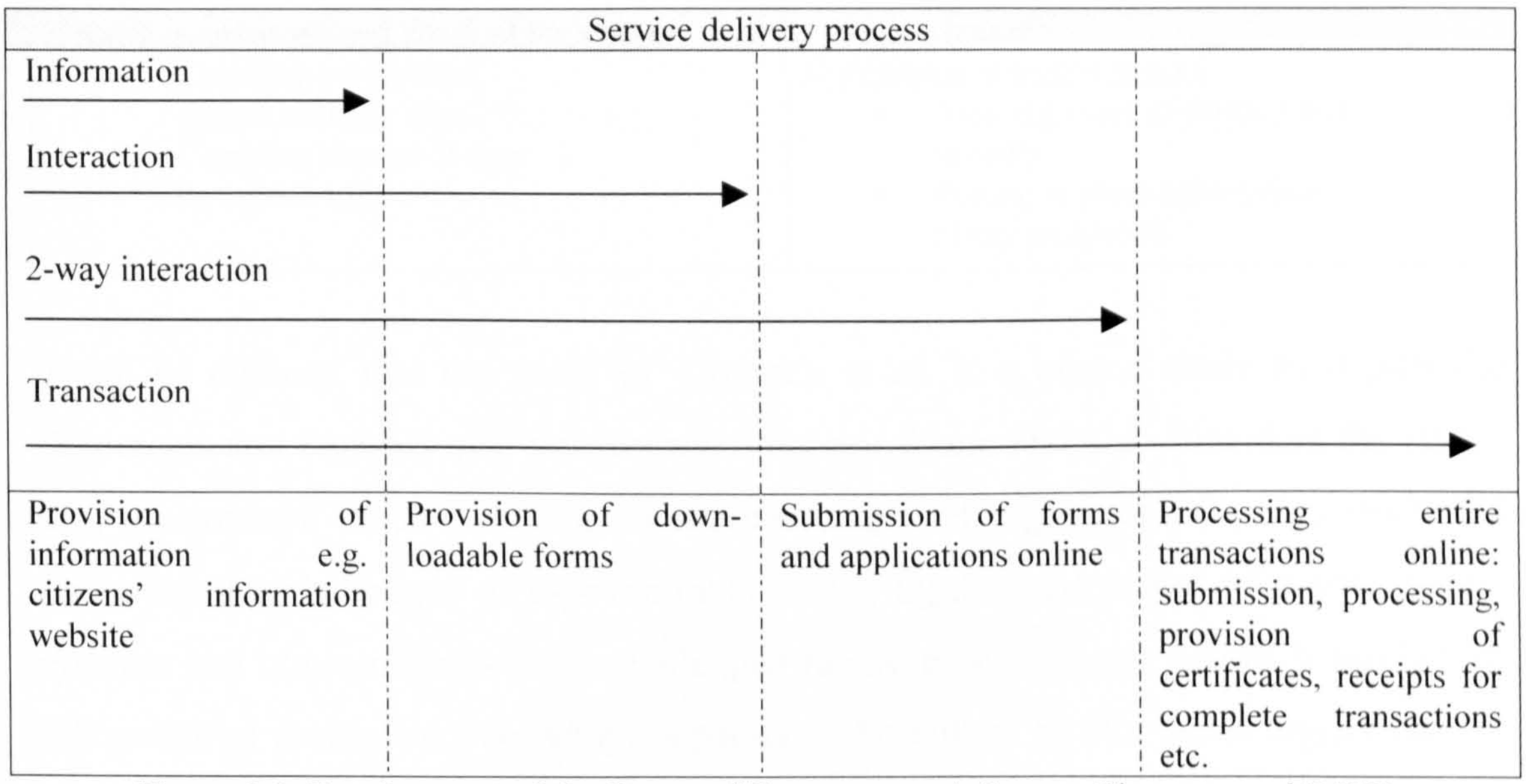

Figure 2.3: Development of the Stages of E-government. Source: Timonen *et al* (2002)

As shown in the following table, Timonen *et al.* (2002) claim that the benefits of e-government include increased efficiency, paying more attention to customer needs and desires and decreasing abuse of the system. Their study concentrated on and discusses in depth three challenges of e-government, these are re-engineering the processes of internal government, accessibility to e-government services, and providing trust for the user of online services.

Table 2.12: Benefits and Challenges of E-Government. Source: Timonen *et al* (2002).

Benefits	Challenges
Efficiency • Reduced costs • Increased speed • Greater co-ordination • Avoiding duplication Customer focus • Services delivered where and when needed • Resource and time savings for customers. Greater security/reduced abuse of the system • Checking information against multiple data • Complete control of data by service user	Re-engineering processes • Initial costs • Staff re-skilling • Possible re-location Access • Ensuring equality of access • Material and knowledge resources • Providing alternative ('traditional') delivery channels Confidence in e-government • Assuring users of privacy and security • Putting in place appropriate safety protocols.

It can be claimed that the study of Timonen *et al.* is a unique study as it puts the challenges and benefits of e-government into one frame and also considers the stages of e-government when focusing on the challenges of e-government. This study has discussed the challenges of e-government in the light of the stages of e-government systems and concentrates on the challenges facing e-government before it reaches its full potential (complete transaction capacity). The author of this thesis argues that, in light of Table 2.12, Figure 2.3 can be modified and presented simply, as shown in Figure 2.4. This shows that there is no need to mention different stages before e-government can reach complete transaction capacity because, following comprehensive literature review, specifically Baum and Di Maio (cited in Seifert and Petersen, 2002) and the Project of InfoDev and The Centre for Democracy & Technology (2002), e-government projects must not necessarily follow all the stages progressively, but can skip stages either from the start or in the course of their development. It follows also that the stages of e-government are not mutually dependent and none of the stages necessarily depends or builds on the completion of a previous stage (see Section 3.6). Another shortcoming of the study of Timonen *et al.* is that it does not identify clearly the criterea of the stage posited before reaching complete transaction capacity.

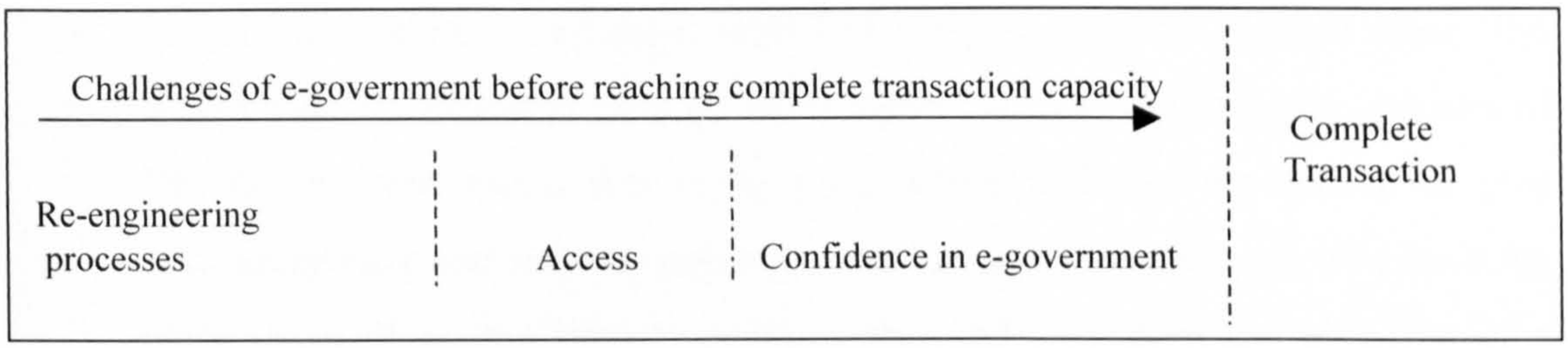

Figure 2.4: Challenges Facing E-government Before Reaching Complete Transaction Capacity

However, there are many challenges to e-government; some of the most common and important e-government challenges are discussed from the following perspectives:

- The shortage of skilled IT workers as well as the lack of technical staff is one of the biggest challenges to e-government; this challenge could actually threaten the success of e-government (Brown, 2002). The study carried out by the University of Albany in New York revealed that 47 out of 50 states reported a lack of IT workers (National Centre for Small Communities, 2001). The Pacific Council on International Policy (2002) argues that officials may refuse the projects of e-government because of a lack of human resources, poor economy and difficulties in finding other job opportunities; in this respect developing countries may suffer more than developed countries. The leaders of e-government projects must deal with these problems by trying to identify the sources of resistance and adopting a plan to overcome them. However, resistance to e-government projects by officials may include the following reasons:

  - Fear that by adopting the e-government system their jobs will be lost.
  - Fear that the new technology will cause them problems in front of others if they cannot use it correctly.
  - Compared with the current system, they fear that new technology will lead to a loss of their power.
  - Fear that technology will cost them more work, for example, constitutional e-mail must be answered.
  - Belief that there is nothing to be gained by adopting new technology and nothing to be lost if this technology is refused.

- Security and privacy challenges represent a big concern for Internet users. The World Markets Research Centre (2001) surveyed 2,288 government websites of 196 nations and found that many government websites are unable to give citizens privacy and security policies. The survey shows that only 6% have the reassurance of visible privacy policies and only 3% have the privilege of a public security policy.
- A lack of funding is considered the biggest challenge to e-government. The results of the questionnaires distributed by National Association Counties (2000) revealed that the greatest challenge to moving a county's government services to the Internet is funding.
- Another challenge facing e-government is known as the 'digital divide', which means the digital divide between those with access to the Internet and online services and those without. Some people are unable to access the Internet for reasons that include a lack of income and a lack of knowledge. Konga (2002) pointed out that data from Statistics Canada shows that 78% of Internet users had an income of $60,000 (annual income), while 24 percent of users had less than an annual income of $20,000. So, it can be claimed that the level of income and the level of knowledge are an important factor affecting the percentage of Internet users and hence the success of an e-government system.
- Another challenging issue surrounding e-government is that there is a gap that needs to be bridged between expectations of government and citizens' awareness of e-government services (National Centre for Small Communities, 2001). According to Hart-Teeter poll conducted for the Council for Excellence in Government, cited in the National Centre for Small Communities (2001), while 84% of government officials claim the Internet has improved their work and communication with citizens, only 29 percent of citizens and 37 percent of business leaders feel comfortable and familiar with e-government.
- An e-government infrastructure is the set of tools that allow the implementation of e-government (e-government strategy and solutions team, IBM Public Sector, 2001). Basic infrastructure such as internal connections and telecommunication lines is a main requirement for e-government initiatives. One of the challenges that may face implementation of e-government,

especially for poor countries, is a lack of basic infrastructure (Banerijee and Chau, 2004).

Following a comprehensive literature review related to the challenges of e-government system discussed in this section, two main points can be derived: (a) there is a lack of studies focusing on the challenges of e-government in the light of the stages of an e-government system, and (b) the challenges of e-government can be classified into political, economic, organisational, social and technological challenges (as shown in Figure: 2.5).

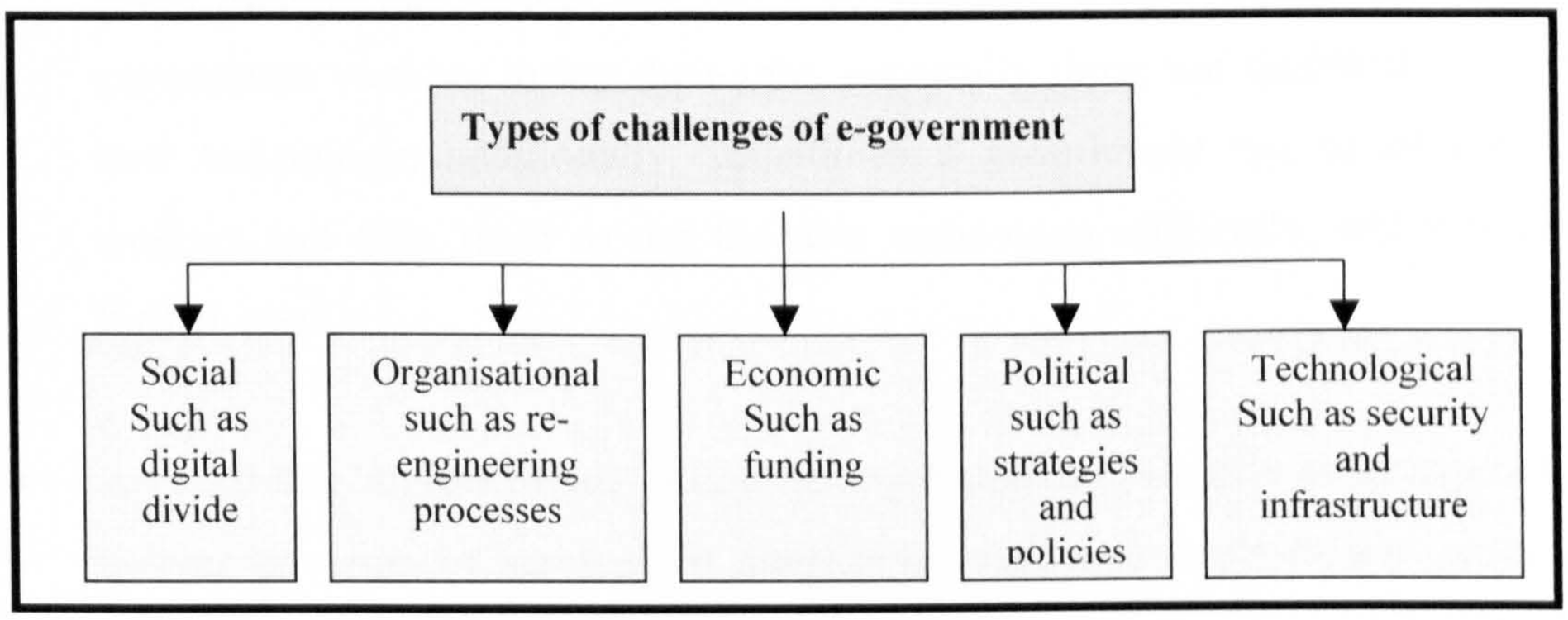

Figure 2.5: Types of Challenges of E-government

2.6.1 Benefits/ Challenges of E-government

As a result of the different challenges and benefits of e-government that have been discussed in the previous sections, some points have emerged to confirm what has been discussed, i.e. that although an e-government system may have many benefits, it also leads to new kinds of challenges. The author of this thesis, following the comprehensive literature review, will focus only on some of the contentious issues, these will include: money, employees and accessibility/digital divide, the single point of access/security and efficient relationship/gap between expectations and awareness.

- **Money**: Adopting an e-government system enables the government to deliver their services and information efficiently and cost-effectively, especially when the e-government system reaches its full potential. However, e-government systems can be extremely costly in different ways; for example, establishing an infrastructure (satellite, earth station, LAN) and training government workers to use the new technology efficiently.

- **Employees**: Although using new technology to deliver government services electronically leads to a reduction in the number of government workers and saves money, this means that the e-government system would lead to many government workers losing their jobs, especially those not qualified to use the new technology; additionally, sometimes a government has to retrain their workers and train them to use the new technology efficiently, which leads to further costs.

- **Accessibility/digital divide**: Although e-government provides an opportunity to deliver government services in alternative and more sophisticated ways and allows a wide choice of delivery of government services, a new challenge called the digital divide will appear; this means the divide between those who can access the Internet and those who cannot. Some of the reasons behind an inability to access the Internet include a lack of knowledge, lack of money and the fact that some people have no desire to use the Internet for government services.

- **Single point of access/security**: There is no doubt that one of greatest values of e-government is delivery of e-government services through a single point of access, as it leads to the integration of government services through different departments as well as providing citizens, businesses and government itself with the highest level of benefits. However, different challenges face reaching the delivery of government services through a single point of access. One of the greatest of these challenges is security and privacy; reaching this high level of delivery of government services involves a high level of need for security and privacy.

- **Efficiency - relationship/gap between expectations and awareness:** It is clear that e-government leads to an increase in interactivity and improves the relationship between government and citizens, through allowing citizens to receive quicker, more convenient services from a more responsive and informed government. However, before reaching this benefit, there is a gap between the expectations of government to reach high levels of interactivity with citizens online, and citizens' awareness of the importance and benefits of e-government, that needs to be bridged.

2.7 Models of the Stages of E-government

A comprehensive literature review reveals that there are various models of the stages of e-government such as Heath (2000), Adam *et al.* (2003) and Eyob (2004). Yang and Paul (2005) argue that the level of developmental stages of e-government reached by different governments may vary according to differences in human resources and financial conditions. Different models of the stages of e-government can be viewed from a perspective that focuses on aspects of development, i.e. providing communication facilities and fully realising the integration of government systems (Wimmer *et al.* 2002, cited in Ebrahim *et al.* 2003). However, this section aims to classify different models of the stages of e-government system based on the number of stages suggested by each model.

The various models of the stages of e-government, based on the number of stages and their perceptions, can be seen in Table 2.13. As a result, a brief analysis of different models of the stages of e-government systems will be provided.

Table 2.13: Different Classifications of the Stages of E-government

Stage	Perception	Reference
Stage 1: publish: *Stage 2*: interact: *Stage 3*: transact:	Aims only to make information about activities of government available online. Enables citizens to have simple interactions with their governments such as sending e-mail and participating in "chat rooms" on specific policy questions. Provides citizens with full benefits from transactions over the Internet, such as applying for programs and services, purchasing licenses and permits, etc.	Howard, 2001
Stage 1: information *Stage 2*: interaction: *Stage 3*: transaction: *Stage 4*: integration:	Delivery of government services online. One-way communication between government and citizens. Leads to simple interaction between citizens and governments. Services that enable transactions of value between citizens and government. Leads to integration of services across the agencies and departments of government.	Chandler and Emanuels, 2002
Stage 1: presence: *Stage 2*: interaction: *Stage 3*: transaction *Stage 4*: transformation	General information about government available on line without any interaction. Provides limited interaction, e.g. down- loading forms and responses to simple questions. Provides a level of interactivity higher than at the second stage. Facilitates the integration of government information between different levels of agencies and departments.	Baum and Di Maio, 2000, cited in, Seifert and Petersen, 2002
Stage 1: posting information: *Stage 2*: two way communication: *Stage3*: exchange of value: *Stage4*: integrated services & exchange	Delivers general information via website for one-way communication. Websites enable two-way communications where forms and information queries can be dealt with online. Websites enable exchange of value to be adopted where agencies of government can interact directly with clients online. Ranges of government services will be integrated by portal reliance being on needs and functions not on departments.	Atallab, 2001
Stage 1: information: *Stage 2*: interaction: *Stage 3*: transaction: *Stage 4*: transformation:	Establishment of government websites that make government services and information available online. The format of the website at this stage would look like a brochure or a leaflet. Enables the public (citizens and businesses) to have some interaction with their governments via the Internet, for example: downloading forms and documents and asking questions through e-mail. Leads to enabling the public to make complete transactions, such as renewal of visas, licenses and passports online without the need to go to an office. Leads to integration of all information systems and enables the public to obtain government services from one single point.	Backus, 2001
Stage1: cataloguing: *Stage 2: transaction:* *Stage 3: vertical integration.* *Stage 4: horizontal integration.*	Creating websites and making the government information and services available online. This stage enables citizens to interact with their governments and complete their work electronically in convenient ways, whenever and wherever. This stage concentrates on integrating of scattered systems at different levels. This stage focuses on integration government services for different functions horizontally.	Layne and Lee (2001)
Stage 1: emerging: *Stage 2*: enhanced: Stage 3: interactive: *Stage 4*: transactional *Stage 5*: seamless or fully integrated	Creating a government website with limited, basic and static information. Updating information with greater regularity. Provides users with reasonable levels of interaction enabling them to download forms and contact officials. Enables users to complete transactions such as obtaining visas, licenses, passports, birth and death records, etc. on line safely and securely. Provides services across administrative and departmental lines with the highest level of integration.	United Nations – DPEPA (2002)
Stage 1: information *Stage 2*: 'official' two-way transactions: *Stage 3*: multi-purpose portals: *Stage 4*: portal personalization: *Stage 5*: clustering of common services: *Stage 6*: full integration and enterprise transformation:	Creates websites by departments and agencies. One-way communication. Enables customers to have electronic interaction with government services such as renewing television licenses and paying parking tickets. Enables customers to obtain government services and information from a single point. Provide customers with opportunities to customize portals according to their needs. As a result of portals becoming stronger, individual government departments will disappear where government will seek to gather common services to hurry the process of delivery. At this stage, some government departments will disappear others will appear; some departments will keep the same names but become entirely different internally.	Deloitte research (2000)

As a result of the above classifications of different models of the stages of e-government, the following points should be noted:

- The specified approach of stages of e-government systems has not been agreed among scholars, nor has there been agreement on the number of stages required for an e-government system. However, the stages required by an e-government system have been classified into three, four, five or six stages.
- Although scholars have called stage one of e-government systems by different names, i.e. information, publishing, information publishing/dissemination and emerging, they agree as to the purpose of this stage: that it makes government services and information available online without any interaction.
- Although scholars have called the last stage of e-government systems by different names, i.e. integration, transaction, full integration, enterprise transformation and seamless or fully integrated, they agree as to the purpose of this stage: that it leads to integrated government services and information from a single point of access.
- Almost all models mention the transaction stage of the e-government system. As can be derived from the different models shown above, regarding the transaction stage (see Table 2.13), scholars almost all agree on the purpose of this stage, i.e. that it leads to enabling the public to make complete transactions, such as renewal of visas, licenses and passports online. The transaction stage should provide a level of interactivity much higher than at the initial stages, such as information and interaction. The maximum benefit of these initial stages is the downloading forms. The comprehensive literature review reveals that there are only a few studies, such as those of Adam *et al.* (2003), Layne and Lee (2001) and Ebrahim *et al.* (2003), that provide general information regarding the transaction stage of an e-government system; but there is in fact still a surprising lack of detail regarding the transaction stage.

2.8 The Transaction Stage of E-government Systems

Based on the above discussion, it can be claimed that the process of implementing an e-government system passes through different stages until it reaches its highest potential stage, which is the integration of government information and services in different departments, for different functions and at different levels of the government system, enabling customers to obtain government services and information online from a single point of access. The transaction stage of an e-government system can be considered to be one of the most important stages in the implementation of any e-government system because it leads to enabling customers to carry out complete transactions, such as renewal of visas, licenses, and passports online. It could therefore, be claimed that this stage might be the target of government organisations setting up an e-government system (see Section 3.3).

2.8.1 Absence of Theoretical Models of Challenges Facing Reaching the Transaction Stage of E-government

There is no doubt that reaching the transactional stage of an e-government system is not easy because at this stage the customers (citizens, businesses and public administrations) should be able to implement a complete transaction with specified government organisations electronically. Because this stage represents a high level of interactivity between government organisations and customers, it requires, according to Layne and Lee (2001) and Ebrahim *et al.* (2003): (a) a high level of privacy and security of personal data to be provided as part of obtaining government services, because at this stage the organisational system, such as the application servers and databases, can be accessed directly by the public via the Internet; (b) the upgrading and re-engineering of the internal business process and structure of the organisation before implementation of this stage; and (c) since this stage gives customers access to the back-office of an organisation to complete the transaction processing, organisation administration should train their workers to deal with new ways of implementing procedures and management more efficiently, such as using electronic receipts and digital signatures.

However, according to the previous discussion regarding challenges to e-government systems (see section 2.6) and models of the stages of e-government (see section 2.7), three main issues can be derived: (a) there is a lack of studies focusing on the challenges of e-government in the light of the stages of an e-government system. Although a unique study was provided by Timonen *et al.* (2002), which focused on challenges faced by policy makers in Ireland before the e-government could move from provision of information and one-way communication (such as downloading forms) towards complete transaction capacity (see Figure 2.3), there is an absence of theoretical models that focus on different challenges (specifically technical and organisational) after reaching the transaction stage of an e-government system. Moreover, there is a lack of studies that focus on identification of the importance, categorisation, and presentation of strategies for overcoming these technical and organisational challenges. (b) The challenges of e-government can be classified into political, economic, organisational, social and technological challenges. The author of this thesis argues that these various types of challenges might be faced when reaching the transaction stage of e-government. And (c) although there are many studies that provide a perception of the transaction stage of e-government systems (see Table 2.13), there are extremely few in the literature that discuss this stage in detail. There is a surprising lack of detail regarding the transaction stage, i.e. its location among different models of the stages of e-government, its importance and the need of government organisations to reach it, its scope of implementation and the criteria identifying government organisations reaching this stage.

2.9 The Relationship Between the Stages, the Types of Online Services and the Benefits of E-Government

According to Aichholzer and Schmutzer (1999), cited in Dridi *et al.* (2001) services that can be provided by government electronically can be divided into three categories (as shown in Figure 2.6) namely: information, communication, and transaction services (see Section 1.2).

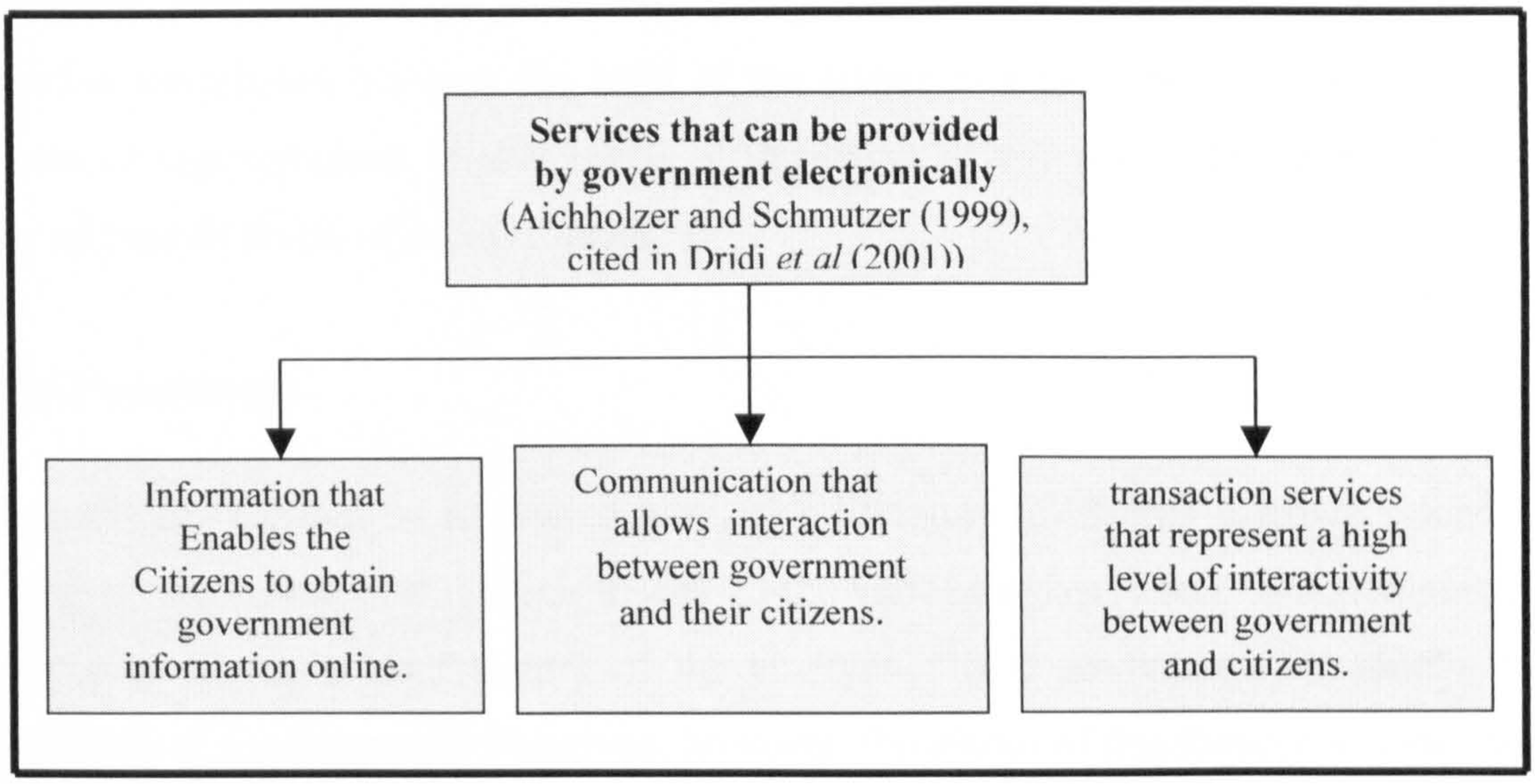

Figure 2.6: Types of Government Services Online

As a result of the above classifications of the stages of e-government, the author of this thesis notes that regardless of the names of the e-government stages, there is – as shown in Table 2.14 below - a relationship between them, regarding the types of online services and the benefits to the public (citizens and businesses).

Table 2.14: The Relationship Between the Stages of E-Government, the Types of Online Services and the Benefits to Citizens and Businesses

Level of the stages of e-government maturity	The type of service	Benefit levels
Stage 1	Information services, static information, one-way communication. Information services meet the requirements of the first stage of e-government where the purpose of government is only to present static information and services online. The benefits of this stage for both citizens and businesses are limited.	The benefit is low
Stage 2, 3, or even 4	Communication services meet interaction or two-way communication stage. The main purpose of government at this stage is to obtain at least simple interaction online with its citizens and businesses. The benefits of an e-government system will increase.	The benefit is medium
Final stages	Transaction services that lead to enabling customers to complete transactions with agencies online such as renewal of visas, licenses and passports as well as transaction services allowing integration of government services and enable citizens to access government services from a single point. The benefits from e-government at this stage will be at the highest level. This services meets transaction and integration stages of e-government system.	The benefit is high.

However, as a result of the above table, the author of this thesis notes that there is a positive correlation between the level of the stages of e-government and the benefit levels of e-government. Higher levels of the stages of e-government maturity lead to higher benefit levels of e-government.

2.10 Conclusions

This chapter focused on reviewing normative literature to identify research issues. In doing so, the author of this thesis discussed the various issues related to e-government; firstly, by giving a brief history of the emergence of e-government. Secondly, the definition of e-government was given; however, the author of this thesis concluded that any definition of e-government is debatable since there is no specified definition among scholars. The reasons for this were discussed and the main characteristics of definitions of e-government concluded. Thirdly, motivations for e-government were classified into change of traditional government method for delivery of services, technological, economic and social forces. Fourthly, benefits, costs and risks of e-government were discussed and the benefits of e-government were categorised into citizens' benefits, government benefits and business benefits. Fifthly, challenges to e-government were discussed. As result, some of the arguable issues including money, employees, accessibility/digital divide, the single point of access/security and efficient relationship/gap between expectations and awareness, are discussed to confirm that although an e-government system may have many benefits, it also leads to new kinds of challenges. Finally, the author of this thesis found that there was no specified approach for stages of e-government systems, and furthermore there is a relationship between the stages, type of online services and benefits of e-government. Higher levels of the stages of e-government maturity lead to higher benefit levels of e-government.

Discussion of the challenges of e-government and models of the stages of e-government led to the identification of research issues that should be considered. Consequently, three important issues derived from the literature review were presented in this chapter. The first issue is that the process of implementing an e-government system passes through different stages. The transaction stage of an e-government system can be considered one of the most important stages of the implementation of

any e-government, because it leads to enabling the public to make complete transactions online. Therefore, government organisations might seek to reach this stage. The second issue is that very few studies have focused on the transaction stage of an e-government system nor provided a detailed description of the issues related to this stage, i.e. its location among different models of the stages of e-government, its importance and the need of government organisations to reach it, its scope of implementation, and criteria identifying when government organisations reach this stage. The third issue is that political, technical, economic, social and/or organisational issues are various challenges that may be faced when attempting to reach the transaction stage of an e-government system. There is an absence of theoretical models for different challenges (specifically technical and organisational) that are faced when reaching the transaction stage of an e-government system; there is also a lack of studies that focus on the identification of the importance, the categorisation and presentation of the strategies for overcoming the technical and organisational challenges faced when reaching the transaction stage of e-government systems. These research issues came from the literature review presented in this chapter and are taken into account in Chapter 3.

3

Chapter 3: Framework

Summary

This chapter focuses on the investigation of the research issues derived from Chapter 2. It seeks mainly to: (a) clarify the confusion surrounding the transaction stage of an e-government system, (b) develop a framework for this dissertation, and (c) develop a conceptual model of technical and organisational challenges facing transactional e-government systems.

3.1 Introduction

The previous chapter focused on issues related to e-government, including: definition, benefits, challenges, level of e-government maturity and motivations for e-government. The main research issues, derived from chapter 2, are that: (a) to reach a transactional e-government, government organisations face various challenges. These challenges could be political, economic, social, organisational and/or technical; (b) there is an absence of theoretical models for different challenges (specifically technical and organisational) that are faced when reaching the transaction stage of an e-government system as well as a lack of studies that focus on the identification of the importance, categorisation and presentation of the strategies for overcoming of technical and organisational challenges faced in reaching the transactional stage of an e-government system and (c) there is a surprising lack of detail regarding the transaction stage in the literature i.e. its location among different models of the stages of e-government, its importance and the need of government organisations to reach it, its scope of implementation and criteria identifying when government organisations reach this stage.

Therefore, the purpose of this chapter is: (a) to attempt to clarify the confusion surrounding the transactional stage of an e-government system, (b) to develop a framework for this dissertation, and (c) to develop a conceptual model of technical and organisational challenges facing a transactional e-government system. In doing so, this chapter will focus on: (a) analysis of different models of the stages of e-government; (b) a description of the importance of the transaction stage and the need for government organisations to reach this stage; (c) development of a clear perception of the transaction stage that adds a characteristic that has been missed by most scholars who have provided various perceptions of the transaction stage of an e-government system, and identification of the scope of implementation of different stages of e-government; (d) discussion of the criteria involved in identifying the transaction stage, criteria that could be used by decision-makers to measure progress towards implementing an e-government system inside government organisations; (e) development of a framework for this research; (f) a conceptual model of technical and organisational challenges facing transactional e-government systems will be proposed;

(g) a brief description of technical and organisational challenges, included in the proposed conceptual model, facing a transactional e-government system will be provided; and finally (h) the strategies for overcoming each technical and organisational challenge, identified in the proposed conceptual model, will be suggested.

3.2 Analysis of Different Models of the Stages of E-government:

Different models of the stages of an e-government system were discussed briefly in Chapter 2 (see Section 2.7). A comprehensive literature review (Adam *et al.* 2003; Ebrahim *et al.* 2003; Heath, 2000) reveals that there are many models of the stages of an e-government system. Most of these models have divided e-government systems into four stages and the justification for this will be discussed in a later in sub-section 3.2.2. However, it is not possible to present and analyse all models of the stages of e-government, it should, therefore, be noted that the different models of the stages of e-government presented and analysed in this section have already been discussed briefly in Chapter 2 (see Section 2.7) and chosen (as sample) because they represent different models of the stages of an e-government, i.e. three, four, five and six stages. This section aims mainly to explore the existence and location of the transaction stage within different models of the stages of e-government; therefore, different models of the stages of e-government system will be presented and analysed.

However, there is much debate among researchers as to the number of stages that an e-government system goes through. Some, such as Howard (2001), believe that only three stages are necessary to implement an e-government system while others believe four, five or even six stages are required. Therefore, various models will be (as mentioned earlier) classified according to the number of stages, i.e. 3, 4, 5, and 6, and analysed to identify and locate the transaction stage within the different models. A table will be created for each model and these will be divided into three columns as follows: 1) the names and number of stages, 2) the perspective of the author of each stage, 3) references. At the end of the section the results of the analysis of this information will be provided, which means that the existence and location of the

transaction stage within the various models of the stages of e-government will be clarified (see section 3.2.2).

3.2.1 Evaluating Models of the Stages of E-government

3.2.1.1 The Three-Stage Model of an E-government System

Howard (2001) provided one of the pioneer studies that divided the stages of an e-government system into three, namely: publication, interaction, and transaction (see Table 3.1) below.

Table 3.1: The Three-Stage Model of an E-government System

Stage	Perception	Reference
Stage 1: publication:	Aims only to make information about activities of government available online.	Howard, 2001
Stage 2: interaction:	Enables citizens to have simple interactions with their governments such as sending e-mail and participating in "chat rooms" on specific policy questions.	
Stage 3: transaction:	Provides citizens with full benefits from transactions over the Internet, such as applying for programs and services, purchasing licenses and permits, etc.	

Table 3.1 above shows that the perceptions of this three-stage system are similar to the perception of the first three stages that are provided by most authors – including Chandler and Emanuels (2002), Baum and Di Maio (2000, cited in Seifert and Petersen, 2002) and Backus (2001), all of which divide e-government systems into four or more stages (see four stage model below). Table 3.1 also shows that the interaction and transaction stages have been classified as the second and third stages respectively in three- and most four-stage models. Although the first stage has been given various names such as information, publication and presence, there is almost agreement among the scholars, such as Howard (2001) and Atallab (2001), as to the purpose of this stage, i.e. that it makes government services and information available online without any interaction.

However, there is a shortcoming in Howard's (2001) study which divides e-government systems into three stages ignoring the integration stage even though this can, from the perspective of the author of this thesis, be considered as a very important part of any e-government system since, as discussed earlier, the integration stage leads to the facilitation of the integration of government information between different levels of agencies and departments and enables the customers to obtain government services from one single point. However, although the integration stage of e-government has been given different names, including transformation, almost all scholars of e-government, such as Chandler and Emanuels (2002) and Backus (2001), who divide e-government systems into four, five or six stage models have included it as one of their stages.

3.2.1.2 Four Stage Model of an E-government System

Many studies – as shown in table 3.2 - have divided e-government into four stages. Table 3.2 below shows that almost all authors - there are a few exceptions such as Layne and Lee (2001) and Atallab (2001) - divide e-government into four stages, including stage two 'interaction' and stage three 'transaction', and almost all agree on the perception of these stages. This implies the importance of these stages, i.e. interaction and transaction, because the interaction stage means providing limited and simple interaction with government information and services online with the ability to download forms and documents and ask questions via e-mail. The interaction stage is seen as a bridge between the information and transaction stages, and the transaction stage as that allowing the customers (citizens, businesses and public administrations) to complete full transactions with government services such as renewing visas, licenses and passports etc. online.

It should be noted that Layne and Lee (2001) do not mention the interaction stage, instead, they move directly to the transaction stage because, as can be seen from their perspective regarding the transaction stage (see Table 3.2), they have embedded the function of the interaction stage (as have different researchers of e-government such as Chandler and Emanuels, 2002 and Backus 2001), into the perspective of the transaction stage. Layne and Lee (2001) argue that the vertical integration stage concentrates on

transforming government services and combining and integrating scattered systems at different levels, whilst the horizontal integration stage can be considered as the top of the information technology leading to integration of government services for different functions horizontally. However, Layne and Lee (2001) have provided a unique contribution to the division of the stages of e-government by dividing the integration stage into vertical and horizontal integration, where they differentiated between integration of systems at different levels and services for different functions.

Atallab (2001) calls stage two a 'two-way communication', which is similar in its purpose to the interaction stage that enables customers (citizens, businesses and public administrations) to carry out simple interactions with government services and information online, such as downloading forms and documents and asking questions through e-mail. Atallab (2001) also calls stage three the 'exchange of value' stage which means that websites enable an exchange of value to take place as government agencies interact directly with customers electronically, including recording and storing sensitive information. However, the 'exchange value' stage is similar in its purpose to the so-called 'transaction' stage, which enables customers to exchange values and carry out transactions with government agencies online.

Table 3.2: The Four-stage Model of an E-government System

Stage	Perception	Reference
Stage 1: information Stage 2: interaction: Stage 3: transaction: Stage 4: integration:	Delivery of government services online. One-way communication between government and citizens. Leads to simple interaction between citizens and governments. Transaction stage enables transactions of value between citizens and government. Leads to integration of services across the agencies and departments of government.	Chandler and Emanuels, 2002
Stage 1: presence: Stage 2: interaction: Stage 3: transaction: Stage 4: transformation	General information about government available on-line without any interaction. Provides limited interaction, e.g. downloading forms and responses to simple questions. Enables customers to complete tasks such as license renewals and paying fees electronically at any time of the day or night. Facilitates the integration of government information between different levels of agencies and departments.	Baum and Di Maio, 2000, cited in, Seifert and Petersen, 2002
Stage 1: posting information: Stage 2: two-way communication: Stage3: exchange of value: Stage4: integrated services & exchanges	Delivers general information via website of one-way communication. Enables two-way communication where forms and information queries can be dealt with online. Enables exchange of value to be adopted where agencies of government can interact directly with clients online. Ranges of government services will be integrated by portal reliance being on needs and functions not on departments.	Atallab, 2001
Stage 1: information: Stage 2: interaction: Stage 3: transaction: Stage 4: transformation:	Establishment of government websites that make government services and information available online. The format of the website at this stage would look like a brochure or a leaflet. Enables the public (citizens and businesses) to have some interaction with their governments via the internet, for example: downloading forms and documents and asking questions through e-mail. Leads to public ability to make complete transactions, such as renewal of visas, licenses and passports online without the need to go to an office. Leads to integration of all information systems and enables the public to obtain government services from one single point.	Backus, 2001
Stage1: Cataloguing: Stage 2: Transaction: Stage 3: Vertical integration. Stage 4: horizontal integration.	Creating websites and making the government information and services available online. Enables citizens to interact with their governments and complete their work electronically in convenient ways, whenever and wherever. Concentrates on integration of scattered systems at different levels. Focuses on integration of government services for different functions horizontally.	Layne and Lee (2001)

3.2.1.3 The Five- and Six-Stage Models of an E-government System

A few studies have divided e-government systems into five and six stages. Table 3.3 below shows that a report prepared by the United Nations (Division for Public Economics and Public Administration) divides e-government into five stages (United Nations – DPEPA, 2002). It splits the stages between the first and final stage into three. This study added an enhanced stage between the emerging stage (stage one) and the interactive stage (stage three). The author of this thesis argues that the enhanced stage, as can be seen from its perception in Table 3.3, can be embedded or encompassed into stage one because, based on its function, which is that of updating information, it does not include any interactive functions and the upgrading of information can be done within stage 1 (emerging), since its role is to create a government website with limited, basic and static information. It should be noted that the transaction stage arises in this model as stage 4.

Table 3.3: The Five- and Six-Stage Model of an E-government System

Stage	Perception	Reference
Stage 1: emerging:	Creating a government website with limited, basic and static information.	United Nations – DPEPA, 2002
Stage 2: enhanced:	Updating information with greater regularity.	
Stage 3: interactive:	Provides users with reasonable levels of interaction enabling them to download forms and contact officials.	
Stage 4: transactional	Enables users to complete transactions such as obtaining visas, licenses, passports, birth and death records, etc. on line safely and securely.	
Stage 5: seamless or fully integrated	Provides services across administrative and departmental lines with the highest level of integration.	
Stage 1: information publishing/dissemination:	Creates websites by departments and agencies. One-way communication.	Deloitte research (2000)
Stage 2: 'official' two-way transactions:	Enables electronic interaction with government services such as renewing television licenses and paying parking tickets.	
Stage 3: multi-purpose portals:	Enables customers to obtain government services and information from a single point.	
Stage 4: portal personalization:	Provides customers with opportunities to customize portals according to their needs.	
Stage 5: clustering of common services:	As a result of portals becoming stronger, individual government departments will disappear since governments will seek to gather common services to hurry the process of delivery.	
Stage 6: full integration and enterprise transformation:	At this stage, some government departments will disappear others will appear; some departments will keep the same names but become entirely different internally.	

The Deloitte Research (2000) divides e-government into six stages (as shown in Table 3.3 above). Even though it has the role of joining or linking the information and transaction stages, the Deloitte Research (2000) does not mention the interaction stage but moves directly to the transaction stage from stage one (information). It should also be noted that from stage three to stage five, the Deloitte Research (2000) focuses on delivery of government services from a single point by using a portal which provides a full range of services and enables customers easy and single access to government services, without the need to know which agency is responsible for which service. Eyob (2004) has collapsed stages 3, 4 and 5 of this model into 'portal for government services'. The author of this thesis argues that this might refer to the fact that stages 3, 4 and 5 provided within this model (six-stage model) have similar functions, so they could be embedded or encompassed into one stage. Since the above analysis of five- and six-stage models shows that some stages can be encompassed into other stages of e-government, the author of this thesis argues that, from the theoretical perspective, the four-stage model might be closest to reality (see sub-section 3.2.2).

3.2.2 Results of the Analysis of Different Models of the Stages of E-government

The above analysis of the different models of the stages of e-government shows that a specific approach to the stages of e-government systems has not been agreed between the researchers, neither has there been an agreement on the number of stages required for an e-government system, since they have been classified into either three, four, five or six stages. The author of this thesis claims that this argument between the researchers on the number of stages of e-government might refer to the fact that most of these classifications of the stages of e-government – such as that of Layne and Lee, (2001) – depend on theoretical perspectives. It is also evident from analysis of different models of the stages of e-government that most studies have classified e-government into four stages, although, as previously shown, some studies have classified e-government into three, five and six stages. It would appear that, theoretically, the four stage model of e-government is the nearest to reality, since the three-stage model leads to the ignoring of the interaction, transaction or integration stages. The author of this thesis argues that it is not possible to ignore these stages due to their importance; they are, in fact, included in almost all studies. The interaction stage is also important

because of its role as a bridge between the information and transaction stages. Choosing the five- or six-stage model could lead to the addition of new stages that could be embedded into other stages of e-government (see discussion of five-stage model above). In fact, the practical implementation of an e-government system does not follow the theoretical framework as stages can be omitted, added to or combined (see Section 3.6).

Furthermore, as discussed in Chapter 2 (see section 2.7), different models of the stages of e-government show that there is almost a consensus that the first stage of an e-government system aims to create a static website that contains information and services of e-government without interaction. However, this first stage has been given different names including 'information', 'presence' and 'emerging'. It should also be noted that there is almost total agreement on the main purpose of the final stage, that is, to integrate government information and services between different departments, functions and levels of the government system to enable citizens to obtain government services and information online from a single point of access. The final stage of e-government has also been given different names such as 'transformation' and 'integration'. Finally, the different models of the stages of e-government show that there remains an argument among researchers of e-government systems on the perception and number of stages that arise between the first and final stages.

However, different models of the stages of e-government also reveal that firstly, as discussed earlier (see section 2.7) almost all models mention the transaction stage of e-government systems (see section 3.3); and secondly, the transaction stage of e-government (the focus of this research) usually arises between the first and the final stages of an e-government system, except within the three-stage model where the transaction stage appears as the final stage. The transaction stage almost always arises as the third stage before integration (final stage); it rarely arises as a second or fourth stage (see section 3.4). Even within different models of the stages of e-government, the transaction stage of an e-government system is almost always called the transaction stage, except for a few models, such as the six-stage model, where it is called ''official' two-way transactions'.

3.3 The Importance of the Transaction Stage of E-government

As mentioned in section 2.7, previous analysis of different models of the stages of e-government systems show that almost all models mention the transaction stage. This indicates the importance of this stage. A similar conclusion was reached by (Ebrahim *et al.* 2003).

However, the importance of the transaction stage of e-government comes from its impact on implementing e-government systems. The roles of the initial stages, such as information and interaction (see section 3.2), are only to reduce the need for resources to inform customers (citizens, businesses, public administrations). They provide limited improvement in their satisfaction levels (Adam *et al.* 2003). The maximum benefit of these initial stages lies in the capacity to download forms. These initial stages enable one-way communication 'push e-government' where government information is pushed by government organisations to be available to customers online. The transaction stage, on the other hand, enables two-way communication 'push/pull e-government' where government services are pushed by government organisations to be available to customers online and data can be pulled from customers online. Thus the transaction stage enables customers to carry out complete transactions such as renewing visa and paying bills with specified government organisations safely online.

Chapter 2 (Table 2.13) reveals that the transaction stage provides the high benefit of an e-government system where this stage leads to enabling the customer to complete transactions, such as renewal of visas, licenses, and passports online. The transaction stage can be considered to be the highest level of maturity of an e-government system *inside government organisations*; the scope of implementation of all stages until e-government reaches the transaction stage (see section 3.4), because, as shown in the previous paragraph, the transaction stage leads to a high level of interactivity between government organisations and customers. The transaction stage could lead to abolition of entire services and their processes; this has the great possibility of reducing both cost and time. The transaction stage could help public administrations to increase efficiency and lower costs (Adam *et al.* 2003).

As mentioned earlier (see sub-section 3.2.2), the transaction stage almost always arises as a third stage before integration (final stage), so it can be considered as an introduction to the integration stage whereby each government organisation can reach the highest level of interactivity with its customers. Thus the process of transformation to the integration stage that leads to integration of services across different agencies and departments of government will be easier, quicker and more efficient because at the transaction stage (as mentioned earlier) different government organisations are supposed to reach the highest level of maturity of an e-government system inside government organisations.

Consequently, it can be said that government organisations might seek to reach the transactional stage of an e-government system for several reasons, including saving time, effort and cost of delivery of services, by increasing the efficiency of internal government processes as well as making the delivery of external services quicker and enabling customers to implement a complete transaction electronically.

3.4 Analysis of Different Perceptions of the Transaction Stage of E-government

Analysis of different models of the stages of e-government systems (see section 3.2 above) shows that the transaction stage is classified into various locations within different models of e-government maturity. Most models have classified the transaction stage as the third, regardless of the number of stages (see Table 3.4 below), except for a very few models, such as Layne and Lee's (2001). The transaction stage here is classified as the second stage because the interaction stage is ignored. The transaction stage is also very rarely classified as a fourth stage as in the United Nations - DPEPA (2002) model, where an enhanced stage has been added between the emerging and interactive stages. Although the integration stage is generally considered important, Howard (2001) has ignored it and classifies the transaction stage as the final stage of an e-government system (see sub-section 3.2.1.1).

However, this section aims to find a clear perspective of the transaction stage of e-government by analysis of different perceptions (see Table 3.4) regardless of whether the transaction stage has been classified as stage 2, 3 or 4.

The following table shows various perceptions of the transaction stage and the location of this stage within different models of an e-government system as discussed earlier.

Table 3.4: Various Perceptions of the Transaction Stage of E-government

Location of transaction stage (Within different models)	Perception	Reference
Stage 2	This stage enables citizens to interact with their governments and complete their work electronically in convenient ways, whenever and wherever.	Layne and Lee, 2001
	Enables electronic interaction with government services such as renewing television licenses and paying parking tickets. In this model the transaction stage has been called 'two-way transactions.	Deloitte research (2000)
Stage 4	The transaction stage enables users to complete transactions such as obtaining visas, licenses, passports, birth and death records, etc. on line safely and securely.	United Nations - DPEPA, 2002
Stage 3	The transaction stage also leads to enabling the public to make complete transactions, such as renewal of visas, licenses and passports online without the need to go to an office.	Backus, 2001
	The transaction stage enables customers to complete tasks such as license renewals and paying fees electronically at any time of the day or night.	Baum and Di Maio, 2000, cited in, Seifert and Petersen, 2002
	The transaction stage enables transactions of value between citizens and government.	Chandler and Emanuels, 2002
	The transaction stage provides citizens with full benefits from transactions over the Internet, such as applying for programs and services, purchasing licenses and permits etc.	Howard, 2001
	This stage represents the online communication between public administrations and their customers and already allows triggering processes of public administrations electronically. It includes electronic financial transactions such as online declarations and payment of taxes.	Adam *et al*, 2003

The above table shows that the transaction stage of e-government has been viewed in different ways. It shows that some perceptions of the transaction stage of e-government, such as those provided by Howard (2001) and Layne and Lee (2001), claim that services are provided by government only to citizens. However, the services - such as renewal of visas and paying fees - provided by government electronically should be available to all customers including citizens, businesses and public

administrations. Table 3.4 also shows that most perceptions of the transaction stage of e-government systems do not mention clearly the scope of the implementation of this stage. The author of this thesis argues – as shown in Table 3.5 below - that all stages (including transaction) are implemented inside the organisation, except for the final stage (integration), which requires integration with different organisations of local, and/or central government.

Table 3.5: The Scope of Implementation of Different Stages of E-government

Stages	Scope of Implementation
Different stages until e-government reaches the transaction stage.	Inside one (specified) organisation.
Final stage (integration).	Includes different organisations, departments and agencies of local and/or central government.

Consequently, the transaction stage of an e-government system can be viewed from the perspective of the author of this thesis as follows:

> *The transaction stage of e-government is the stage that enables customers (citizens, businesses and public administrations) to carry out complete transactions, such as obtaining visas, passports and renewing licenses with specified government organisations, online, safely and almost without the need to go to the office of the appropriate organisation. The implementation of this stage is within the scope of any one (specific) organisation.*

This perception adds a characteristic that has been missed by most authors who have provided various perceptions of the transaction stage of an e-government system (see Table 3.4), i.e. the security and safety that is required at this stage to enable customers to carry out the highest level of interactivity with government organisations and complete their electronic transactions with full trust in the system.

3.5 Criteria for Reaching the E-government Transaction Stage Within Government Organisations

There is no doubt that reaching the transactional stage of an e-government system is not easy because this stage (as discussed in section 3.3 above) represents a high level of interactivity between government organisations and customers (citizens, businesses and public administrations). This section develops and provides criteria for reaching the e-government transaction stage within government organisations. These criteria could benefit government organisations that may be attempting to implement e-government, because they could be used to measure progress towards implementing an e-government system.

A number of different websites of government organisations on the Internet, such as the site provided by the Dubai Municipality (http://www.dm.gov.ae/DesktopServlet) as well as on various perceptions of the transaction stage provided in Table 3.4 and the perception of the transaction stage provided by the author of this thesis (see section 3.4) have given rise to the criteria mentioned below. Furthermore, based on the studies discussed, such as Layne and Lee (2001) and United Nations - DPEPA, (2002), the author of this thesis suggests that there are a number of criteria that indicate government organisations have reached the transaction stage of their e-government system. These criteria are as follows:

a) Enabling customers to fill in and electronically submit different types of forms such as registration and payment;
b) Providing a secure connection by enabling customers to complete their transaction with the required government organisation online, safely and with trust in the system. For this reason, government organisations should ensure: (i) the security of any confidential data stored in government databases and, (ii) the privacy of transactions of personal data provided by citizens as part of obtaining government services.
c) Allowing customers to perform online financial transactions (if applicable) such as payment of bills and fines.
d) Enabling customers to create online accounts with their own usernames and passwords within government organisations.

e) Providing customers with instant decisions, meaning that as soon as a customer has completed a transaction such as filling in a form or paying a bill online, a message will appear, confirming that the process has been executed successfully.

Criteria for identifying transactions of e-government systems, as discussed above, can be shown in the following figure:

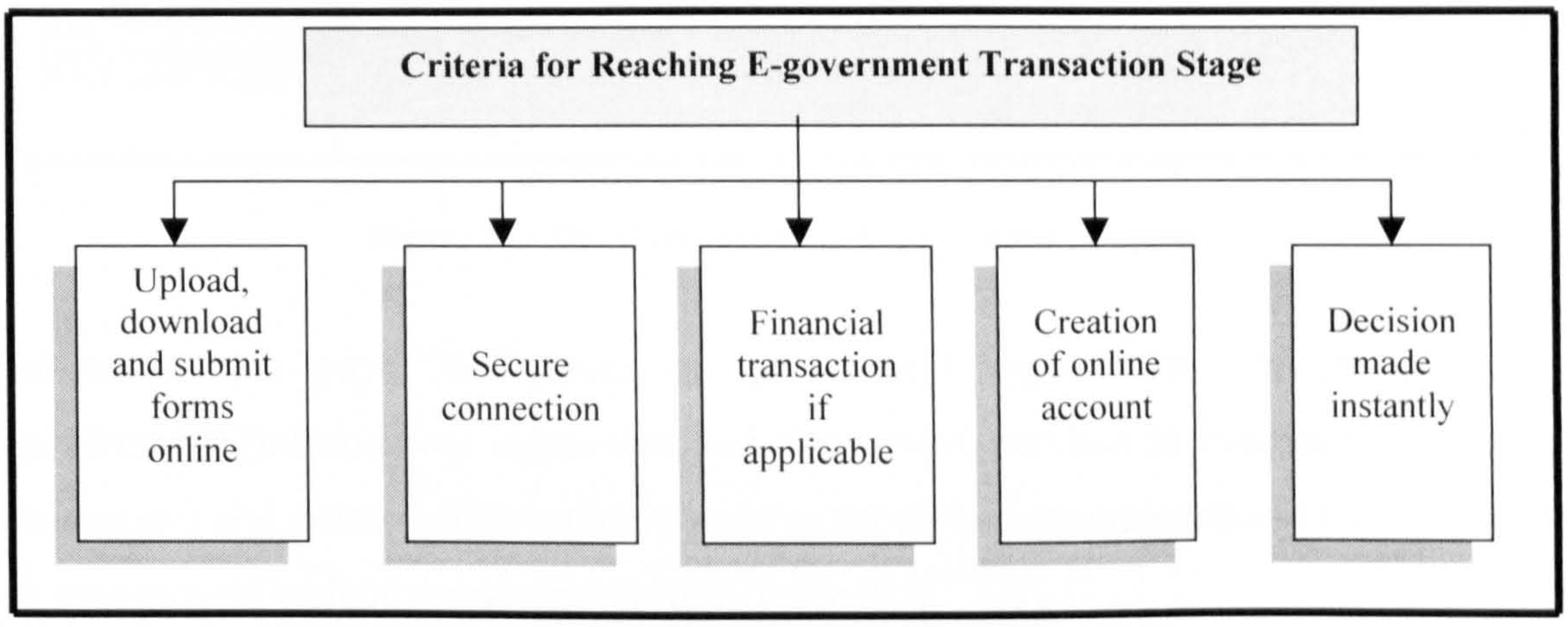

Figure 3.1: Model of Criteria Identifying Transaction Stage of E-government

3.6 Framework of this dissertation

As discussed in Chapter 2 and earlier in this chapter, there is a surprising lack of detail in the literature regarding the transaction stage, therefore, the previous sections of this chapter have attempted to fill in the information gap and clarify the confusion surrounding the transaction stage of an e-government system by discussing its location within different models of the stages of e-government, its importance and the need of government organisations to reach it, its scope of implementation and the criteria identifying whether a government organisation has reached this stage. Based on the above, this section seeks, by developing a framework, to identify the boundaries of this dissertation.

Figure (3.2) below shows that an e-government system consists of three main elements: (a) provider or server of government information and services: the provider is the government organisation and central and/or local government, (b) services that

are provided to customers and users, and (c) customers or users (citizens, businesses and public administrations).

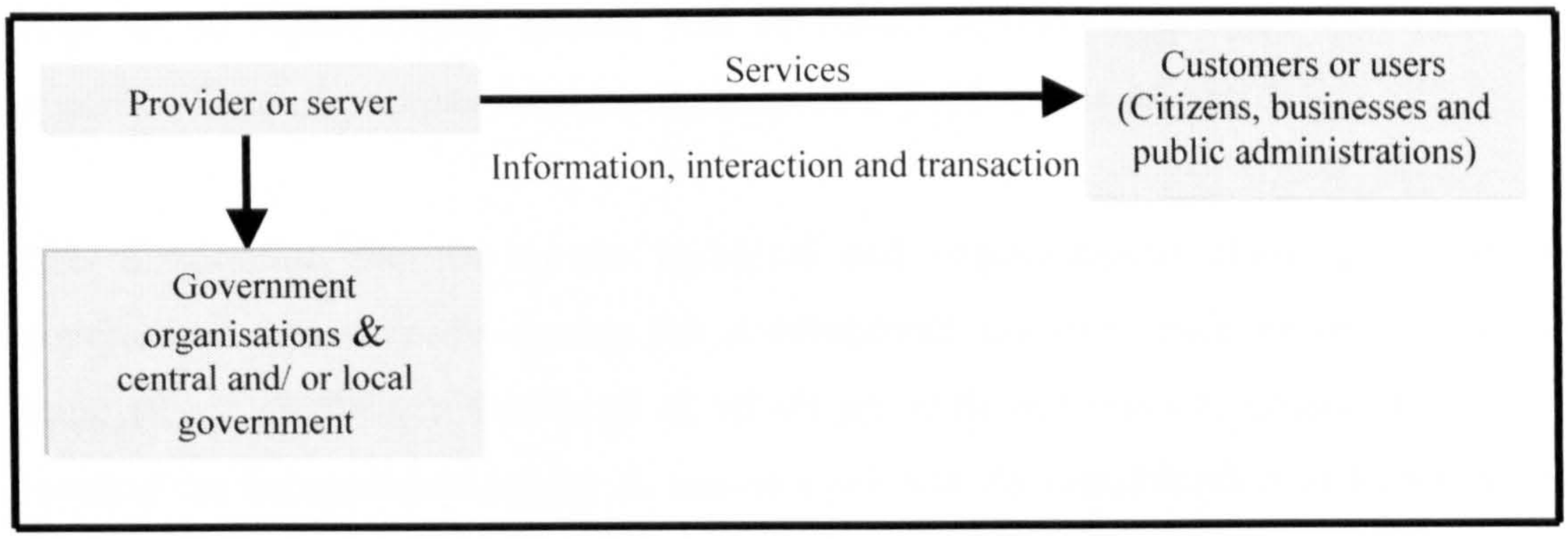

Figure 3.2: The Elements of an E-government System

However, this paper will focus on government organisations as providers of government (information, interaction and transaction) services to customers (citizens, businesses and public administrations) and as scope for implementation of all stages of e-government including transactions (see Table 3.5).

The reaching of the transaction stage of e-government by government organisations can be measured by several criteria (see section 3.5 above). However, the reaching of the transaction stage of an e-government system by government organisations will be called within this dissertation a *transactional e-government system*.

Due to the importance of the transactional stage of the e-government system and its positive impact, not only on making the delivery of external services quicker, but also on increasing the efficiency of internal government processes, government organisations might seek to reach this stage (see section 3.3). In order to reach the transaction stage of e-government, government organisations face various challenges. These challenges could be political, technical, economic, social or organisational. As discussed earlier there is an absence of theoretical models for political, technical, economic, social or organisational challenges already faced by government organisations in trying to reach a transactional e-government system.

Due to time limitations, this dissertation focuses only on the *technical* and *organisational* challenges already faced by government organisations trying to reach a

transactional e-government system. Technical and organisational challenges faced by government organisations during the development towards reaching the transaction stage of an e-government system will be called in this dissertation: *technical and organisational challenges facing transactional e-government system.*

This dissertation focuses on the technical and organisational challenges faced by government organisations during the development towards reaching the transaction stage (these challenges are faced at all stages until government organisations have reached the transactional stage). It does not provide the classification of technical and organisational challenges of each stage until e-government reaches the transactional e-government. Technical and organisational challenges facing the transaction stage of e-government systems should not be classified at each stage until reaching transaction. There are several reasons including, as discussed earlier, most of the classifications (such as those of Layne and Lee, 2001) depend on theoretical perspectives. In fact, the practical implementation of an e-government system does not follow the theoretical framework as stages can be omitted, added to or combined. Furthermore, (as discussed in Section 2.6), Baum and Di Maio (cited in Seifert and Petersen, 2002) argue that it is not necessary for e-government projects to start at the first stage and proceed through all stages; it is possible for a project to skip stages either from its start or as it develops. A project carried out by InfoDev and The Centre for Democracy & Technology (2002) claims that the stages of e-government are not dependent on each other, nor need one stage be completed before another can begin.

As discussed earlier, there is a lack of studies that focus on identification of the importance, categorisation and presentation of the strategies for the overcoming of technical and organisational challenges facing transactional e-government systems. This thesis, therefore, aims to identify the importance of technical and organisational challenges facing a transactional e-government system and to categorise them based on the level of importance (these challenges are faced at all stages until government organisations have reached the transactional stage) (see Figure 3.3). Furthermore, the strategies used/suggested for overcoming each technical and organisational challenge will be provided.

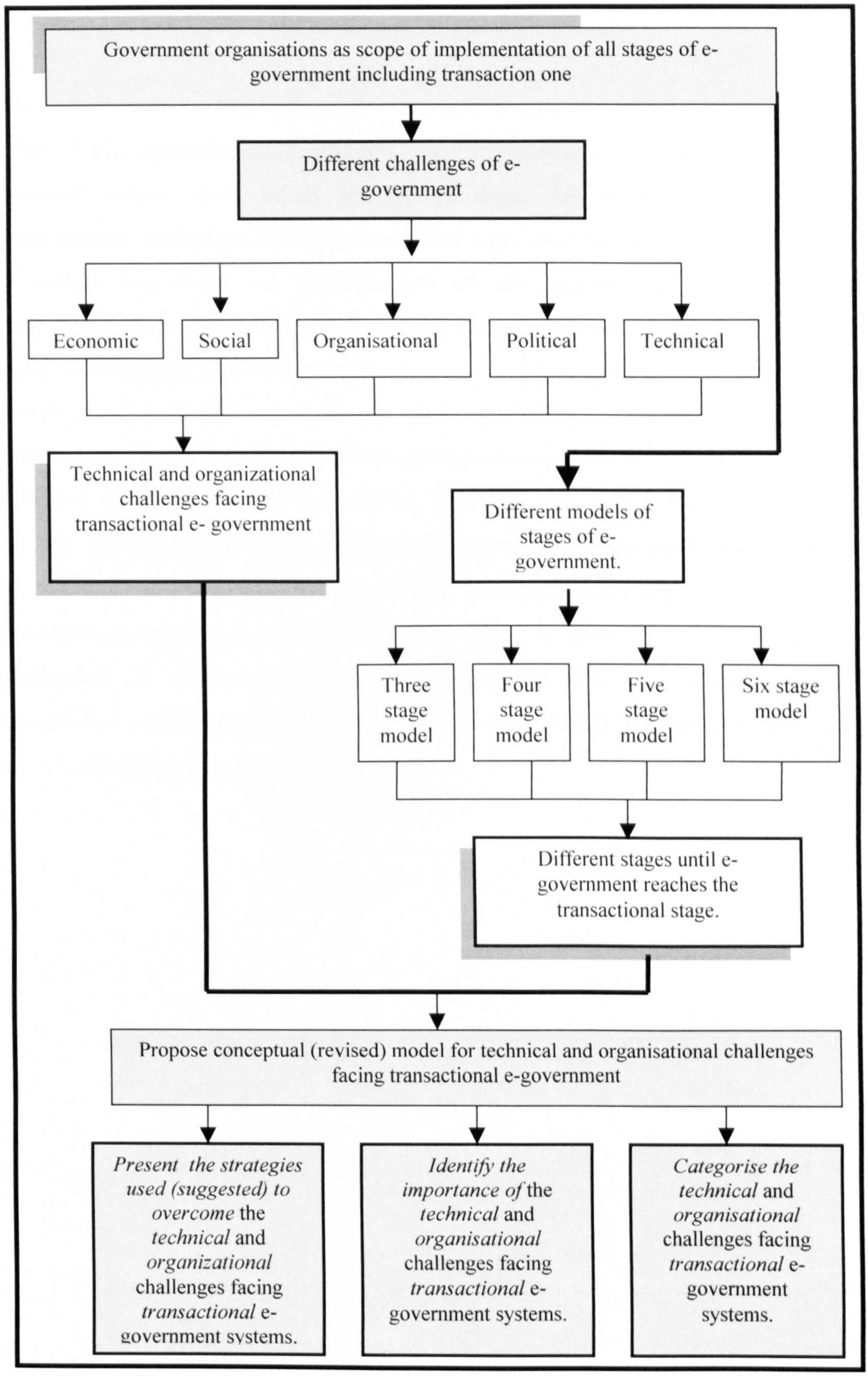

Figure 3.3: Framework of this Dissertation

3.7 Model for the Technical and Organisational Challenges

This section aims to contribute to the area of e-government by proposing a model for technical and organisational challenges facing transactional e-government systems. As discussed earlier, there is an absence of theoretical models for technical and organisational challenges facing transactional e-government systems as well as a lack of studies that focus on identification of the importance, categorisation and presentation of strategies for the overcoming of technical and organisational challenges facing transactional e-government system. As a result, the author of this thesis has identified technical and organisational challenges facing transactional e-government systems (see Figure 3.4) based mainly on: (a) a comprehensive literature review such of Backus (2001), Layne and Lee (2001), Timonen *et al.* (2002) etc. (see sections 2.6 and 2.8), where a comprehensive set of e-government challenges (that can be classified into technical and organisational challenges) identified separately in previous studies have been combined; and (b) information (face to face or telephone) given by stakeholders in different government organisations that have already reached a transactional e-government system (according to the criteria developed in section 3.5), and (c) attending of various workshops.

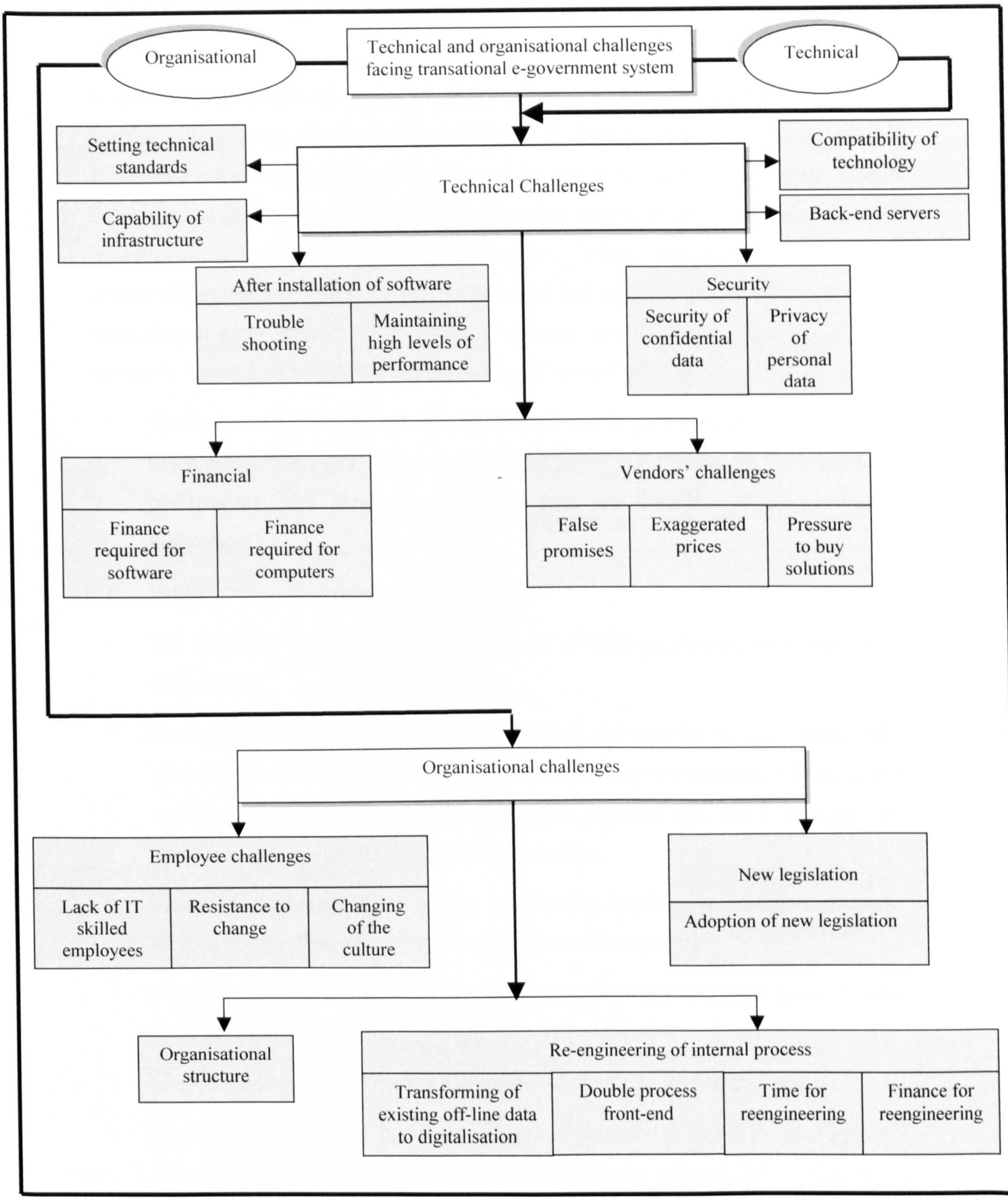

Figure 3.4: Proposed Conceptual Model for Technical and Organisational Challenges

3.7.1 A Novel Model for the Technical and Organisational Challenges

It should be noted that the proposed conceptual model of this dissertation is based on the framework of this dissertation (see Figure 3.3). Consequently, the proposed model provides a novel contribution at three levels. Firstly, at a conceptual level, the model combines the challenges (that can be classified into technical and organisational) of e-government identified separately in previous studies. Secondly, the proposed conceptual model attempts to categorise technical and organisational challenges facing transactional e-government based on their common characteristics. Consequently, as shown in Figure 3.4, technical challenges are categorised into:

- Challenges after installation of software that enable government organisations to reach a transactional e-government that includes: (a) maintaining high levels of performance and service availability, and (b) trouble shooting technical problems.
- Setting technical standards for all e-services.
- The capability of the infrastructure in terms of handling the range and number of transactions.
- Security challenges that include: (a) ensuring the security of confidential data stored in government organisation databases and e-government sites from attack and misuse, and (b) ensuring the privacy of personal data that is provided by citizens as part of obtaining government services.
- Financial challenges that include: (a) finance required to install a software system, and (b) finance required to provide more computers;
- The back–end servers (communication failures between internal systems and the external web–server).
- Compatibility of e-government technology available to the internal system.
- Vendor challenges that include: (a) vendors pressure to buy their solutions, (b) false promises of vendors, and (c) exaggerated vendor prices.

Organisational challenges have been categorised into:

- Employee challenges that include: (a) lack of IT skilled employees, (b) resistance to change (from traditional to electronic ways working) by employees, and (c) changing the culture of employees (government processes should be organised for the convenience of the customers rather than the convenience of the department).
- Re-engineering of internal process challenges that include: (a) the transforming of existing off-line data to digitalisation; (b) double process front–end (the interaction between government organisations and its customers needs to be offered in both a traditional manner and also through the internet); (c) time required to re-engineer and change the internal business processes of the organisation; and (d) finance required to reengineer and change the internal business processes of the organisation.
- Adopting new legislation to deal with new issues such as electronic receipts and digital signatures.
- Change of organisational structure.

Thirdly, the proposed model could be used as a frame of reference by government organisations that seek to reach a transactional e-government system.

3.8 Description of Technical and Organisational Challenges

This section aims to provide a brief description of technical and organisational challenges, identified in the proposed conceptual model (see Figure 3.4), facing a transactional e-government system. The importance of these technical and organisational challenges and those explored based on empirical data will be presented and analysed in Chapter 5. As a result, to realise the aim of this dissertation, the importance of these technical and organisational challenges and those explored based on empirical data will be identified, and then categorised based on the level of importance in Chapter 6.

3.8.1 Description of Technical Challenges Facing Transactional E-government

This sub-section seeks to provide the description of technical challenges that were identified in the proposed conceptual model (see Figure 3.4). There is no doubt that various technologies are applied to enhance e-government; these technologies include among others (Tian and Tainfield, 2003): web technology that is used for information display and interface design; Internet and wireless communication used to establish contact with users and deliver e-government information and services; programme languages that are used to edit programmes, such as HTML, XML and Java, in e-government system; and databases that are used to enhance the whole e-government processes.

Following comprehensive literature such as Evangelidis (2004) and e-government strategy and solutions team, IBM Public Sector (2001), the technical system of e-government for transaction service (as shown in Figure 3.5 below) can be divided into three elements: (a) back-end system that indicates the point where the e-service interacts with the organisation, which is responsible for the service; (b) front-end system that represents the main application/function that the user is interacting with through web-server; and (c) users of transaction service (see Section 1.2), who can be citizens, businesses and public administrations (see Figure: 3.2), that interact with the front end of the system through using the system and/or providing feedback to the system.

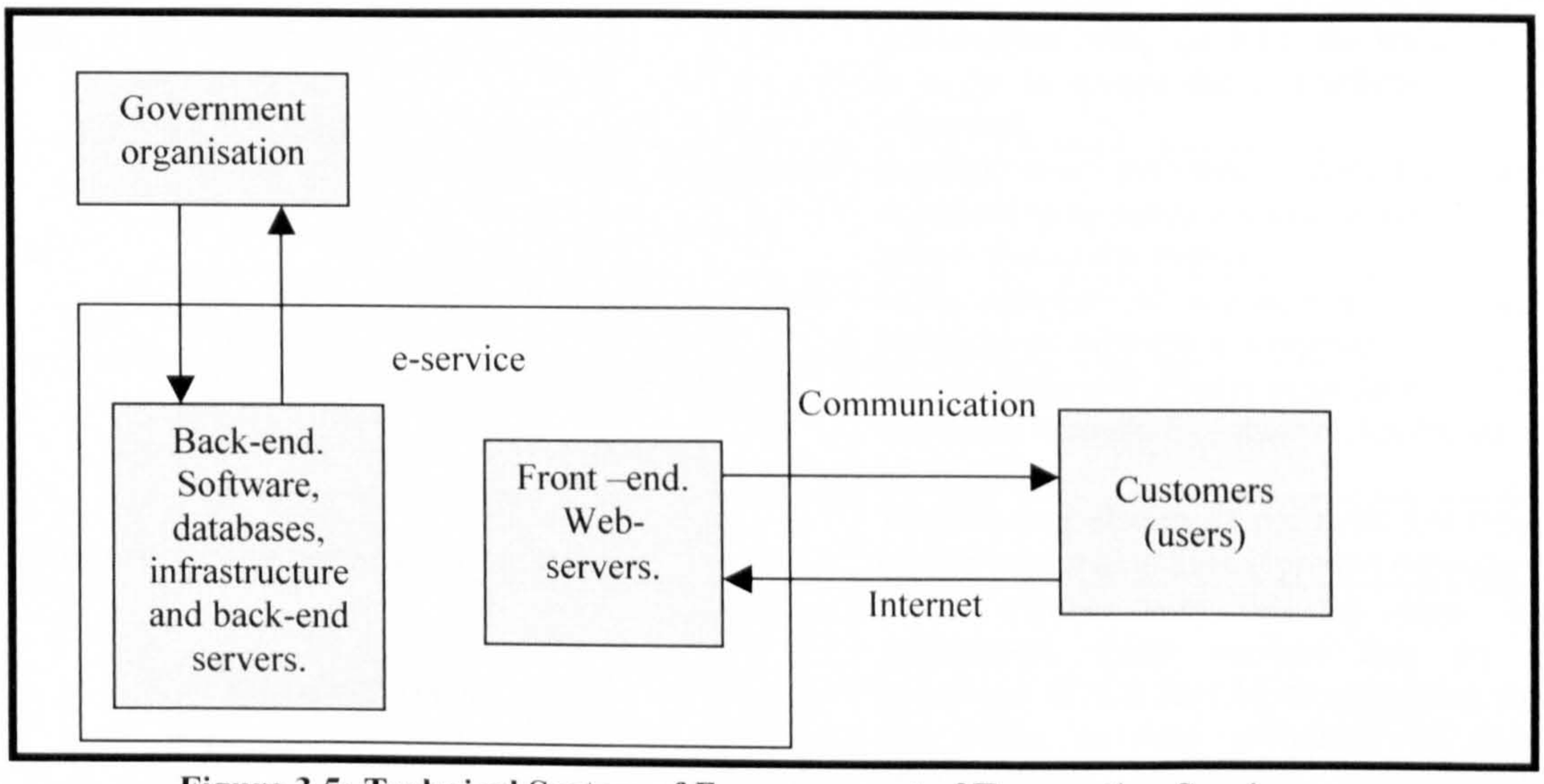

Figure 3.5: Technical System of E-government of Transaction Service

The above discussion, which is translated into Figure 3.5, is important and needed to make some technical challenges facing transactional e-government systems included in the proposed conceptual model more understandable. Table 3.6 below shows the description of technical challenges that are identified in the proposed conceptual model (see Figure 3.4).

Table 3.6: Description of Technical Challenges

Categorisation of technical Challenges	Technical challenges facing transactional e-government system.	Description
After installation software system	Maintaining high levels of performance and service availability	Ensuring acceptable response time for customers and ensuring that the e-services are available continuously without interruption.
	Trouble shooting technical problems	Being able to quickly and efficiently pinpoint technical problems and resolve them quickly to ensure minimum disruption to e-services.
Technical standards	Setting technical standards for all e-services	Putting in place a set of technical policies and standards that must be followed by all parties (in-house or external vendors) to ensure uniformity and compliance.
The capability of the infrastructure	The capability of the infrastructure in terms of handling the range and number of transactions	Making sure the infrastructure is scalable enough to cope with the increasing number of online transactions that come from introducing more and more online services.
Security	Ensuring the security of confidential data stored in government organisation databases and e-government sites from attack and misuse	Putting in place the necessary security measures and processes (technical and business-related) to ensure all data is securely stored and protected.
	Ensuring privacy of personal data that is provided by customers as part of obtaining government services	Putting in necessary measures and processes to ensure that the data is only accessible to people who need it to do their work.
Back–end servers	The back–end servers (communication failures between internal system and the external web–server)	Sending data back and forth between e-government (online) services and back-end systems and ensuring data integrity and consistency between the 2 platforms.
Compatibility	Compatibility of e-government technology available to the internal system	Making sure the technologies used for running the online services are compatible with the technologies being used for the back-end systems in order to ensure the 2 platforms can be well integrated.
Financial	Finance required to install a software system	Installation of software system that enables an organisation to reach a transactional e-government system costs extra money.
	Finance required to provide more computers	Implementation of e-government requires more money to provide more computers.
Challenges of vendors	Vendors' pressure to buy their solutions	Key vendors will always push their own solutions and make it sound like their technologies will cure all problems.
	False promises of vendors	Vendors may also make promises that they are not capable of meeting during project execution.
	Exaggerated vendor prices	Since e-government is the new hype in government, many vendors may try to take advantage of this fact by exaggerating the prices and trying to take advantage of government organisations' enthusiasm to implement e-government.

3.8.2 Description of Organisational Challenges Facing Transactional E-government

The following Table (Table 3.7) shows the description of organisational challenges as included in the proposed conceptual model (see Figure 3.4).

Table 3.7: Description of Organisational Challenges

Categorisation of organisational Challenges	Organisational challenges facing transactional e-government system	Description
Employees' Challenges	The lack of IT skilled employees	The lack of technical staff could be threatening to the implementation of e-government successfully where e-government project requires many IT skilled employees.
	Resistance to change (from traditional to electronic ways of working) by employees.	Employees might refuse to transfer from traditional to electronic ways of working for different reasons such as fear of new technology.
	Changing the culture of employees (government processes should be organised for the convenience of the customers rather than the convenience of the department).	This refers to changing the culture of employees and attempts to convince them to put the needs and desires of customers at the centre.
Challenges of Reengineering of internal Processes	The transforming of existing off-line data to digitalisation.	The ability to make offline information/knowledge readily available to employees and customers to allow them to do their work in a more efficient manner.
	Double process front–end (the interaction between government organisations and its customers' needs to be offered in both a traditional manner and also through the internet).	Customers must have a choice between conducting their interactions with government online or though traditional over-the-counter methods. Online channels need to be marketed to customers due to their obvious benefits to both customers and government. It is also essential to maintain consistency of data and information across all service delivery channels.
	Time required for re-engineering and changing the internal business processes of the organisation.	It is always important to review all services before transforming them to e-government in order to simplify the process and reduce waste (process reengineering). It is also important to review the structure of the organisation and ensure that it allows the organisation to respond to customer requirements and change. This is a time-consuming and costly process but the benefits are huge in the long run.
	Finance required for re-engineering and changing the internal business processes of the organisation.	Process re-engineering and organisational change takes time and the effects are often long-term. As such, it is essential for senior management to believe in the benefits of process reengineering and organisational change and to secure the necessary funding required to carry out these activities.
New legislation Challenge	Adopting new legislation to deal with new issues such as electronic receipts and digital signatures.	E-government often requires changes to legislation that is outdated because such legislation tends to hinder government departments' abilities to transform services to e-government.
Changes of Organisational Structure Challenge	Change of organisational structure	This refers to changing the organisation's hierarchy structure in a way that compliments e-government and its goal of improving customer services and responding to customer requirements in a quick and efficient manner.

3.9 Strategies for overcoming technical and organisational challenges

The purpose of this section is to provide strategies for overcoming each technical and organisational challenge identified in the proposed conceptual model (see Figure 3.4). However, in order to realise the aim of this dissertation, the strategies for each technical and organisational challenge, included in Tables 3.8 and 3.9, will be revised (more might be added, some might be cancelled) based on the empirical data in Chapter 5, it will then be presented in Chapter 6.

3.9.1 Strategies for overcoming technical challenges

This sub-section seeks to present strategies for overcoming each technical challenge identified in the proposed conceptual model (see Figure: 3.4). It should be noted that almost all solutions for technical challenges presented in Table 3.8, except the solutions for security challenges (Reffat, 2003), have been taken from information (face to face or telephone) given by stakeholders in different government organisations that have already reached a transactional e-government system (according to the criteria developed in section 3.5) and through attending various workshops.

Table 3.8: Strategies for Overcoming Technical Challenges

Categorisation of technical Challenges	Technical challenges facing transactional e-government systems	Solutions
After installation software system	Maintaining high levels of performance and service availability.	▪ Training the staff to deal with new software systems. ▪ Learning from mistakes.
	Trouble shooting technical problems.	
Technical standards	Setting technical standards for all e-services.	
The capability of the infrastructure	The capability of the infrastructure in terms of handling the range and number of transactions.	▪ Expectations of how many transactions will be processed online and provide an extra margin of 20 – 30%.
Security	Ensuring the security of confidential data stored in government organisation databases and e-government sites from attack and misuse.	▪ Specify an official responsible for computer security. ▪ Assess systems regularly to make sure security precautions are being implemented. ▪ Backup information continually and store backup in a separate location. ▪ Provide ongoing training to employees on computer security.
	Ensuring privacy of personal data provided by customers as part of obtaining government services.	▪ Limit access to personally identifiable information. ▪ Train government employees in the importance of privacy.
Back–end servers	The back–end servers (communication failures between internal system and the external web–server).	▪ Installation of tools to monitor back – end server performance. ▪ Use tools to monitor the availability of network.
Compatibility	Compatibility of e-government technology available to the internal system.	▪ Study technology solutions carefully to ensure high compatibility. ▪ Invest in strong integration solutions.
Financial	Finance required to install a software system.	▪ Specify fixed budgets for buying software systems and computers. ▪ Buying technology in phases in order to spread the cost over several years.
	Finance required to provide more computers.	
Challenges of vendors	Vendors' pressure to buy their solutions.	
	False promises of vendors.	
	Exaggerated vendor prices.	

3.9.2 Strategies for Overcoming Organisational Challenges

This sub-section aims to present strategies for overcoming each organisational challenge identified in the proposed conceptual model (see Figure: 3.4). It should be noted that all solutions for organisational challenges presented in Table 3.9 have been taken from information (face to face or telephone) given by stakeholders in different government organisations that have already reached a transactional e-government

system (according to the criteria developed in section 3.5), and through attending various workshops.

Table 3.9: Strategies for Overcoming of Organisational Challenges

Categorisation of organisational Challenges	Organisational challenges facing transactional e-government systems	Solutions
Employees Challenges	The lack of IT skilled employees.	▪ Training employees. ▪ Encouraging employees by giving them prizes (money, certificates) to train to deal with new technology. ▪ Bringing in (contracting) new skilled people.
	Resistance to change (from traditional to electronic ways working) by the employees.	▪ Arranging workshops for employees to upgrade knowledge of e-government. ▪ Raising awareness of e-government by sending e-mails to employees describing importance and benefits of e-government to customers and employees. ▪ Assuring employees that e-government will not affect negatively the authority and jobs of employees.
	Changing the culture of employees (government processes should be organised for the convenience of the customers rather than the convenience of the department).	▪ Raising awareness of e-government by arranging presentations and sending e-mails to employees describing importance of e-government to customers and employees. ▪ Arranging workshops for employees to upgrade their knowledge of e-government. ▪ On-the-job training on using e-services. ▪ Training employees in customer service concepts.
Challenges of Reengineering of internal Processes	The transforming of existing off-line data to digitalization.	**Solutions (<u>in general</u>) for dealing with various challenges of re-engineering of internal processes**
	Double process front–end (the interaction between government organisations and its customers needs to be offered in both a traditional manner and also through the internet).	▪ Ensuring employees' awareness of importance of the re-engineering of processes. ▪ Ensuring employees' awareness of benefits of the re-engineering of processes before moving them to e-government. ▪ Ensuring enough time is provided for project team to work on re-engineering processes. ▪ Involvement of all levels of employees in re-engineering processes.
	Time required to re-engineer and change the internal business processes of the organisation.	
	Finance required to re-engineer and change the internal business processes of the organisation.	
New legislation Challenge	Adopting new legislation to deal with new issues such as electronic receipts and digital signatures.	▪ Support of higher management inside organisation. ▪ Defining legislation that needs to be changed or introduced in order to facilitate reaching organisational transactional e-government.
Changes of Organisational Structure Challenge	Change of organisational structure.	▪ Convincing management of importance of structural changes and requirements. ▪ Identifying need for structural changes to organisation. ▪ Adopting new organisational department(s) to ensure success of e-government project.

3.10 Conclusions

This chapter aimed to: (a) attempt to clarify the confusion surrounding the transaction stage of an e-government system, (b) provide a clear framework for this dissertation, and (c) propose a conceptual model for technical and organisational challenges facing transactional e-government systems. This was done by firstly analysing the models of e-government and secondly giving a description of the importance of the transaction stage. This was followed by the development of a clear perception of the transaction stage, there was then a discussion regarding the criteria involved in identifying this stage, and thereafter, the framework of this research was developed and a conceptual model of technical and organisational challenges facing transactional e-government systems was proposed. The technical and organisational challenges facing transactional e-government system were then described and finally, the strategies for overcoming technical and organisational challenges were provided.

According to the above analysis of various models of the stages of an e-government system, it has been concluded that: firstly, there is no specific approach to the stages of an e-government system; secondly, there is almost agreement among researchers as to the purposes of the first and final stages of e-government; and thirdly, there is still a debate about the perception and the number of stages which arise between the first and final stages of e-government.

It has been shown that the transaction stage of e-government almost always arises as a third stage before integration (final stage); it rarely arises as a second or fourth stage. Researchers have reached a consensus among themselves as to the importance of the transaction stage of e-government systems. The importance of the transaction stage of e-government comes from its role, which is to lead to a reduction in the costs and time of customers by enabling them to implement complete transactions with the specified government organisations safely online without the need to go to the appropriate organisation. Therefore, the transaction stage should provide the highest level of maturity of the e-government system inside an organisation.

Furthermore, analysis of different perceptions of the transaction stage of e-government has revealed that the following issues are overlooked by most authors who have perceived this stage: firstly, the scope of implementation of the transaction stage; secondly, the scope of the services that are provided electronically; and thirdly, the high level of security that should be provided at this stage. As a result, a clear perception of the transaction stage of e-government has been developed by the author of this thesis.

The criteria for reaching the e-government transaction stage within government organisations have been presented in this chapter. These criteria are: uploading, downloading and submitting forms online, secure connections, financial transactions (if applicable), creation of online accounts and instant decision making. These criteria will be used as a framework to help the author of this thesis to identify and categorise the technical and organisational challenges that have been faced by government organisations in order to reach the transaction stage of e-government systems. Moreover, these criteria could be used by government organisations that may be attempting to implement e-government and could help them to measure progress towards implementing an e-government system.

The framework of this dissertation was developed and a novel model for technical and organisational issues facing transactional e-government system was introduced. The proposed conceptual model is novel because: (a) it combines the challenges (which can be classified into technical and organisational) of an e-government system identified separately in previous studies; (b) it attempts to categorise technical and organisational challenges facing transactional e-governments based on their common characteristics; and (c) it could be used as a frame of references by government organisations that seek to reach a transactional e-government system. Consequently, the proposed conceptual model can be used as a decision-making tool to support management when taking decisions regarding the development of a transactional e-government system. Moreover, the model can be used by researchers to analyse and understand technical and organisational challenges facing transactional e-government systems.

Finally, technical and organisational challenges that face transactional e-government systems, identified in the proposed conceptual model (see Figure 3.4), were described and the strategies for overcoming each technical and organisational challenge, identified in the proposed conceptual model, were provided.

4

Chapter 4: Research Methodology

Summary

To deal with the issues identified in Chapters 2 and 3, this chapter focuses mainly on: (a) identifying and developing an appropriate research strategy, and (b) identifying an appropriate research method. The justification for the research method and strategy chosen is stated in this chapter. The discussion is based on the research approaches commonly used in the field of IS.

4.1 Introduction

This chapter presents the research methodology proposed for exploring (identification of the importance, categorisation, and presentation of the strategies for overcoming) technical and organisational challenges facing transactional e-government systems. It starts with a description of both positivism and interpretivism as epistemological stances. This will be followed by the justification for choosing 'interpretivism' as the research approach. An explanation will then be given as to why the case study research strategy was used, and the adoption of a qualitative research method will be justified. An empirical research methodology will be presented that has been translated into a research design for conducting collection of the empirical data. Finally, this methodology was transformed into a protocol showing its role as a data collection tool where data are elicited from case study government organisations.

4.2 Selecting an Appropriate Research Approach

The process of choosing an appropriate research approach is one of the most important tasks to be carried out during the process of research design. In the IS area, it is difficult to select an appropriate approach because it is considered multi-disciplinary, with many aspects such as engineering, linguistics and mathematics. Galliers (1992) claims that there is no specific framework available to combine all aspects of knowledge needed for the study of information systems. Furthermore, there is no single theoretical perspective in information systems, but there are many philosophical assumptions concerning the underlying nature of the phenomena under investigation (Orlikowski and Baroudi, 1991). Consequently, there are many research approaches and strategies that could be chosen by researchers.

IS research lends itself to several philosophical approaches including: (a) critical, (b) interpretivism, (c) positivism (or scientific), and (d) post-positivism (Orlikowski and Baroudi, 1991). Based on the objectives of this dissertation, critical and post-positivist approaches are not appropriate for this research. According to Cavaye (1996), interpretivism and positivism depend on quite different assumptions about the nature of knowledge and demand considerably different approaches. Irani *et al.* (1999) argue that the goal of interpretivism is to understand the phenomena from the point of view

of participants who are directly involved with the particular phenomenon under study while positivism depends on measurable evidence that influences a high level of control over the phenomenon. Irani *et al.* also claim that the positivism stance involves dealing with hypothesis, theoretical propositions and quantifiable measures of variables.

However, the author of this thesis argues that for the purpose of this research, the interpretivism approach is the most valid. The reason being that following the comprehensive literature in Chapter 2 and framework of this research presented in Chapter 3, it was noted that there were interrelated and complex political, technical, economic, social and/or organisational challenges related to implementing a transactional e-government system. The technical and organisational challenges facing a transactional e-government system need to be understood from the participants' point of view. Therefore, the author considers the interpretivist stance to be appropriate. Positivism is not considered because there will be no research hypothesis, theoretical propositions or quantifiable measures of variables reported in this research.

4.3 Selecting a Research Strategy

Having justified choosing interpretivism as an epistemological stance, this section concentrates on selecting a research strategy. Galliers (1992) and Weick (1984), cited in Irani *et al.* (1999), differentiate between the terms of *research strategy* and *research method*. They claim that a research strategy is the means of going about one's research, obtaining a particular style and using different research methods to gather data; while a research method is the means of collecting evidence that indicates the utilized techniques and the tools used during gathering of data. Cavaye (1996) argues that in addition to case studies, there are different research strategies that share one or more of the characteristics of the case study research strategy, including field study, action research, ethnographic research, and application descriptions. Case study has been chosen for this research as the most appropriate strategy. At the end of the following sub-section, the justification(s) for this decision will be reported.

4.3.1 Justification of the Use of the Case Study

The case study research strategy focuses on learning about a complex instance through extensive description and contextual analysis (Davey and Lynn, 1991). Soy (1998) notes that case study research enables the researcher to understand a complex issue or object and extend experience or strengthen what is already known through previous research.

Case study is a descriptive examination and can be a useful approach to research of organisations and institutions in both the private and public sectors (Hakim, 1992). Consequently, case study research can be considered as the most common qualitative approach used where the object of the discipline is to study information systems in an organisation (Myers, 1997). The main characteristics of case studies, as discussed briefly by Benbasat *et al.* (1987) are as follows:

- Phenomenon is examined in a natural setting;
- Data is collected by multiple means;
- No experimental control or manipulation is involved;
- One or more entities are examined;
- Concentration is on contemporary events;
- The complexity of the unit is studied intensively;
- Changes in site selection and data collection methods could take place as the investigator develops new hypotheses;
- Case studies are more appropriate to the exploration, classification and hypotheses development stages of the knowledge building process; (the investigator should have a receptive attitude towards exploration);
- The results derived rely on the investigative powers of the investigator;
- The set of variables may not be specified by the investigator in advance; and,
- Case research is useful in the study of *why* and *how* questions because these deal with operational links to be traced over time rather than with frequency of incidents.

Benbasat *et al.* (1987) claim that there are three reasons for case study research being applicable to IS research, these are: (a) it enables the researcher to understand the nature and complexity of the processes taking place; therefore, case study is appropriate for this research because it was noted, as discussed earlier, that there were interrelated and complex political, technical, economic, social and/or organisational challenges facing transactional e-government systems; (b) case study allows the researcher to study IS in a natural setting. This research will explore and identify the importance of technical and organisational challenges facing a transactional e-government system in its natural settings; and (c) a case study approach enables the researcher to gain valuable insight into new topics emerging in the rapidly changing IS arena. It is also suitable for this research because e-government is a new area. Consequently, based on these reasons and the characteristics of case study methods (as set out above), the author has chosen the case study strategy for this research. At the end of this section, justification for this decision will be summarised.

Yin (1994) claims that there are different kinds of case studies such as exploratory, descriptive and explanatory each relying on the research questions that are used to answer what, how and why respectively. *Based on this classification, the case study used in this dissertation can be categorised as exploratory.* The reason for this is that this research concentrates more on questions of *what,* e.g. what are the technical and organisational challenges facing a transactional e- government system. Exploratory case studies are useful for theory building since they are valuable in developing and refining concepts for further study (Themistocleous, 2002).

However, the main reasons the author has chosen a case study approach for this dissertation are: firstly, following on from the comprehensive literature review in Chapter 2, the author has noted that e-government is a new area with little and limited research. The interpretivism case study strategy is, therefore, used since it is suitable for studying the technical and organisational challenges facing transactional e-government systems in government organisations; secondly, the case study strategy enables the researcher to study technical and organisational challenges facing transactional e-government systems in government organisations in their natural settings and learn from practices; thirdly, studying technical and organisational

challenges facing transactional e-government systems in government organisations in their natural settings will help the author to understand the nature and complexity of technical and organisational challenges; and fourthly, the case study strategy allows the author to understand in-depth the context of the technical and organisational challenges facing transactional e-government systems in government organisations.

4.3.1.1 Single and Multiple Case Studies

Case studies can be single or multiple and the decision as to which to use is important in cases of study design (see sub-section 4.5.1). A single case study can provide the researcher with valuable information about the research question from one organisation. It provides 'rich' descriptions of the organisational context. Hartley (1994) notes that single case studies may be the only recommended choice for research if opportunities or resources prevent a wider study. However, Yin (1994) claims that, if the researcher has the choice, multiple-case designs may be better than single-case designs. The author of this thesis chose multiple case studies as being a more appropriate strategy because multiple case studies enable the researcher to cross-check and examine the findings of the research through analysis of data across organisations.

The number of case studies has caused arguments among researchers. Eisenhardt (1989) has determined the number of multiple case studies as 10 maximum and 4 minimum cases. Gable (1994) has suggested that a multiple case study should include up to five case study companies. However, according to Irani *et al.* (1999), Eisenhardt (1989), and Cavaye (1996), there are some considerations that should be taken into account in order to choose the number of cases: (a) the number of cases to be studied in multiple case design are not pre-determined and are usually defined by the factors of the research; (b) the appropriate number of cases should be based on: how much is known about the phenomenon after studying a case and how much new information is likely to emerge from studying further cases; (c) both the research questions and the data collected determine at what point the researcher has collected data from a sufficient number of cases to enable appropriate analysis. Accordingly, the researcher of this dissertation will use multiple case studies and follow the above considerations.

Since government organisations in Dubai can be considered advanced in implementation of the e-government project as well as to satisfy the aim of this dissertation, two case studies in Dubai city (United Arab Emirates) were chosen, according to the criteria developed by the author of this thesis (see Chapter 3), to collect data (see Chapter 5).

4.4 Justification of the Use of Qualitative Research

Having justified choosing interpretivism as the epistemological stance and employing a case study strategy in previous sections, this section focuses on providing justification of the use of the qualitative research approach. According to Jankowicz (2000, p.209) a research method can be defined as:

> *"a systematic and orderly approach taken towards the collection and analysis of data so that information can be obtained from those data".*

Creswell (2003) claims that there are three types of research method, namely: (a) quantitative, (b) qualitative, and (c) mixed. An appropriate method should always be chosen according to the goals of the research and should be applicable to the questions being asked (Paul, 1992).

Quantitative methods of research that depend on the statistical analysis of data may not be appropriate if research questions concentrate on organisational processes and seek to understand both individual and group experiences of work (Cassell and Symon, 1994). Creswell (2003) argues that the quantitative approach is most appropriate when the problem is to identify factors that influence an outcome, understand the best predictors of outcomes, or the utility of an intervention. On the other hand, Creswell (2003) also argues that qualitative research is preferred when there is a phenomenon that has been investigated with little research and needs to be understood. Furthermore, Audet and d'Amboise (2001), argue that qualitative research approaches are more appropriate when the main objective of the research is to improve the understanding of a phenomenon. In this research, where the objective is exploration of an extremely little known phenomenon, a qualitative approach is more appropriate.

Marshall and Rossman (1999) summarise the types of research for which the qualitative research approach would be more suitable. They are as follows:

- Research on little known phenomena or innovative systems. This research aims to explore an extremely little known phenomenon.
- Research that investigates complexities and processes in-depth. This research seeks to investigate complexities and processes in-depth in order to provide rich empirical data;
- Research on informal and unstructured linkages and processes in organisations;
- Research that cannot be done experimentally for ethical or practical reasons. This research cannot be carried out experimentally, as described in Chapters 2 and 3;
- Research on real, as opposed to stated, organisational goals;
- Research for which relevant variables have yet to be identified;
- Research that seeks to explore where and why policy and local knowledge and practices are at odds.

However, the qualitative research approach suffers from a number of drawbacks that should be taken in consideration when adopting such a research approach. Disadvantages associated with qualitative research, according to Rao and Woolcock (2002), include among others: the individuals or groups being studied are usually small in number and/or have not been randomly selected, making it highly problematic to draw generalizations, and because groups are often selected idiosyncratically, it is difficult to replicate, and thus independently verify, the results. Smithson and Cornford (1996) identifies more drawbacks to qualitative research, which include: firstly, it is very difficult to generalise from a small number of cases (perhaps only one case) to a wider range of situations; secondly, due to complexity and richness of data, it means that it is open to a number of interpretations, such that researcher bias is a constant danger, and thirdly, researchers involved in dynamic cases where the situation is changing frequently, face inherent problems in attempting to make controlled observations and predictions. This leads to problems related to the validity and verifiability of the research.

Bearing these points in mind, qualitative research was still chosen as the most suitable for this dissertation due to the epistemological stance being followed. The main reasons for this decision are: (a) the research focuses on organisational processes and seeks to understand individual experiences of work; (b) the objective of this research is exploration of a phenomenon that is extremely little known; (c) the strength of the qualitative approach comes from its capacity to explore human subject motivation and actions within a research study frame of reference, so exposing the richness of the data (Debreceny *et al.* 2002), and in this research, rich empirical data is required to give more understanding of technical and organisational challenges facing transactional e-government systems; (d) the need for rich empirical data means that the use of qualitative methods is more suitable for this research because they enable processes to be examined in-depth; and (e) as described in Chapters 1, 2 and 3, the research cannot be carried out experimentally.

4.5 Empirical Research Methodology

The author has developed an empirical research methodology based on three stages (as shown in figure 4.1): (1) research design, (2) data collection, and (3) data analysis. These stages will be discussed in detail in the following sections of this chapter.

4.5.1 Research Design

According to Yin (1994, p.19) a research design can be defined as:

> *"...an action plan for getting from here to there, where here may be defined as the initial set of questions to be answered, and there is some set of conclusions (answers) about these questions."*

Research design can be considered to be the first part of the empirical research methodology. It begins with a review of the literature, thus looking in-depth at different issues of the research area under investigation. The development of a conceptual model then enables the researcher to present the desired empirical research. According to the needs of an empirical study, the author of this thesis has chosen to use

a multi-case study strategy through the employment of the qualitative research method. The justification for choosing a multi-case study strategy is provided in sub-section 4.3.1.1. The research design was thereafter transformed into a plan of action or protocol (see Section 4.7). Themistocleous (2002) claims that research protocols are an important investigation tool for several reasons:

- To make sure that the targeted data is collected;
- To follow the route from which knowledge was developed;
- To make sure that the research tracks a specific schedule;
- To provide a map that others might follow to reach similar conclusions;
- To put gathering data into a manageable format.

The qualitative research method was developed, within the protocol to collect data. Several sources will be used to collect data such as documents, reports and organisational websites. Interviews will be the main source of data gathering, and these will be structured (and semi-structured or unstructured), the justification for using these types of interviews will be shown in sub-section 4.5.2.1.

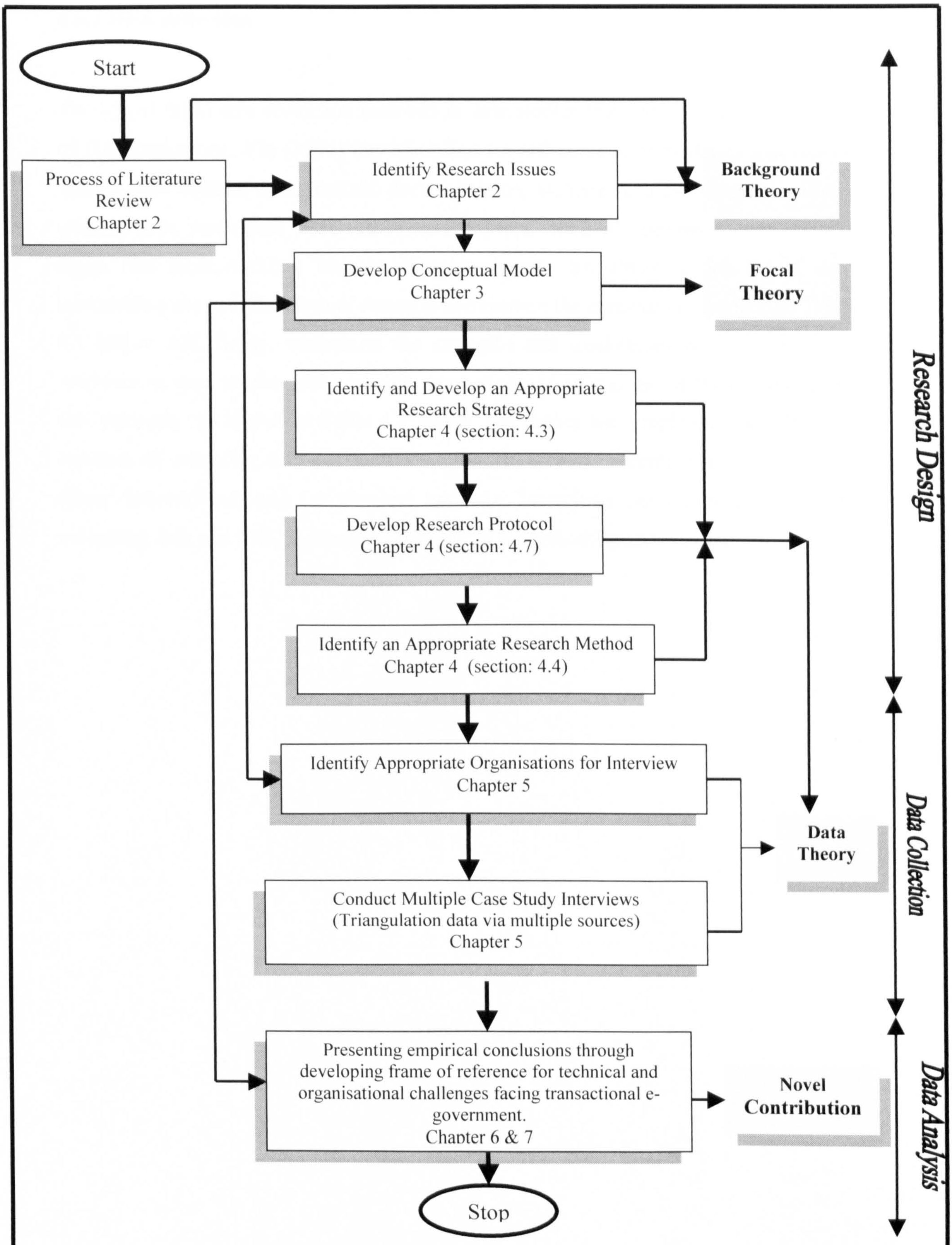

Figure 4.1: Empirical Research Methodology

4.5.2 Data collection

The use of multi data collection methods in case studies leads to greater enhancement of the conclusions. Yin (1994) has identified several sources of evidence that can be used in case studies, these include: documentation, archival records, interviews, direct observations, participant observation, and physical artefacts. Benbasat *et al.* (1987) argue that these multiple sources of evidence aim to: obtain a rich set of data surrounding the specific issue of research and capture the contextual complexity. Table 4.1 below will, firstly, summarise the strengths and weaknesses of each source of evidence in case studies and secondly, give examples of the use of these methods in this research. As shown in Table 4.1 below, the author has employed the following methods of collecting data: (a) documentation; (b) archival records; (c) interviews; (d) direct observations; and (e) physical artefacts. Interviews are the main source of collecting data and will be discussed in detail in the following sub-section.

Table 4.1: Methods of Data Collection – Strengths, Weaknesses and their use in this Study

Source of evidence	Strengths as suggested by Yin (1994)	Weaknesses as suggested by Yin (1994)	Use of evidence sources in this research
Documentation	▪ Stable - can be reviewed repeatedly ▪ Unobtrusive - not created as a result of the case study ▪ Exact -contains exact names, references, and details of an event ▪ Broad coverage-long span of time, many events, and many settings	▪ Retrievability - can be low ▪ Biased selectivity, if collection is incomplete ▪ Reporting bias - reflects (unknown) bias of author ▪ Access - may be deliberately blocked	• Reports from organisations. • Project plan documentation. • Reference material downloaded from Internet.
Archival Records	▪ [Same as above for documentation] ▪ Precise and quantitative	▪ [Same as above for documentation] ▪ Accessibility due to privacy reasons	• Organisational Records (IT department organisation charts)
Interviews	▪ Targeted - focuses directly on case study topic ▪ Insightful - provides perceived casual inferences	▪ Bias due to poorly constructed questions ▪ Response bias ▪ Inaccuracies due to poor recall ▪ Reflexivity – interviewee gives what interviewer wants to hear	• Structured interviews. • semi-structured interviews. • unstructured interviews.
Direct observations	▪ Reality - covers events in real time ▪ Contextual - covers context of event	▪ Time-consuming ▪ Selectivity - unless broad coverage ▪ Reflexivity - event may proceed differently because it is being observed ▪ Cost - hours needed by human observers	• Formal and informal meetings with interviewees to enrich the data and contribute to gain further insights.
Physical artefacts	▪ Insightful into cultural features ▪ Insightful into technical operations	▪ Selectivity ▪ Availability	• Hardware, network and office equipment.

4.5.2.1 Interviews

Yin (1994) claims that interviews can be considered one of the most important sources of information of the qualitative method. The interview is the most commonly used qualitative method in organisational research because it is a flexible method, it can be used anywhere, and it can provide the researcher with a great depth of data. It aims to enable the researcher to: (a) see the topic of research from the perspective of the interviewee; and (b) understand why and how the interviewee comes to have this particular perspective (King, 1994).

Robson (2002) argues that there are three main types of interview namely: (a) fully structured, (b) semi-structured, and (c) unstructured. Robson defines these types as follows: *fully structured* - has predetermined questions with fixed wording, usually in a pre-set order; *semi-structured* - has predetermined questions but the order can be changed based upon the perception of interviewer of what seems most suitable; *unstructured interviews* - means that the interviewer has a general area of interest, but allows the conversation to develop within this area.

In the context of this research, interviews can be considered the main data source. Before conducting interviews, the Heads of IT in both organisations chosen for this thesis to collect data were contacted (by telephone) and given general information regarding the data that needed to be obtained. However, seven people from each organisation under investigation were interviewed (one person from each organisation was interviewed twice, that is for technical and organisational challenges, see Table 4.2) using structured (and semi-structured or unstructured) interviews so as to obtain as much information as possible. Structured interviews were based on the agenda of interviews (see Appendix B). Using the interview agenda, the interviewees answered specific questions concerning technical and organisational challenges facing transactional e-government systems. Semi-structured interviews were used without an agenda of interview. The purpose of using semi-structured interviews in this research was to clarify and/or expand on issues derived from the structured interviews. Structured, semi-structured and unstructured interviews were almost all performed in the office of interviewees. Unstructured interviews were (rarely) carried out during

coffee breaks, lunches etc. Unstructured interviews were used with all interviewees when they were asked at the end of each interview to add any technical/organisational challenge(s) that had not been reported within the interview. In this case, the interviewees were given time to express technical/organisational challenges facing the transactional e-government system in their organisation and in their own terms.

Within the case studies (two cases), as mentioned earlier, seven people from each organisation were interviewed. All are directly involved in implementing an e-government project. The interviewees selected for structured interviews were divided into two groups (see the following paragraph for details), and data were collected according to: (a) the interviewee's positions inside the organisation (this research will focus basically on decision–makers); (b) their role within the implementation of the e-government project (as mentioned earlier, all interviewees should be directly involved in implementing an e-government project; (c) the purpose of this research (i.e. to seek, identify and categorise *technical* and *organisational* challenges facing transactional e-government systems).

As mentioned in the previous paragraph, two groups of interviewees were selected for structured interviews: group one provided information concerning technical challenges; they were all asked questions regarding technical challenges (see Appendix B, Section C). Group two provided information regarding organisational challenges; they were all asked questions regarding organisational challenges (see Appendix B, Section B). However, Table 4.2 below presents the design of data collection through interviews.

To avoid the time pressure of collecting and interpreting data accurately, all interviews were tape-recorded. Tape recording is a more effective and less time consuming method of conducting interviews than note taking (Themistocleous, 2002). Sometimes, conducting interviews requires the ability to make the interviewee discuss issues that might be confidential. Therefore, the first step is to gain the confidence of the interviewee. In doing so, the Heads of IT, in both organisations, were persuaded that the data obtained would be treated confidentially and as a result the tape-recorder was used smoothly during each interview (see Section 4.7.2).

As part of the structured interviews, the interview agenda (see Appendix B) concentrates on collecting data from the following areas:

- General background: the purpose of this section is to collect data regarding organisations that will be under study such as the type of information and services provided by the organisation and the nature of the organisation (private or public).
- Technical challenges: this section mainly aims to collect data regarding technical challenges facing transactional e-government systems. Data collected will include among others: (a) security and privacy challenges, (b) vendor challenges, (c) after installation of software challenges.
- Organisational challenges: the purpose of this section is to collect data regarding the organisational challenges facing transactional e-government systems. Data to be collected includes among others: (a) employees' challenges, (b) reengineering of the process challenges, (c) legislation challenge.

The following table shows the design of data collection through interviews. The choosing of the respondent's position in e-government projects for interview in this thesis as well as choosing the types of interviews (see Table 4.2 below) was justified earlier in this section.

Table 4.2: Collecting of Data Via Interviews

Organisation	Type of Interviews	Respondent's Position	Type of Interview
Group one: interviewees providing technical challenges			
Case Study 1	• Face-to-face • Telephone • Email questions	Head of e-government services (development unit)	• Structured • Semi-structured • Unstructured
	• Face-to-face • Telephone • Email questions	Head of Internet (Operation Unit)	• Structured • Semi-structured • Unstructured
	• Face-to-face • Telephone • Email questions	Head of Operations & Network Services	• Structured • Semi-structured • Unstructured
	• Face-to-face • Telephone • Email questions	Security Administrator	• Structured • Semi-structured • Unstructured
Group two: interviewees providing organisational challenges			
Case Study 1	• Face-to-face • Telephone • Email questions	Head of e-Government Services	• Structured • Semi-structured • Unstructured
	• Face-to-face • Telephone • Email questions	Head of Operations & Network Services	• Structured • Semi-structured • Unstructured
	• Face-to-face • Telephone • Email questions	Head of Strategy Unit – e-Government Section	• Structured • Semi-structured • Unstructured
	• Face-to-face • Telephone • Email questions	Head of e-Government Services (Support Unit)	• Structured • Semi-structured • Unstructured
Group one: interviewees providing technical challenges			
Case Study 2	• Face-to-face • Telephone • Email questions	Project Manager (Information Technology Section)	• Structured • Semi-structured • Unstructured
	• Face-to-face • Telephone • Email questions	Head of Information System Development Section (Information Technology Section)	• Structured • Semi-structured • Unstructured
	• Face-to-face • Telephone • Email questions	Programmer (Information Technology Section)	• Structured • Semi-structured • Unstructured
	• Face-to-face • Telephone • Email questions	Sr. Network/Security Consultant (Information Technology Section)	• Structured • Semi-structured • Unstructured
Group two: interviewees providing organisational challenges			
Case Study 2	• Face-to-face • Telephone • Email questions	Deputy Section Head of Operation (IT Department)	• Structured • Semi-structured • Unstructured
	• Face-to-face • Telephone • Email questions	Head of Strategic Planning Section (IT Department)	• Structured • Semi-structured • Unstructured
	• Face-to-face • Telephone • Email questions	Head of Information System Development Section (Information Technology Section)	• Structured • Semi-structured • Unstructured
	• Face-to-face • Telephone • Email questions	Manager of section of programming applications (IT Department)	• Structured • Semi-structured • Unstructured

4.5.3 Data Analysis

After discussion regarding the first and second parts of the empirical research methodology, which are research design and data collection respectively, this section focuses on data analysis, which is the third part of the empirical research methodology (see Figure 4.1). Empirical data obtained from case studies will be triangulated (see Section 4.6) and then analysed to illustrate empirical conclusions. Yin (1994) argues that analysis of case study evidence can be considered one of the most difficult aspects of case studies. This means that in comparison with statistical analysis, methods for analysing qualitative data are few and not well formulated. To overcome this problem, the researcher will analyse data by examining the meaning of words and actions of people which is similar to other studies (Themistocleous, 2002; Ramanath, 2000; Irani, 1998). However, the research findings of this dissertation are derived from empirical data. Empirical evidence is employed to draw conclusions and develop a frame of reference for technical and organisational challenges facing transactional e-government systems.

4.6 Data Triangulation

According to Stake (2000) triangulation is the process of employing multiple perceptions to clarify meaning, verifying the repeatability of interpretation or observation. Yin (1994) does not recommend one individual source of evidence for conducting case studies because the main strength of a case study is the chance to use different sources of evidence. Hakim (1992) claims that the use of multiple sources of evidence makes the case study one of the most powerful research designs. Additionally, it meets the need to confirm the validity of the processes (Tellis, 1997). In doing so, this research (as shown at the end of this section) has employed data and interdisciplinary triangulation to confirm the validity of the processes.

Patton (1987), cited in Yin (1994), has suggested that there are four types of triangulation, namely: (a) data, (b) investigator, (c) theory, and (d) methodological. Janesick (2000) has added a fifth type known as interdisciplinary triangulation.

According to Denzin (1988), cited in Robson (2002), *data triangulation* means the use of more than one method of data collection, e.g. interviews, observation, documents; the second type of triangulation is *investigator (observer) triangulation*, which means the use of more than one observer in the study; *methodological triangulation* refers to a combination of the quantitative and qualitative approaches. Janesick (2000) argues that *methodological triangulation* means the use of multiple methods to study a single problem; *theory triangulation* means the use of multiple theories or perspectives to interpret a single set of data. Finally, *interdisciplinary triangulation* is the investigation of issues related to more than one discipline (Janesick, 2000).

As a result of the above definitions, it can be concluded that data and interdisciplinary triangulation are being used in this research to confirm the validity of the processes; these results are summarised in Table 4.3.

Table 4.3: Kinds of Triangulation Used in this Research

Organisation	Type of triangulation applied	Sources
Case Study 1	Data: where more than one method of data collection was used. Data triangulation is important because it enables the author to: (a) obtain a rich set of data about the specific issue under research; and, (b) provide additional information.	▪ Using structured (and semi-structured or unstructured) Interviews of people who are directly involved in implementing an e-government project and their positions meet the needs of the research. It supports evidence obtained from other sources ▪ Archival Records: organisational records, lists of names and/or survey data. Useful for providing additional information. ▪ Direct Observations by formal and informal meetings with interviewees to access further information. Serves to provide additional information. ▪ Documentation: reports from organisations, project plan documentation and reference material downloaded from Internet. Useful for supporting evidence from other sources.
	Interdisciplinary: where more than one discipline was used.	▪ Information Systems ▪ Management
Case Study 2	Data: (as above)	▪ Interviews ▪ Organisational Records ▪ Observations ▪ Documentation
	Interdisciplinary: (as above)	▪ Information Systems ▪ Management

Information regarding the organisations, the role of individuals and general facts about the project was taken at the initial interview (by telephone or face to face). The respondents were given complete freedom to speak, because the researcher wanted to get as much as information as possible. In some cases, this information was very useful for the researcher because it led the interviewees to report various issues that had not been taken into account, such as challenges of vendors, of the software system after installation, of legislation, and of change of structure of the organisation, as well as the strategies for overcoming technical and organisational challenges during the designing of the agenda of the interviews.

4.7 Case Study Protocol

As suggested by Tellis (1997) a case study protocol not only contains survey instruments, but should also contain general rules and procedures to be followed when employing the instrument. The importance of having a case study protocol is to remind the researcher what the case study is about as well as to force the researcher into expecting various problems, including that of how the case study reports might be completed (Yin, 1994). Tellis (1997) also argues that a case study protocol is important for tracking the overall progress and reliability of the study. It helps the researcher to remain focused on the main tasks and goals, while the process of development brings out problems that would only be faced during the actual investigation. Yin (1994) claims that a case study protocol should outline: (a) an overview of the case study; (b) fieldwork procedures of research, (c) case study research questions, and (d) an output format of the research. However, point (d) is not appropriate for the design of this dissertation. According to Yin there are five levels of questions for case studies (see Table: 4.4) below. This research will follow the outline suggested by Yin, and this chapter will deal with level 1, 2 and 3 questions, with other parts of the dissertation addressing the remaining levels.

Table 4.4: Levels of Questions in Multiple Cases. Source: Yin (1994)

Question Level	Research Question	Section Reference
Level 1	Questions asked of specific interviewees	4.7.1 / Appendix B
Level 2	Questions asked of individual cases	4.7.1 / 4.7.2/ 4.7.3
Level 3	Questions asked across multiple cases	4.7.3
Level 4	Questions asked of an entire study	1.7/ 7.1
Level 5	Questions related to recommendations and conclusions beyond the narrow scope of the study	7.4

4.7.1 Case Study Overview

The author suggests that this research is not intended to offer perspective guidelines to the technical and organisational challenges facing transactional e-government systems but rather, to describe the perspectives of a case study that enables others to link their experiences to those reported.

This section of the case study protocol gives details of the issues under investigation so as to aid the researcher's concentration on the main questions being studied. The issues that will assist the researcher to remain focused during the interviews are as follows:

- Identification of the importance of technical challenges facing transactional e-government systems.
- Identification of the importance of the organisational challenges facing transactional e-government systems.
- Identification of the strategies used (suggested) to overcome the technical challenges facing transactional e-government systems.
- Identification of the strategies used (suggested) to overcome the organisational challenges facing transactional e-government systems.

4.7.2 Field Work Research Procedures

As reported in Section 4.3.1, the nature of the case study is to examine the phenomenon in its natural setting. This means that the researcher should deal with real world events such as unavailability of documents, interruptions during interviews,

delaying of interviewee etc., but these events should not stop the researcher from collecting data. Therefore, a fieldwork procedure must be designed to deal with such eventualities. In some cases, during the case studies, the availability of interviewees was a problem because some of them were too busy; therefore there was limited time for interviews. To deal with this problem, a timetable for interviews was created according to the circumstances of the interviewees. This timetable was sometimes changed, which was time consuming. Furthermore, interruptions during interview and delaying of interviewees have happened. In the case of interruptions, the researcher had to stop the tape-recorder and complete it after the interruption was over. As mentioned earlier (see Sub-section 4.5.2.1) the Heads of IT, in both organisations, were convinced that the data obtained would be confidential and as a result the tape-recorder was used smoothly during each interview. The author of this thesis noted that some interviewees were hesitating to provide complete information especially for the questions related to the security and privacy challenges. However, this section of protocol will focus on the procedures used during the multi-case study investigations. They are as follows:

- To identify who needs to be interviewed; the interviewees included among others: Head of e-Government Services (Development Unit); Head of Internet (Operation Unit); Head of Operations & Network Services; Security Administrator; Head of e-Government Services; Head of Strategy Unit – e-Government Section and Head of e-Government Services (Support Unit) (see Table 4.2). The reasons for choosing these people were justified in section 4.5.2.1.
- To develop the agenda of data collection, contingencies such as the failure of an interviewee to keep an appointment had to be that taken into consideration. Interviews were tape recorded and transcribed later. Furthermore, additional data such as documents, archival records (see Table 4.1) would be obtained to enhance the research findings.
- To create a timetable for interviews that includes dates and times which are adjusted to the needs of the interviewee.
- To develop an agenda of interviews and use it to collect primary data through structured interviews. All interviews were tape recorded and transcribed later.

To enhance the findings, additional data was obtained from reports, documents and other sources as shown in Table 4.1.

Robson (2002) reports that the interview is a type of conversation where the role of the interviewer is to get interviewees to talk freely and openly. Robson provides some advice that should be taken into account by the interviewer during the interview. The author will follow this advice, which is summarised as follows:

- Should listen rather than speak.
- Put clear and straightforward questions.
- Eliminate indications that lead interviewees to respond in a particular way.
- Not allow the interviewee to think you are bored or nervous.

For the purpose of verifying the accuracy of data, four people in each organisation were asked the same line of questions regarding organisational challenges and four people in each organisation were asked the same line of questions regarding technical challenges (see Section 4.5.2.1 & agenda of interview). Furthermore, documents were, if it was possible, used to enhance the claims of interviewees; this type of procedure leads to support of triangulation of data.

4.7.3 Questions Addressed by the Research

A number of questions were developed for the purpose of maintaining focus on the task of data collection. These questions were used only by the author, not by the interviewees, and their role was to remind the author of the data. The purpose of collecting this data was to identify the importance, categorisation, and presentation of the strategies for overcoming, technical and organisational challenges facing a transactional e-government system. Basically, the protocol questions are aimed at maintaining the author's (interviewer's) focus during the process of data collection. For this purpose, four questions were developed to be asked of the interviewee; these questions represent part of level 2 questions (see Table 4.4). Table (4.5) below summarises these questions.

Table 4.5: Questions Addressed by the Empirical Study

Question Number	Question
1	What is the importance of technical challenges facing a transactional e-government system?
2	What is the importance of organisational challenges facing a transactional e-government system?
3	What are the strategies used (suggested) to overcome the organisational challenges facing a transactional e-government system?
4	What are the strategies used (suggested) to overcome the technical challenges facing a transactional e-government system?

4.8 Conclusions

The purpose of this chapter was to justify the use of an appropriate methodology for this dissertation. The research methodology intended to be applied to this dissertation has been examined.

This chapter has set out the reasons why the interpretive method was selected for this research; i.e. it was considered more appropriate since the research question is based on the need to understand the challenges involved in government projects to reach a transactional e-government system. The problems that have arisen from the perspectives of those carrying out the projects and the methods sought to overcome them are more easily ascertained by in-depth questioning of those involved. It was, therefore, decided to use structured, semi-structured and unstructured interviews so as to obtain as much information as possible from the interviewees. As mentioned above, it was also decided to back up the information obtained from the interviewees by using the triangulation approach, which means that more than one method of information gathering, i.e. use of archival records, documentation and direct observation will be used.

The case study strategy for the research was discussed; the decision to use it for this research was based mainly on the facts that: (a) this research covers an area of study that has not been greatly studied before, and (b) it allows the researcher to study technical and organisational challenges facing transactional e-government systems in government organisations in their natural settings. In fact, multiple case studies were

decided on as a strategy in order to analyse data from more than one organisation and to allow cross checking of the data gathered.

The merits of both the qualitative and quantitative approach were discussed and the decision to use the qualitative approach for this research was based on the need to focus clearly on organisational processes and those who operate them and to explore this whole area of study which has, as mentioned above, so far had little attention paid to it. It was also thought that this approach would give a better insight into the problems encountered once the material gathered had been analysed.

So as to remain focused on the requirements of this research, it was decided to divide the empirical research methodology into three areas of study: (a) research design, (b) data collection, and (c) data analysis (see Figure 4.1).

Finally, the case study protocol was discussed. Since it was decided to follow the outline of the case study protocol proposed by Yin (1994) an overview of the case study; fieldwork procedures of research and case study research questions were discussed.

For the above reasons this research methodology will be based on the stance of interpretivism, the method employed will be qualitative and the strategy used will be based on multiple case studies. The main source of information gathering will be by interview including structured, semi-structured and unstructured interviews, which, although covering a wide area, will allow a greater depth of information to be achieved.

Chapter 5:

Case Studies and Preliminary Research Findings

Summary

This chapter focuses on presenting analyses of empirical data used to: (a) examine the proposed model for technical and organisational challenges facing transactional e-government systems; (b) identify the importance and the strategies for overcoming each technical and organisational challenge included in the conceptual model presented in Chapter 3; (c) explore and identify the importance and the strategies for overcoming of other technical and organisational challenges that were not included in the conceptual model presented in Chapter 3. The analysis of empirical data should not be viewed as a comparison of cases. This chapter provides an empirical analysis of perspectives of different case studies that describe human and organisational behaviour and perceptions during the implementation of an e-government system when trying to reach a transactional e-government system. Consequently, the author of this thesis aims to examine each case study by describing respective approaches to technical and organisational challenges facing a transactional e-government system, rather than generalising the outcome of these case studies. However, despite the differences between developing and developed countries, and sometimes between developing countries themselves, in various aspects such as finance, knowledge and technology (see Chapter 2), the results of this thesis could benefit government organisations in both developed and developing countries when they attempt to reach transactional e-government systems, as well as enable others to draw parallels in outcome.

5.1 Introduction

Chapters 2 and 3 of this dissertation have identified that there is a need to explore (identification of the importance, categorisation, and presentation of the strategies for overcoming) technical and organisational challenges facing transactional e-government systems. The absence of theoretical models for technical and organisational challenges facing transactional e-government systems has led the author of this thesis to propose a novel model that consists of technical and organisational challenges (see Chapter 3).

This chapter aims to: (a) identify the importance of each technical and organisational challenge identified in the conceptual model proposed in Chapter 3, when government organisations (that have already reached the transaction stage of an e-government system based on criteria presented in section 3.5) seek to reach this stage; (b) provide strategies used (suggested) to overcome each technical and organisational challenge identified in the conceptual model presented in Chapter 3; and (c) explore, identify the importance of, and present the strategies for overcoming other technical and organisational challenges that were not included in the conceptual model proposed in Chapter 3, and derived as a result of empirical data presented in this chapter. In doing so, it should result in:

- Revision of the conceptual model proposed by exploration of other technical and organisational challenges facing transactional e-government that were not included in the conceptual model proposed in Chapter 3.
- Achievement of the aim of this dissertation.

Consequently, the author will examine the proposed conceptual model using the case study strategy. In doing so, the cases of two government organisations will be presented and analysed in the following sections. The reason for selecting only two case organisations is that they provided enough data for this research; selecting a third case organisation might have added marginal benefits to this work, however, to realise the aim of this dissertation, the *two case organisations were selected that have already reached a transactional e-government system according to the criteria for reaching the e-government transaction stage within government organisation, as presented in Chapter 3 (see section 3.5).*

5.2 Case Study One – Dubai Municipality (DM)

5.2.1 Background to the Organisation

The first case study is that of the Dubai Municipality (DM). Dubai Municipality is one of the government organisations in Dubai city. Dubai city is one of United Arab Emirates' cities. United Arab Emirates is in the Arabic Gulf region. According to the information taken from eight interviewees, the DM is one of the biggest government organisations in Dubai. It provides many services for its customers such as building permits, maintains public parks, libraries, exports, imports etc. The DM provides the following services and information to customers (see Section 2.9):

- Information services that enable customers to obtain information about the organisation.
- Communication services that give the opportunity for interaction with groups of people and/or individuals.
- Transaction services that include submitting data or getting products or services online.

The Directory of Services is an example of an informational service that provides useful information on DM services to both individuals and businesses. The Directory of Services provides important information on all DM services such as service descriptions, service owners, important instructions on how to obtain the service, contact number, downloadable forms, etc. The DM also provide services such as "Zoning Regulations Enquiry" that allow both individuals and businesses to enquire about zoning regulations in various parts of Dubai City. This is an example of a communication service. Regarding transactional services, examples of such e-services for businesses include: applying for food certificates, applying for No Objection certificates, applying for Engineering Material Testing, various types of health and physical fitness certificates, etc. Regarding transactional services for individuals, examples include: Payment of Parking Fines, Applying for Demarcation Certificates, etc.

Although the DM provides services and information to citizens, businesses and public administration, it focuses more on business. The majority of DM e-services are

directed towards the business community in Dubai. Many engineering services are provided for building and infrastructure contractors and consultants. Other e-services are provided to companies that deal with food issues such as food traders (importers and exporters), restaurants, supermarkets, etc. Other useful e-services are designed for waste management and disposal companies. The DM organisation employs about 12,000 employees.

According to the criteria developed by the author of this thesis (see Chapter 3), to reach a transactional e-government within government organisations, the DM has already reached a transactional e-government system.

The language used for the software in the DM is Java; this was, according to the interviewees, selected from other software languages such as C, C++ and ASP because C and C++ do not support the technological aims as well as Java which, when compared to ASP is more reliable. Furthermore, Java is: compatible with the experience of the staff and is recommended by the consultancy; very strong on the Internet and developing sites; provides high levels of security; is easily used for development and is available on the market and platform independent, i.e. it can be used on every platform and is open to all platforms.

5.2.2 Technical and Organisational Challenges

To realise the aim of this dissertation, the following sub-sections, when seen from the view of multiple-stakeholders, aims to: (a) identify the importance of technical and organisational challenges (identified in the conceptual model proposed in Chapter 3) facing transactional e-government system at DM; (b) provide the strategies used (suggested) to overcome each challenge identified in the conceptual model presented in Chapter 3; (c) explore, identify the importance of, and present the strategies for overcoming other technical and organisational challenges that were not included in the conceptual model proposed in Chapter 3. Furthermore, the categorisation of technical and organisational challenges will, empirically, be presented in Chapter 6, based on their level of importance.

The interviewees were asked to justify, if possible, when the answer was not important, any challenge (technical or organisational). At the end of each interview, time was

given to each interviewee to add any technical or organisational challenges that were not asked about within the interview.

5.2.3 Technical Challenges Facing Transactional E-government System at DM

Because it was not possible to interview all DM stakeholders, four stakeholders, who were all directly involved in the implementation of the e-government project, were selected for structured interviews. The aim of these interviews was to identify the importance of technical challenges facing a transactional e-government system at DM and provide the strategies used (suggested) to overcome each challenge. Each interviewee was asked questions (see Section C, Appendix B). The stakeholders interviewed were: the Head of e-Government Services (Development Unit) (D.U); Head of Internet (Operation Unit) (I.O); Head of Operations & Network Services (O.N) and, Security Administrator (S.A).

Interviewees were asked to identify the importance of each technical challenge identified in the conceptual model proposed in Chapter 3. The level of importance presented in the tables 5.1, 5.2, 5.3 and 5.4 of this chapter follows a scale similar to that used by Miles and Huberman (1994) with values of: (a) unimportant, (b) important, and (c) very important; as represented by ○ , ◎ and ● respectively. In those cases where the interviewees did not give a response regarding the level of importance, the author of this thesis uses the mark '-' to indicate this reaction.

This sub-section aims to analyse the perceptions of interviewees related to the importance of technical challenges facing the transactional e-government system at DM and the strategies used (suggested) in their organisation to overcome each technical challenge. Table 5.1 summarises the perceptions of the interviewees when asked to identify the importance of technical challenges. It should be noted that, based on the common characteristics, the technical challenges facing the transactional e-government system have been divided (see sub-section 3.7.1) into: (a) challenges after installation of software that enables government organisations to reach a transactional e-government, these include maintaining high levels of performance and service availability, and trouble shooting technical problems; (b) setting technical standards for all e-services; (c) the capability of the infrastructure in terms of handling the range and

number of transactions; (d) security challenges that include ensuring the security of confidential data stored in government organisation databases and e-government sites from attack and misuse, and ensuring privacy of personal data that is provided by citizens as part of obtaining government services; (e) financial challenges that include finance required to install a software system, and finance required to provide more computers; (f) the back–end servers (communication failures between internal system and the external web–server); (j) compatibility of e-government technology available to the internal system; and (h) vendors' challenges that include vendors pressure to buy their solutions, false promises of vendors, and exaggerated vendor prices.

Table 5.1: Technical Challenges Facing Transactional E-government System in DM

Categorisation of technical Challenges	Technical challenges facing transactional e-government system in DM.	O. N	S. A	I. O	D.U
After installation software system	Maintaining high levels of performance and service availability	●	●	●	●
	Trouble shooting technical problems	●	●	●	○
Technical standards	Setting technical standards for all e-services	●	○	●	●
The capability of the infrastructure	The capability of the infrastructure in terms of handling the range and number of transactions	●	●	●	●
Security	Ensuring the security of confidential data stored in government organisation databases and e-government sites from attack and misuse	●	●	●	●
	Ensuring privacy of personal data that is provided by customers as part of obtaining government services	●	●	●	●
Financial	Finance required to install a software system	○	○	○	○
	Finance required to provide more computers	○	○	○	○
Back–end servers	The back–end servers (communication failures between internal system and the external web–server)	○	○	●	●
Compatibility	Compatibility of e-government technology available to the internal system	○	○	●	○
Challenges of vendors	Vendors' pressure to buy their solutions	○	○	○	○
	False promises of vendors	●	○	●	○
	Exaggerated vendor prices	○	○	○	○
Other	The evolution of the technology (there is always new technology)	○	●	-	●
Other	The availability of technical resources (skilled employees of vendors)	●	●	-	○
Other	After-sales support (from vendors)	●	●	-	●
Other	Viruses and worms have come from the connection with other departments or companies	●	●	-	○

5.2.3.1 Challenges After Installation of Software

5.2.3.1.1 Maintaining High Levels of Performance and Service Availability

Table (5.1) above shows that the interviewees all agreed that maintaining high levels of performance and service availability is a very important challenge. The Head of e-Government Services (Development Unit) provided the reasons for the great importance of this challenge; he said:

> *"Any E-Environment is a 24/7 environment therefore requires a high level of maintenance at the infrastructure as well as at the application levels; the number of users of an e-application is huge as it's open to the public, performance is a concern here as you cannot predict the load or the growth accurately and, to gain the users trust you need to provide an undisrupted service."*

The Head of Operations & Network Services justified the great importance of the challenge of maintaining high levels of performance and service availability; he reported:

> *"The IT world is a very challenging and demanding environment. The reason for this is that new technologies are introduced frequently and at the same time security threats are exposed on daily basis plus the business opportunities and business demand are growing."*

Interviewees said that the maintaining of high levels of performance and service availability challenge could be solved by:

- Continuous maintenance of the infrastructure (hardware and software).
- Training employees to deal with any new software system.
- Consultancy with specialized companies for a particular problem.
- Applications should be run on two servers because if one server were shut down the other would still be working.
- Specifying teamwork to monitor and make sure of the availability of services.
- Continuous evaluation of the performance of the system.

- Proper planning, designing and implementation of the infrastructure, which would lead to ensuring constant high levels of performance and service availability.
- Learning from mistakes.

5.2.3.1.2 Trouble Shooting Technical Problems

It appears (see Table 5.1) that the interviewees almost all shared the same perceptions regarding the importance of the challenge of trouble shooting technical problems. All interviewees except the Head of E-government Services (Development Unit), who claims that trouble shooting technical problems is an important challenge, agreed that trouble shooting technical problems is a *very* important challenge. The Head of Operations and Network Services reported that the trouble shooting of technical problems challenge was very important because:

> "*(a) In the Internet environment, there are a number of technical problems such as hackers, bugs, viruses, and (b) Adding or developing new applications to the infrastructure could cause a problem*".

The Head of Internet (Operation Unit) suggested a strategy for dealing with trouble shooting technical problems; he said:

> "*If the problem is new, you should firstly know what the problem is and what the reasons are for this problem. But, if the problem is not new, you can learn from the mistakes*".

However, the interviewees reported that the trouble shooting of technical problems challenge could be solved by:

- Learning from mistakes.
- Minimizing and dealing with a problem as soon as possible.
- Dealing with a simple problem internally, complex problems might needs consultancy.
- Training employees to deal with new software systems.

- Consulting companies, which specialize in a particular problem (for a short time because long contracts with consultancies are very expensive).
- Specifying specialised skilled team to deal with technical problems.

5.2.3.2 Technical Standards Challenge

As can be seen from Table (5.1), there was almost complete agreement among the interviewees that setting technical standards for all e-services is a very important challenge; the Security Administrator in particular emphasised its importance. The Head of E-government Services (Development Unit) said:

> *"We (in DM) are dealing with a lot of services that need to be available online. So, to be able to keep an acceptable level of performance, you need to at least have a certain technical standard (development, implementation, and documentation standard) for different services. Using certain standard leads to minimise risk of performance and save the time of development."*

The Head of Operations and Network Services added that:

> *"Setting technical standards depends mainly on clear planning and good design that assist to address the required standard. Defining of the required standard accurately lead to high level of performance."*

The interviewees reported that setting technical standards for all e-services challenge can be solved by:

- Consultancy of a specialised company so as to build the required standard.
- Setting up a standard, development of standards (coding, design, architecture and documentation standards).
- Learning from mistakes.
- Training employees to deal with new software systems.
- Proper planning, designing and implementation of the infrastructure.

5.2.3.3 The Capability of the Infrastructure Challenge

In interpreting the empirical data – as shown in Table 5.1 above - it appears that the interviewees share the same perceptions regarding the importance of the challenge posed by the capability of the infrastructure in terms of handling the range and number of online transactions. Interviewees all agreed that the capability of the infrastructure in terms of handling the range and number of online transactions is a very important challenge. The Head of Internet (Operation Unit) justified the great importance of this challenge, he said:

> *"This challenge is a very important one because you have to make sure that the infrastructure is ready to deal with the growing numbers of transactions".*

The Head of Operations & Network Services provided the reason for the great importance of the challenge of the capability of the infrastructure in terms of handling the range and number of online transactions, he reported:

> *"We are serving users, and Dubai Municipality partners. Therefore, we need to ensure that our infrastructure has to handle the transactions and we can grow as their requirement for doing more transaction grows. This requires us to continuously monitor the capacity and performance, to be proactive."*

The interviewees reported that the capabilities of the infrastructure in terms of handling the range and number of transactions is 1000 to 5000 transactions a day for the DM. The Head of E-government Services (Development Unit) claimed that the capability of the infrastructure in terms of handling the range and number of transactions depends on: (a) How many transactions can be provided online, and (b) How many users there are.

The interviewees said that the challenge of the capability of the infrastructure in terms of handling the range and number of transactions could be solved by:

- Knowing the expectations of how many transactions will be processed online and providing an extra margin of 20 to 30%. Some interviewees said that the extra margin should be more than 30%.

- Continuous reviews of the infrastructure and knowing the number of transactions it can handle.
- Providing a flexible or expandable infrastructure by adding more servers so that a better performance and extended service can be provided for the users.
- Good design (the design should be flexible) of the infrastructure followed by good planning and good monitoring.
- Use of particular switches or machines (Load Balancer) that control and distribute the load among the servers.
- Good monitoring which informs as to what the daily position is, i.e. how many transactional services have been carried out.

5.2.3.4 Security Challenges

5.2.3.4.1 Ensuring the Security of Confidential Data

In interpreting the empirical data, as shown in Table (5.1) above, it appears that the interviewees share the same perceptions regarding the importance of the challenge of ensuring the security of such confidential data from attack and misuse and agreed that it is a very important challenge. The Head of E-government Services (Development Unit), Head of Operations & Network Services and Security administrator reported:

> *"Ensuring of security and privacy are very important challenges because they are related to the reputation of the organisation and customer trust".*

Therefore, the Head of Operations & Network Services said:

> *"...you need to establish trust with your customers and suppliers. Failure to ensure them a secure environment will result in them walking away from you."*

The interviewees reported that the security challenge could be solved by:

- Specifying an official who will be responsible for computer security.
- Assessing systems regularly to make sure security precautions are being implemented.
- Backing-up information continually and storing this backup in a separate location.

- Providing on-going computer security training to employees.
- Ensuring data level security, which protects the data from unauthorized access, whether this data is residing in a database (encryption), or travelling (through SSL and/or encryption).
- Ensuring application level security, which makes sure that there are no holes in the application that allows illegal access to certain data or other applications.
- Ensuring the infrastructure level security which protects the whole infrastructure from hackers and intruders by setting up network authentication.
- Creating security policy documents which should be reviewed and upgraded continuously and approved by the top level of management.
- Consulting specialist companies to help create security policy documents.
- Ensuring physical security.
- Choosing the right infrastructure that will ensure a high level of security and is easily maintained.
- Understanding of the importance and requirements of the security issue by top management.

5.2.3.4.2 Ensuring the Privacy of Personal Data

It appears (see Table 5.1) that the interviewees share the same perceptions regarding the importance of the challenge of ensuring privacy of personal data that is provided by customers as part of obtaining government services. Interviewees all agreed that ensuring privacy of personal data is a very important challenge. They said that the challenge of ensuring the privacy of personal data could be solved by:

- Limiting access to personally identifiable information.
- Training government employees on the importance of privacy.
- Raising the awareness of employees about the importance of the privacy of data.
- Limiting information taken from the customers to the level that is really required.
- Raising the awareness of customers about the importance of privacy.

5.2.3.5 Financial Challenges

5.2.3.5.1 Finance Required to Install a Software System

As shown in Table (5.1), interviewees do not share the same perceptions regarding the importance of the challenge of finance required to install a software system, however, the Head of Internet services (Operation Unit) and the Security Administrator claim that finance required to install a software system is an important challenge. Interviewees reported that the challenge of finance required to install a software system could be solved by:

- Buying of technology in phases to spread the cost over several years.

The Head of Internet (Operation Unit) added that this challenge could be solved by:

- Specifying a fixed budget to buy a software system.
- Leasing technology equipment could be a possible solution. They did not use this strategy in their organisation (suggested solution).

On the other hand the Head of E-government Services (Development Unit) and Head of Operations and Network Services claim that the finance required to install a software system is not an important challenge because the finance required was available to the DM organisation. The Head of Operations and Network Services said that:

> *"...the business is the driver here and if the business decision makers want a particular service from IT and they view that this service is feasible then we will get the money as part of the yearly approved budget for the IT department."*

5.2.3.5.2 Finance Required to Provide More Computers

Table 5.1 reveals that interviewees almost all agreed that the finance required to provide more computers was not an important challenge because the finance is available to the DM and there is no problem related to the budget due to the high level of support from the upper management. The Head of Operations and Network Services said:

"The money required to provide more computers is not an important challenge because the DM has decided to go to the e-government way and specified fixed budget every year for this target."

The Head Administrator said that the finance required to install a software system was an important challenge while the finance required to provide more computers was not, when asked to justify this answer, he claimed:

"*...because the cost of buying computers is very low in comparison with the high cost required to buy and install software*".

On the other hand, The Head of Internet (Operations Unit) claimed that, although the finance required is available to the DM, the finance required to install a software system and provide more computers is an important challenge (in general). He said that the solutions to the lack of finance required for installing a software system and providing more computers are to:

- Specify a fixed budget to buy a software system and computers.
- Buy technology in phases in order to spread the cost over several years.
- Leasing equipment and technology could be one solution; however, they had not used this strategy in their organisation.

5.2.3.6 Back–End Servers Challenge

There was agreement, as shown in Table (5.1), among interviewees regarding the importance of the challenge of back–end servers (communication failures between internal systems and the external web–server). The Head of Operations & Network Services and the Security Administrator claimed that this was an important challenge. The Head of Internet (Operation Unit) and the Head of E-government Services (Development Unit) claim that it is very important challenge. The Head of E-government Services (Development Unit) justified the great importance of the challenge of back–end servers; he said:

"The inputs will be received from the users through web-servers. So, if there is a failure of communication between the servers of internal (back-end) systems and the external web–server, the users will be unable to get feedback about their requests and the process will not be completed. By another meaning, the request sent by the users will not be delivered to back-end servers in the organisation."

However, interviewees reported that the back–end servers challenge could be solved by:

- Installation of tools to monitor back–end server performance. The Head of Internet (Operation Unit) reported that the tool used in the DM for this purpose was Tivoli.
- The use of tools to monitor the availability of networks. The Head of Internet (Operation Unit) reported that the tool used in the DM for this purpose was Site Scope
- The provision of a reliable integration tool between web application and the back-end system.

5.2.3.7 Compatibility Challenge

In interpreting the empirical data (see Table 5.1), it appears that the interviewees share the same perceptions regarding the importance of the challenge of the compatibility of the e-government technology available to the internal system. Interviewees almost all agreed that the compatibility of the e-government technology available to the internal system is an important challenge. The Head of Internet (Operation Unit) claimed that it is a very important challenge. The Head of Operations and Network Services said that:

"The challenge of the compatibility of the e-government technology available to the internal system is not a huge challenge because tools are available. Today, if you go out, there are solutions and tools that make you overcome this challenge."

Interviewees reported that the challenge of the compatibility of the e-government technology available to the internal system could be solved by:

- Studying technological solutions carefully to ensure high compatibility.
- Investing in strong integration solutions.

5.2.3.8 Vendor Challenges

5.2.3.8.1 Vendors Pressure to Buy their Solutions

In interpreting the empirical data, as shown in Table (5.1), it appears that the interviewees almost all share the same perceptions regarding the importance of the challenge of vendor pressures when buying solutions. Interviewees reported that challenge of vendor pressures when buying solutions is not really important because in the final analysis it is the decision of the DM organisation to purchase the required solutions. The Head of Operations & Network Services identified the criteria of the decision to purchase the required solutions; he said:

> *"...business is the driver here and if they require a particular service from IT. Then it has to select the right technology to provide the service. We (IT) have a methodology that we follow to select the right technology based on business requirements."*

However, the Security Administrator reported that:

> *"vendors' pressure to buy their solutions is an important challenge because we (at DM) are always facing pressures from vendors to buy their solutions and they are trying to convince us of the features of their technology."*

5.2.3.8.2 False Promises of Vendors

Table (5.1) reveals that there is agreement among interviewees regarding the importance of the challenge of false promises of vendors. The Security Administrator and Head of E-government Services (Development Unit) claim that this is an important challenge. The Head of Internet (Operation Unit) and the Head of Operations & Network Services claim that this is a very important challenge. However, interviewees reported that the false promises of vendors challenge could be solved by:

- Including clear and strong conditions (penalties) within the contract and following-up on the implementing of these conditions.
- Testing new software and hardware in the organisational environment before buying new technology.
- Researching the Internet to find good vendors and offers.

5.2.3.8.3 Exaggerated Vendor Prices

In interpreting the empirical data, as shown in Table (5.1), it appears that interviewees do not share the same perceptions regarding the importance of the challenge of exaggerated vendor prices. The Head of E-government Services (Development Unit) and the Head of Internet (Operation Unit) claim that this challenge is not really important because in the final analysis it is the decision of the DM organisation based on their requirements. The Head of Internet (Operation Unit) said:

> *"...the prices can always be reduced somehow. But, the important factors are the vendors who are implementing the solution and the solution itself."*

On the other hand, the Security Administrator and the Head of Operations & Network Services claim that it is an important challenge. The former says:

> *"Yes, it is the decision of the organisation to buy or not. But, sometimes, the challenge is that the level and standard of technology required is only available from one vendor".*

5.2.3.9 Other Technical Challenges at DM

Based on empirical data, this sub-section seeks to explore, identify the importance of, and present the strategies for overcoming other technical challenges that were not included in the conceptual model proposed in Chapter 3.

5.2.3.9.1 The Evolution of the Technology Challenge

It seems (see Table 5.1) that interviewees share the same perceptions regarding the challenge of the evolution of the technology (there is always new technology) after installation of software that enables the DM to reach a transactional e-government. The Head of e-government Services (Development Unit) and Security Administrator claim that the evolution of the technology is a very important challenge following the installation of software that enables the DM to reach a transactional e-government. The Head of Operations & Network Services claims that the evolution of the technology is an important challenge. The Head of e-government Services (Development Unit) reported that the evolution of the technology challenge can be solved by:

- Following up with new technology continuously.
- Stopping regularly every six months to evaluate the performance of the system.

5.2.3.9.2 The Availability of Technical Resources (Skilled Employees of Vendors)

Table (5.1) reveals that there is agreement among interviewees regarding the importance of the challenge of the availability of technical resources (skilled employees of vendors). The Head of Operations & Network Services and Security Administrator claim that the availability of technical resources (skilled employees of vendors) is a very important challenge. The Head of e-Government Services (Development Unit) claims that the availability of technical resources is an important challenge, he said:

> "*...during the case study of any upcoming project the set of skills needed have to be identified and then a decision based on this will be made to outsource or develop in house. If outsourced, the vendors team's CVs should be required as part of the proposal.*"

The Head of Operations & Network Services reported that the availability of technical resources (skilled employees of vendors) challenge could be solved by:

- Looking at the history of the companies and choosing the ones with experience and good reputations.

5.2.3.9.3 After Sales support (from Vendors)

In interpreting the empirical data – as shown in Table (5.1) above - it appears that the interviewees share the same perceptions regarding the challenge of after sales support (from vendors). Interviewees agreed that after sales support (from vendors) is a very important challenge. The Head of e-Government Services (Development Unit) justified the great importance of this challenge of after sales support (from vendors), he said:

> *"...it is a costly activity, especially within an e-solution environment, therefore, we at DM do not depend on vendors' support, we provide the support ourselves."*

The Head of Operations & Network Services and Security Administrator reported that the after sales support (from vendors) challenge can be solved by:

- Asking other organisations about the reputation of the vendor.
- Writing contracts and agreements extremely carefully.
- Use of SLA "Service Level Agreements", Contracts & Bank Guarantees (minimum 15%) of the total solution to control and make sure of the after sales implementation support.

5.2.3.9.4 Viruses and Worms have Come from Connection with other Departments or Companies

As can be seen from Table (5.1), there was almost complete agreement among the interviewees that viruses and worms have come from connection with other departments or companies, and that this is a very important challenge; the Head of e-government Services (Development Unit) in particular claimed that this is an important challenge. The Head of Operations & Network Services said:

> *"...viruses and worms that have come from the connection with other departments or companies is a real challenge for us to keep our environment virus clean since new viruses are being created on a daily basis."*

The Head of e-Government Services (Development Unit) claims that the anti-virus technology currently is very advanced and can take care of securing your infrastructure. The Security Administrator also claims that a good security policy in place will reduce the risk but it will not take it away 100%. The Head of Operations & Network Services reported that the challenge of viruses and worms that have come from connections with other departments or companies could be solved by:

- Using different layers of Virus protection and multiple technologies and products such as different Antivirus packages and other technologies like AntiSpam solutions.
- Keeping the system patched with the latest security updates.

5.2.4 Organisational Challenges Facing transactional e-government systems at DM

To collect data regarding organisational challenges facing transactional e-government systems at DM, four stakeholders who were involved in the implementation of the e-government project were interviewed using structured interviews. Each interviewee was asked certain questions (see section B, Appendix B). The interviewees were: (1) Head of E-Government Services (E.S); (2) Head of Operations & Network Services (O.N); (3) Head of Strategy Unit – e-Government Section (S.U) and, (4) Head of E-Government Services (Support Unit) (H.S).

Interviewees were asked to identify the importance of organisational challenges facing the transactional e-government system at DM. The level of importance presented in the following table follows a scale similar to that used by Miles and Huberman (1994) (see sub-section 5.2.3).

This sub-section aims to analyse the perceptions of interviewees related to organisational challenges facing transactional e-government systems and the strategies used (suggested) in their organisation to overcome each organisational challenge. Table 5.2 summarises the perceptions of the interviewees when asked to identify the importance of organisational challenges. It should be noted that, based on the common characteristics, organisational challenges facing transactional e-government systems have been divided (see sub-section 3.7.1) into: (a) employee challenges that include the

lack of IT skilled employees, resistance to change (from traditional to electronic ways of working) by the employees, and changing the culture of employees (government processes should be organised for the convenience of the citizens rather than the convenience of the department); (b) re-engineering of internal process challenges that include, the transforming of existing off-line data to digitalisation, double process front–end (the interaction between government organisations and its customers needs to be offered in both a traditional manner and also through the internet), time required to reengineer and change the internal business processes of the organisation and, finance required to reengineer and change the internal business processes of the organisation; (c) adopting new legislation to deal with new issues such as electronic receipts and digital signatures; and (d) change of organisational structure.

Table 5.2: Organisational Challenges Facing Transactional E-government Systems in DM

Categorisation of organisational Challenges	Organisational challenges facing transactional e-government systems in DM.	E. S	S. U	H. S	O.N
Employees	Lack of IT skilled employees	○	○	○	●
	Resistance to change (from traditional to electronic ways of working) by the employees represents a challenge.	●	○	●	○
	Changing the culture of employees (government processes should be organised for the convenience of customers rather than the convenience of the department).	●	●	●	●
Reengineering of internal Processes	The transforming of existing off-line data to digitalisation.	○	○	●	○
	Double process front–end (the interaction between government organisations and its customers needs to be offered in both a traditional manner and also through the internet).	○	○	○	○
	Time required to reengineer and change the internal business processes of the organisation.	●	○	○	○
	Finance required to reengineer and change the internal business processes of the organisation.	○	○	○	○
New legislation	Adopting new legislation to deal with new issues such as electronic receipts and digital signatures.	○	○	○	○
Changes of Organisational Structure	Change of organisational structure	○	●	○	○
Other	The speed of introducing (adopting) new legislation	○	○	●	●

5.2.4.1 Employee Challenges

5.2.4.1.1 Lack of IT Skilled Employees

In interpreting the data (see Table 5.2), it appears that interviewees almost all share the same perceptions regarding the importance of the challenge of the lack of IT skilled employees: they almost all claim that it is an important challenge. The Head of Operations & Network Services claims that the lack of IT skilled employees is a very important challenge. Interviewees reported that this challenge could be solved by:

- Training employees.
- Encouraging employees by giving them prizes, for example more money or certificates, to train to deal with new technology. (The interviewees said that they use this solution sometimes).
- Employing (contracting) new skilled employees.
- Bringing many new, skilled people into the organisation not only to train employees but also to deliver new technology.

5.2.4.1.2 Resistance to Change from Traditional to Electronic Ways of Working

It appears (see Table 5.2) that there is agreement among interviewees regarding the importance of the challenge of resistance to change (from traditional to electronic ways of doing their work) by employees. The Head of E-Government Services (Support Unit) and the Head of E-Government Services claim that this challenge is very important; whereas the Head of Operations & Network Services and the Head of Strategy Unit claim that it is an important challenge. The Head of Operations & Network Services said:

> *"Resistance to change (from traditional to electronic ways of doing their work) by the employees is a very important challenge, but full support from the higher levels of leadership makes it important".*

However, interviewees reported that the challenge of the resistance to change from traditional to electronic ways of working could be solved by:

- Arranging workshops for employees to upgrade their knowledge of e-government.

- Raising the awareness of e-government by sending emails to employees describing the importance and benefits of e-government to customers and employees.
- Assuring employees that e-government will not affect negatively the authority and the job of employees.
- Managing the change early in the project.
- Starting from the top by convincing the manager of the importance and benefits of e-government.

5.2.4.1.3 Changing the Culture of Employees

Data interpretation (see Table 5.2) shows that interviewees share the same perceptions regarding the importance of the challenge of changing the culture of employees (government processes should be organised for the convenience of customers rather than the convenience of the department). Interviewees all said that changing the culture of employees was a very important challenge. Interviewees reported that this challenge could be solved by:

- Raising the awareness of e-government by sending emails to employees describing the importance of e-government to customers and employees.
- Arranging workshops for employees to upgrade their knowledge of e-government.
- On-the-job training in using e-services.
- Training employees in customer service concepts.
- Arranging workshop for both customers and employees.

5.2.4.2 Reengineering of Internal Processes Challenges

5.2.4.2.1 Transforming the Existing Off-Line Data to Digitalisation

The empirical data (see Table 5.2) also shows that interviewees share similar perceptions regarding the importance of the challenge of transforming the existing off-line data to digitalisation. All claim that it is an important challenge except the Head of E-Government Services (Support Unit) who claims that it is a very important challenge. The Head of Operations & Network Services said that the process of transforming existing off-line data to digitalisation happens automatically as part of the

transformation to e-government; he also said that once you have IT systems and people feed information into it, the transformation happens. Interviewees reported that the challenge of transforming the existing off-line data to digitalisation could be solved by:

- Identifying the data that needs to be digitalised from the beginning of the project (early plan).
- Using technical solutions such as databases.
- Consulting specialist companies and benefiting from their experience.

5.2.4.2.2 Double Process Front–End

Interviewees – as shown in Table 5.2 – all share similar perceptions regarding the importance of the challenge of double process front–end (the interaction between government organisations and its customers needs to be offered in both a traditional manner and also through the internet). All claim that it is an important challenge except the Head of the Strategy Unit who says that it is not an important challenge because the employees can be divided into two groups, one to handle internet services the other to handle counter services. Furthermore, providing on-line services reduces pressure on the employees who are dealing with counter services. The double process front–end challenge can be solved by:

- Dividing employees into two groups: one to handle Internet services, the other to handle counter services. However, both groups must be able to handle traditional *and* Internet work.

5.2.4.2.3 Time Required to Re-engineer and Change the Internal Processes

Table (5.2) shows that interviewees do not share the same perceptions regarding the importance of the challenge of the time required to reengineer and change the internal processes. The Head of E-Government Services (Support Unit) claims that it is not an important challenge; on the other hand, the Head of Operations & Network Services and the Head of Strategy Unit claim that it is an important challenge. The Head of e-Government services claims that it is very important challenge, he says,

"...the more re-engineering there is the better chance there is that the service will be useful to the customers."

The Head of Operations & Network Services claims that time required to re-engineer and change the internal processes challenge can be solved by:

- Defining the requirements and the needs of the re-engineering.
- Reducing the cycle of approval to a minimum.

5.2.4.2.4 Finance Required to Re-engineer and Change the Internal Processes

Table (5.2) reveals that interviewees do not share the same perceptions regarding the importance of the challenge of the finance required to reengineer and change the internal processes. The Head of E-Government Services (Support Unit) and the Head of E-Government Services claim that it is not an important challenge. The latter justified the lack of importance of this challenge by claiming that there was a high level of support from the leadership. On the other hand, the Head of Strategy Unit and the Head of Operations & Network Services claim that it is an important challenge. The former claims that the money is available in the DM, the challenge lies in getting and distributing this money. He said that the finance required to re-engineer and change the internal processes challenge could be solved by:

- Support of the leadership and by specifying a fixed budget.

The *overall* solutions for dealing with the different challenges of re-engineering of the internal processes at DM are:

- Awareness of the employees of the importance of the re-engineering of processes.
- Awareness of the employees as to the benefits of re-engineering of the processes before moving them to e-government.
- Enough time being provided for the project team to work on the re-engineering processes.
- Involvement of all levels of employees in the re-engineering processes.
- Including everyone who may be affected by the process of re-engineering: the manager, employees and customers (if possible).

- Consulting specialist companies, especially in the first phases of the project where e-government knowledge is very limited and resources low. (The Head of E-Government Services claims that this solution is used for almost all organisational challenges).

5.2.4.3 New Legislation Challenge

In interpreting the data (see Table 5.2), it seems that almost all interviewees share the same perceptions (except the Head of Operations & Network Services) regarding the importance of the challenge of adopting new legislation (inside the DM organisation) to deal with new issues such as electronic receipts and digital signatures. The Head of Operations & Network Services was the only one to claim that this was an important challenge. He said that the challenge of adopting new legislation could be solved by:

- Ensuring the support of the higher management inside the organisation.
- Defining the legislation that needs to be changed or introduced in order to facilitate reaching an organisational transactional e-government.

On the other hand, the other interviewees claimed that it is not an important challenge because: (a) they were given a high level of support from the leadership of the Dubai Municipality and the Dubai government; (b) there had been good planning from the start of the project; and (c) there were already benefits from the legislation adopted for e-commerce. The Head of E-Government Services said that it is a very important question

> *"because in many cases new legislation is a very important challenge; however, in our case it is not an important challenge."*

The Head of Strategy Unit and the Head of E-Government Services (Support Unit) said:

> *"New legislation has not been an important challenge so far. But it is expected to be important in the future."*

5.2.4.4 Change of Organisational Structure Challenge

In interpreting the data (see Table 5.2), it seems that almost all interviewees share the same perceptions regarding the importance of the challenge of the change of the organisational structure. Interviewees all claim that it is an important challenge except the Head of Strategy Unit who claims that it is a very important challenge. However, the interviewees report that the solutions for dealing with change of the organisational structure challenge are:

- Convincing those concerned of the importance of management structural changes and requirements.
- Identifying the needs for structural changes to the organisation.
- Adopting new organisational department(s) to ensure the success of the e-government project.
- Consulting specialist companies especially during the first phases of the project.

5.2.4.5 Other Organisational Challenge(s) at DM

Based on empirical data, this sub-section seeks to explore, identify the importance of, and present the strategies for overcoming other organisational challenge(s) that were not included in the conceptual model proposed in Chapter 3.

5.2.4.5.1 The Speed of Introducing (Adopting) New Legislation

It appears (see Table 5.2) that there is agreement among interviewees regarding the importance of the challenge of the speed of introducing (adopting) new legislation. The Head of Operations & Network Services and the Head of E-Government Services (Support Unit) claim that the challenge of the speed of introducing (adopting) new legislation is very important, whereas the Head of E-Government Services and the Head of Strategy Unit claim that it is an important challenge. The Head of Operations & Network Services, from his perspective, justified the great importance of the challenge of the speed of introducing (adopting) new legislation; he said:

"...the technology is moving very fast and changing the way people do business or give commitments. Therefore, it is important that we have new legislation introduced fast to legalize the new ways of doing things. However, on the other hand we all know that changing laws or introducing new laws takes time and effort and that is where we face the challenge."

The Head of Operations & Network Services claims that the challenge of the speed of introducing (adopting) new legislation can be solved by:

- Support of the leadership.
- Good planning from the start of the project.

5.3 Case Study Two–Naturalization & Residency Administration (DNRD)

5.3.1 Background to the Organisation

The second case study is that of the Naturalization & Residency Administration (DNRD), which is one of the government organisations in Dubai city (see Sub-section 5.2.1). According to the information taken from eight interviews, the DNRD is responsible for citizens' passports, issue of entry permits (visas), issue of residency permits, and entry/exit to/from country and control of Dubai establishments. The DNRD employs around 2500 employees and provides services and information to citizens, businesses and public administration. It provides the following services and information to customers (see Section 2.9):

- Information services that enable customers to obtain information about the organisation.
- Communication services that give the opportunity for interaction with groups of people and/or individuals.
- Transaction services that include submitting data or getting products or services online.

According to the criteria developed by the author of this thesis (see Chapter 3), to reach transactional e-government within government organisations, the DNRD has already reached a transactional e-government system.

The language used for the software in the DNRD is mainly ASP.net because it supports Microsoft. Due to the different applications, Java, C++ and Oracle are also used. Java is used for linking with central e-government, C++ is used as an intermediate method of providing services to customers (e-forms) online, and Oracle is used for dealing with the Database.

5.3.2 Technical Challenges Facing the Transactional E-government System at Naturalization & Residency Administration – Dubai (DNRD):

To collect data regarding technical challenges facing transactional e-government system at the DNRD – Dubai (DNRD), four stakeholders involved directly in implementation of the e-government project were interviewed using structured interviews. Each interviewee was asked questions (see section C – Appendix B). The interviewees were the Projects Manager (P.M); the Head of Information System (I.S); the Programmer (P); and the Senior Network & Security Consultant (S.C).

Interviewees were asked to identify the importance of technical challenges facing the transactional e-government system at DNRD. The level of importance presented in the following table follows a scale similar to that used by Miles and Huberman (1994) (see sub-section 5.2.3).

This sub-section aims to analyse the perceptions of interviewees related to technical challenges facing the transactional e-government system at DNRD and the strategies used (suggested) in their organisation to overcome each technical challenge. Table 5.3 summarises the perceptions of the interviewees when asked to identify the importance of each technical challenge. The categorisation of technical challenges, based on the common characteristics, followed in Table 5.3, is the same as that used in Table 5.1.

Table 5.3: Technical Challenges Facing Transactional E-government System in DNRD

Categorisation of technical Challenges	Technical challenges facing transactional e-government system at DNRD	P.M	I .S	P	S.C
After installation software system	Maintaining high levels of performance and service availability	●	●	●	●
	Trouble shooting technical problems	○	○	●	○
Technical standards	Setting technical standards for all e-services	○	○	○	●
The capability of the infrastructure	The capability of the infrastructure in terms of handling the range and number of transactions	●	○	●	●
Security	Ensuring the security of confidential data stored in government organisation databases and e-government sites from attack and misuse	●	●	●	●
	Ensuring privacy of personal data that is provided by customers as part of obtaining government services	●	●	●	●
Financial	Finance required to install a software system	○	○	○	○
	Finance required to provide more computers	○	○	○	○
Back–end servers	The back–end servers (communication failures between internal systems and the external web–server)	●	●	●	●
Compatibility	Compatibility of e-government technology available to the internal system	○	●	○	○
Challenges of vendors	Vendors' pressure to buy their solutions	○	○	○	○
	False promises of vendors	●	●	○	○
	Exaggerated vendor prices	○	○	○	○
Other	The evolution of the technology (there is always new technology)	○	●	●	-
Other	The availability of technical resources (skilled employees of vendors).	○	○	○	-
Other	After sales support (from vendors)	○	○	●	-
Other	Viruses and worms which have come from the connection with other departments or companies	○	●	●	-

5.3.2.1 Challenges After Installation of Software

5.3.2.1.1 Maintaining High Levels of Performance and Service Availability

Table 5.3 shows that the interviewees all agreed that maintaining high levels of performance and service availability is a very important challenge. The Sr. Network & Security Consultant said:

"We at (DNRD) are trying to achieve two main targets: (a) high level of availability of service, and (b) high level of performance."

Interviewees said that the maintaining of high levels of performance and service availability challenge could be solved by:

- Taking technical precautions to ensure high levels of performance and high levels of availability.
- Training employees to deal with any new software system.
- Consultancy with specialised companies for a particular problem.
- Applications should be run on two servers because if one server were shut down the other would still be working.
- Specifying teamwork to monitor and make sure of the availability of services.
- Continuous evaluation of the performance of the system.

5.3.2.1.2 Trouble Shooting Technical Problems

It appears (see Table 5.3) that the interviewees almost all share the same perceptions regarding the importance of the challenge of trouble shooting technical problems. They all – except for the programmer - agreed that it is an important challenge. The Projects Manager claims that trouble shooting technical problems comes after the testing stage or through the observations of customers. The programmer claims that it is a very important challenge. He suggested a strategy for dealing with this challenge: he said:

"*If the problem is new, you should firstly know what the problem is and what the reasons are for this problem. But, if the problem is not new, you can learn from the mistakes*".

However, interviewees reported that the challenge of trouble shooting technical problems could be solved by:

- Learning from mistakes.
- Good testing leads to fewer problems, if testing is done properly, then the problems will be minimized.
- Teamwork for testing and continuous assessment.

- Training employees to deal with new software systems.
- Documentation of all problems and solutions used for each of them would help when facing the same problem in the future.

5.3.2.2 Technical Standards' Challenge

In interpreting the empirical data (see Table 5.3), it appears that the interviewees almost all shared the same perceptions regarding the importance of the challenge of setting technical standards for all e-services. Interviewees all – except Sr. Network & Security Consultant - agreed that it is an important challenge. The Sr. Network & Security Consultant claims that it is a very important challenge. The Projects Manager said:

> *"Using a clear standard for the services provided to the customers will lead more control and less problems on the system. However, using a clear standard requires much more effort, especially in the first stages of the project, through studying of the requirements carefully and proper planning and design."*

The interviewees reported that the setting of technical standards for all e-services challenge could be solved by:

- Consulting a specialized company so as to build the required standard.
- Ensuring that the chosen technical standard can be easily used by customers.
- Learning from mistakes.
- Training employees to deal with new software systems.

5.3.2.3 The Capability of the Infrastructure Challenge

In interpreting the empirical data, as can be seen from Table 5.3, it appears that the interviewees almost all share the same perceptions regarding the importance of the challenges of the capability of the infrastructure in terms of handling the range and number of transactions. All interviewees – except for the Head of Information System who claims that this is an important challenge - agreed that this is a very important challenge. The Sr. Network & Security Consultant claims:

"...this is a very important challenge because the growth of customers is very high."

The Project Manager claims that:

"...the more infrastructure strength, the more the results will be better and the capability of accepting more customers will be bigger."

The Projects Manager expected that the capabilities of the infrastructure in terms of handling the range and number of transactions would be 5000 to 10000 transactions a day in the DNRD. The interviewees said that the challenge of the capability of the infrastructure in terms of handling the range and number of transactions could be solved by:

- Knowing the expectations of how many transactions will be processed online and providing an extra margin. The Sr. Network & Security Consultant said that this margin should be 50%.
- Providing a flexible or expandable infrastructure by adding more servers so that a better performance and an extended service can be provided for the users.
- Using particular switches or machines (Load Balancer) that control and distribute the load among the servers.

The Head of Information System claims that they did not face problems regarding the capability of the infrastructure in terms of handling the range and number of transactions

"because we put the feature of estimating of the numbers of users for the software system in the organisation; but because it represents a concern in our organisation, it can be considered an important challenge."

5.3.2.4 Security Challenges

5.3.2.4.1 Security of Confidential Data

As shown in Table 5.3, the interviewees almost all share the same perceptions regarding the importance of the challenge of ensuring the security of the confidential data stored in government organisations' databases and on e-government sites from attack and misuse. Interviewees all agreed that this is a very important challenge. The Programmer claims that:

> "*...it is a very important challenge because the information is sensitive: it is government information and people data.*"

The Sr. Network & Security Consultant claims:

> "*...as we were very worried about ensuring the security, we adopted strong precautions.*"

The interviewees reported that the security challenge could be solved by:

- Specifying an official to be responsible for computer security.
- Assessing systems regularly to make sure security precautions are being implemented.
- Backing-up information continually and storing this backup in a separate location.
- Providing on-going computer security training to employees.
- Consulting specialist companies, especially at the test stage of the project.
- Involving only trustworthy employees on security issues.
- Using tools such as Firewall to ensure the security of data.
- Adopting regulations that ensure the security of data.

5.3.2.4.2 Privacy of Personal Data

In interpreting the empirical data (see Table 5.3), it appears that the interviewees all share the same perceptions regarding the importance of the challenge of ensuring privacy of personal data that is provided by customers as part of obtaining government

services. Interviewees all agreed that privacy of personal data is a very important challenge. The Projects Manager claims that privacy of personal data is a very important challenge because:

"...it is related to customer trust and the reputation of the organisation."

Interviewees said that the privacy of personal data challenge could be solved by:

- Limiting access to personally identifiable information.
- Training government employees in the importance of privacy. The Projects Manager said using terms of enhancement or upgrading awareness is more suitable than using the term training.

The Head of Information System claims that although they did not face much problems regarding the challenges of ensuring the security of the confidential data stored in government organisations' databases and on e-government sites from attack and misuse and ensuring privacy of personal data that is provided to citizens as part of obtaining government services, they are, nevertheless, very important challenges

"because we put them into consideration during the design and implementation stage of the e-government project and we still worry about it."

5.3.2.5 Financial Challenges

5.3.2.5.1 Finance Required to Install a Software System

Interviewees (as shown in Table 5.3) almost all share the same perceptions regarding the importance of the challenge of finance required to install a software system. They all agreed that this is not an important challenge because there is a fixed budget and money is available. The Projects Manager, on the other hand, claims that it is an important challenge; he said that, although there is a fixed budget and finance is available, the problem is using the available money in the right place.

5.3.2.5.2 Finance Required to Provide More Computers

It appears (see Table 5.3) that interviewees share the same perceptions regarding the importance of the challenge of finance required to provide more computers. Interviewees all agreed that this is not an important challenge because finance is available. The Projects Manager said that the finance required to install a software system was an important challenge while the finance required to provide more computers was not, when asked to justify this answer, he claimed:

> "*...because the cost of buying computers is very low in comparison with the high cost required to buy and install software*".

5.3.2.6 Back–End Servers Challenge

There was (as can be seen from Table 5.3) agreement among interviewees regarding the importance of the challenge of back–end servers (communication failures between internal systems and the external web–server). Interviewees all agreed that this is a very important challenge. The Programmer said:

> *"Failures of communication between internal systems (back –end servers) and the external web–server is very important challenge because the communication between the users and the organisation is significant, so, this communication must not fail any time."*

However, interviewees reported that the back–end servers challenge could be solved by:

- Installation of tools to monitor back–end server performances.
- The use of tools to monitor the availability of networks. The Sr. Network & Security Consultant reported that the tool used in the DNRD for this purpose was CISCO.
- Continuous evaluation of the system.
- 24-hour operation staff to be made available.

5.3.2.7 Compatibility Challenge

In interpreting the empirical data (see Table 5.3), it appears that the interviewees do not share the same perceptions regarding the importance of the challenge of the compatibility of e-government technology available to the internal system. The Sr. Network & Security Consultant and programmer claim that is an important challenge. However, the Head of Information System claims that it is a very important challenge. He said:

> *"...we have already faced some problems regarding the challenge of the compatibility of e-government technology available to the internal system. So, sometimes we had to change our internal system to be compatible with available solutions."*

Interviewees reported that the compatibility of e-government technology available to the internal system challenge could be solved by:

- Studying technological solutions carefully to ensure high compatibility.
- Investing strong integration solutions.
- Trying to identify the solutions compatible with the internal system.

On the other hand, the Projects Manager claims that the compatibility of e-government technology available to the internal system is not an important challenge because they are studying to use a software intermediate (called e-book) that can deal with and make integration with different types of databases and applications easily.

5.3.2.8 Vendors' Challenges

5.3.2.8.1 Vendors' Pressure to Buy their Solutions

In interpreting the empirical data (see Table 5.3), it appears that the interviewees almost all share the same perceptions regarding the importance of the challenge of vendor pressures when buying solutions. Interviewees reported that this challenge is not really important because in the final analysis it is the decision of the DNRD organisation to purchase the required solutions. The Sr. Network & Security

Consultant claims that they have qualified technical teams who choose what they really need. However, the Head of Information System reported that it is an important challenge; he said that vendors' pressure to buy their solutions challenge could be solved by:

- Limiting the vendors based on the organisations' needs.

5.3.2.8.2 False Promises of Vendors

There is (as shown in Table 5.3) almost agreement among interviewees regarding the importance of the challenge of false promises of vendors. The Projects Manager and Head of Information System claim that this is a very important challenge. The Sr. Network & Security Consultant claims that this is an important challenge. Interviewees reported that false promises of vendor challenges could be solved by:

- Adopting clear contracts called SLA (Service Level Agreement) with strong penalties and by selecting well-known companies.

On the other hand, the programmer claims that false promises by vendors are not an important challenge.

5.3.2.8.3 Exaggerated Vendor Prices

As shown in Table 5.3 interviewees do not share the same perceptions regarding the importance of the challenge of exaggerated vendor prices. The Projects Manager and Head of Information System claim that this an important challenge and can be solved by:

- Studying carefully all offers and choosing the best based on the requirements of the project.

On the other hand, the Sr. Network & Security Consultant and the programmer both claim that exaggerated vendor prices are not an important challenge because they can look at different offers online and decide on the best for them. It is finally their decision.

5.3.2.9 Other Technical Challenges at DNRD

Based on empirical data, this sub-section seeks to explore, identify the importance of, and present the strategies for overcoming other technical challenges that were not included in the conceptual model proposed in Chapter 3.

5.3.2.9.1 The Evolution of the Technology Challenge

It seems (see Table 5.3) that interviewees share the same perceptions regarding the importance of the challenge of the evolution of the technology (there is always new technology) after the installation of the software that enabled the DNRD to reach a transactional e-government. The Head of Information System and the programmer claim that the evolution of the technology is a very important challenge following the installation of software that enabled the DM to reach a transactional e-government. The Programmer said:

> *"After installing of the software that you need to maintain the system, the process of maintenance may require installing of a new program that requires new (the latest) hardware. We (at the DNRD) always update our systems with the latest technology."*

The Projects Manager claims that the evolution of the technology is an important challenge. He said:

> *"New technology is an important challenge specially because there is always new technology, usually when software companies release new technology it will be compatible with the previous one but the thing is that you have to make more effort to get used to the new feature. Sometime while developing we have to make it more generic and open to have ability for upgrade the application when new technology comes."*

The Head of Information System reported that the challenge of the evolution of the technology could be solved by:

- Adopting standards for using technology by all parties to the e-government system.
- Building communities for evaluating new technology.
- Conducting periodic meetings to discuss issues & barriers.

5.3.2.9.2 The Availability of Technical Resources (Skilled Employees of Vendors)

There is (as shown in Table 5.3) almost total disagreement among interviewees regarding the importance of the challenge of the availability of technical resources (skilled employees of vendors). The programmer claims that the availability of technical resources (skilled employees of vendors) is not an important challenge; he said:

> *"If the vendor doesn't have the qualified employees to implement the new technology we'll not buy from him because if we did, we would not get all the benefits from this technology. We can seek another vendor and if there wasn't one then this would be a very important challenge for us, and we should train our staff in the implementation of this technology."*

On the other hand, the Head of Information System and the Projects Manager claim that the availability of technical resources (skilled employees of vendors) is an important challenge. The Head of Information System said:

> *"At DNRD we can always replace the vendors in its initial stages of the project as soon as we discovered that they are unable to handle the requirements of the project. However, we have some evaluation and procedures for choosing the right vendors."*

The Projects Manager added that:

> *"Yes, the availability of technical resources (skilled employees of vendors) is an important challenge, but usually (at DNRD) we avoid that by selecting our*

vendors carefully through: meet their technical staff before project start, and study the vendor history (previous projects, other clients, etc.)."

The Head of Information System and the Projects Manager reported that the challenge of the availability of technical resources (skilled employees of vendors) could be solved by:

- Selecting vendors carefully and studying the vendors' history (such as previous projects, other clients, integrity.).
- Meeting the technical staff of the vendors before the project starts.
- Adopting evaluation & assessment procedures for choosing vendors and replacing them at the initial stage as soon as discovering that they would not be capable of handling the project.

5.3.2.9.3 After Sales Support (from Vendors)

As shown in Table 5.3 interviewees do not share the same perceptions regarding the importance of the challenge of after sales support (from vendors). The Head of Information System claims that after sales support (from vendors) is not an important challenge. On the other hand, the programmer and the Project Manager claim that after sales support (from vendors) is very important and an important challenge, respectively. The Programmer justified the great importance of this challenge; he said:

"After sales support is one of the major point in evaluating the vendors. All contracts between the vendors and the organisation, therefore, must contain reference to the after sales support with penalties."

The programmer and the Project Manager reported that the after sales support (from vendors) challenge can be solved by:

- Obtaining references regarding the after sales support with penalties, in all contracts.
- Selecting vendors carefully and studying the vendor's history (such as previous projects, other clients, integrity.).

5.3.2.9.4 Viruses and Worms have Come from the Connection with other Departments or Companies

Interviewees (as shown in Table 5.3) almost all share the same perceptions regarding the importance of the challenge of viruses and worms that have come from connections with other departments or companies. The Head of Information System and the programmer claim that viruses and worms have come from connections with other departments or companies are a very important challenge. The Projects Manager claims that this is an important challenge. Interviewees reported that the viruses and worms that have come from connections with other departments or companies' challenge could be solved by:

- Upgrading and updating the system with the latest Anti-Virus software regularly.
- Limiting access to other departments and not allowing any unsecured connection with any devices.

5.3.3 Organisational Challenges Facing transactional e-government systems at the Naturalisation & Residency Administration – Dubai - (DNRD)

To collect data regarding organisational challenges facing transactional e-government systems at DNRD, four stakeholders who were involved directly in implementation of the e-government project were interviewed using structured interviews. Each interviewee was asked certain questions (section B, Appendix B). The interviewees were: The Head of Information System (I.S); the Head of Strategic Planning Section (S.P); Deputy Section – Head of Operation (H.O); and the Manager of Section of Programming Applications (P.A). Interviewees were asked to identify the importance of organisational challenges already faced by the DNRD organisation in order to reach a transactional e-government system. The level of importance presented in the following table follows a scale similar to that used by Miles and Huberman (1994) (see sub-section 5.2.3).

This sub-section aims to analyse the perceptions of interviewees related to organisational challenges facing the transactional e-government system at DNRD and

the strategies used (suggested) in their organisation to overcome each organisational challenge. Table 5.4 summarises the perceptions of the interviewees when asked to identify the importance of each organisational challenge. The categorisation of organisational challenges, based on the common characteristics, followed in Table 5.4 is the same as that used in Table 5.2.

Table 5.4: Organisational Challenges Facing the Transactional E-government System at DNRD

Categorisation of organisational Challenges	Organisational challenges facing transactional e-government system at DNRD	I. S	S. P	H. O	P. A
Employees	The lack of IT skilled employees	●	●	●	●
	Resistance to change (from traditional to electronic ways of working) by the employees represents a challenge.	○	●	○	○
	Changing the culture of employees (government processes should be organised for the convenience of the customers rather than the convenience of the department).	●	●	●	○
Reengineering of internal Processes	The transforming of existing off-line data to digitalisation.	●	●	●	●
	Double process front–end (the interaction between government organisations and its customers needs to be offered in both a traditional manner and also through the internet).	○	○	○	○
	Time required to reengineer and change the internal business processes of the organisation.	○	○	○	○
	Finance required to reengineer and change the internal business processes of the organisation.	○	○	○	○
New legislation	Adopting new legislation to deal with new issues such as electronic receipts and digital signatures.	○	○	○	○
Changes of Organisational Structure	Change of organisational structure	○	○	○	○
Other	The speed of introducing (adopting) new legislation	○	●	○	●

5.3.3.1 Employee Challenges

5.3.3.1.1 The Lack of IT Skilled Employees

In interpreting the empirical data (see Table 5.4), it appears that interviewees all share the same perceptions regarding the importance of the challenge of the lack of IT skilled employees. Interviewees all claim that it is very important challenge. The Head of Strategic Planning said:

"Lack of IT skilled employees is a very important challenge because you can easily change the system and deal with different technical problems, but it is difficult to change the mind and culture of employees."

Interviewees reported that the lack of IT skilled employees challenge could be solved by:

- Training employees; the Head of Strategic Planning claims this is the main solution for lack of IT skilled employees; he added that they need to put a schedule in place for training employees until they reach the level needed.
- Encouraging employees by giving them prizes, for example more money or certificates, to train to deal with new technology. (The interviewees said that they use this solution sometimes).
- Employing (contracting) new skilled employees to educate, help and be a good example to the existing employees.
- Consulting a specialist company.
- Continuous upgrading of knowledge of employees about new technology.

5.3.3.1.2 Resistance to Change from Traditional to Electronic Methods of Working

In interpreting the empirical data (see Table 5.4), it appears that there is agreement among interviewees regarding the importance of the challenge of resistance to change (from traditional to electronic ways of doing their work) by employees; interviewees all see this as an important challenge, except for the Head of Strategic Planning who claims that this is a very important challenge. However, interviewees reported that the challenge of resistance to change from traditional to electronic ways could be solved by:

- Arranging workshops for employees to upgrade their knowledge of e-government.
- Raising the awareness of e-government by sending emails to employees describing the importance and benefits of e-government to customers and employees.
- Assuring employees that e-government will not affect negatively the authority and the jobs of employees.

5.3.3.1.3 Changing the Culture of Employees

It appears (see Table 5.4) that interviewees almost all share the same perceptions regarding the importance of the challenge of changing the culture of employees (government processes should be organised for the convenience of customers rather than the convenience of the department). The Head of Information System and the Head of Strategic Planning claim that this is a very important challenge. The Head of Strategic Planning said:

> *"You can change the system, but the problem is how do you change the culture of employees. If you do not change the culture of employees, you cannot adopt an e-government system."*

The Manager of Programming Applications and the Head of Operations claim that this is an important challenge. Interviewees reported that the challenge of changing the culture of employees could be solved by:

- Initially arranging presentations that describe the benefits and importance of e-government as claimed by the Head of Information Systems.
- Raising the awareness of e-government by sending emails to employees describing the importance of e-government to customers and employees.
- Arranging workshops for employees to upgrade their knowledge of e-government.
- On-the-job training in using e-services.
- Training employees in customer service concepts.

5.3.3.2 Re-engineering of Internal Processes Challenges

5.3.3.2.1 Transforming the Existing Off-Line Data to Digitalisation

In interpreting the empirical data, (see Table 5.4) it seems that interviewees share the same perceptions regarding the importance of the challenge of transforming the existing off-line data to digitalisation. All claim that it is a very important challenge. The Head of Information System said:

"Transforming the existing off-line data to digitalisation is a very important challenge because it is time consuming."

Interviewees reported that the challenge of transforming the existing off-line data to digitalisation could be solved by:

- Studying the size of the problem.
- Identifying and prioritising the most important data to be digitalised.

5.3.3.2.2 Double Process Front–End

Interviewees (as shown in Table 5.4) all share the same perceptions regarding the importance of the challenge of double process front–end (the interaction between government organisations and its customers needs to be offered in both a traditional manner and also through the internet). All claim that it is not an important challenge because providing on-line services reduces the pressure on the employees who are dealing with counter services; in other words, the number of customers doing their work physically will be decreased.

5.3.3.2.3 Time Required for Re-engineering the Internal Processes

As can be seen from Table 5.4, interviewees share the same perceptions regarding the importance of the challenge of the time required to reengineer the internal processes of the organisation. All claim that it is an important challenge. Interviewees report that the time required to reengineer the internal processes challenge can be solved by:

- Creating timetables for carrying out the tasks.
- Dividing responsibilities among employees.
- Starting with the most important tasks.

5.3.3.2.4 Finance Required to Re-engineer the Internal Processes

In interpreting the empirical data (see Table 5.4), interviewees share the same perceptions regarding the importance of the challenge of the finance required to re-engineer the internal processes of the organisation. All claim that it is not an important

challenge because there was a high level of support from the leadership who provide a fixed budget. The finance required to re-engineer and change the internal processes is available in DNRD.

The *overall* solutions for dealing with the different challenges of re-engineering of the internal processes at DNRD are:

- Awareness of employees of the importance of the re-engineering of processes.
- Awareness of the employees as to the benefits of re-engineering of the processes before moving them to e-government.
- Enough time being provided for the project team to work on the re-engineering processes.
- Involvement of all levels of employees in the re-engineering processes.

5.3.3.3 New legislation Challenge

In interpreting the empirical data (see Table 5.4), it seems that all interviewees share the same perceptions regarding the importance of the challenge of adopting new legislation (inside the DNRD) to deal with new issues such as electronic receipts and digital signatures. Interviewees all claim that this is an important challenge; they also said that the challenge of adopting new legislation could be solved by:

- Ensuring the support of the higher management inside the organisation.
- Defining the legislation that needs to be changed or introduced in order to facilitate reaching an organisational transactional e-government.
- Showing the benefits of e-commerce legislations.
- Showing the benefits of the experience of other organisations.

5.3.3.4 Change of the Organisational Structure Challenge

In interpreting the empirical data (see Table 5.4), it appears that interviewees do not share the same perceptions regarding the importance of the challenge of the change of the organisational structure. The Head of Information System and the Manager of Programming Applications claim that this is not an important challenge. The Head of Information Systems said:

"In DNRD, the change of the organisational structure was not an important challenge because the process of restructuring has been done smoothly due to the support of the higher levels of management and their belief in the benefits and importance of e-government."

On the other hand, the Head of Operation and Head of Strategic Planning claim that this is an important challenge; they said that the change of the organisational structure challenge could be solved by:

- Convincing employees of the importance of management structural changes and requirements.
- Identifying the needs for structural changes to the organisation.
- Adopting new organisational department(s) to ensure the success of the e-government project.

5.3.3.5 Other Organisational Challenge(s) at DNRD

Based on empirical data, this sub-section seeks to explore, identify the importance of, and present the strategies for overcoming other organisational challenge(s) that were not included in conceptual model proposed in Chapter 3.

5.3.3.5.1 The Speed of Introducing (Adopting) New Legislation

It appears (see Table 5.4) that there is agreement among interviewees regarding the importance of the challenge of the speed of introducing (adopting) new legislation. The Manager of Programming Applications and Head of Strategic Planning claim that the speed of introducing (adopting) new legislation is a very important challenge. The Head of Strategic Planning claims that the speed of introducing (adopting) new legislation can be considered as a factor that leads to successful e-government. The Head of Information System and the Head of Operation claim that the speed of introducing (adopting) new legislation is an important challenge. The Head of Information System reported that the challenge of the speed of introducing (adopting) new legislation could be solved by:

- Enhancing the work process.

5.4 Conclusions

This chapter offers an analysis of the technical and organisational challenges facing the transactional e-government systems in two government organisations. The justification for selecting only two cases was discussed in section 5.1 and was based on the rationale that the two cases would provide sufficient data for this dissertation. The author suggests that a third case study could offer only marginal benefits.

The empirical data presented in this chapter enables the author to draw conclusions. However, it is important, before offering any conclusions, to link such conclusions with the empirical research methodology provided in Chapter 4, however, with the conclusions offered in this chapter now forming level 3 as shown in Table 4.4. The conclusions of the empirical data presented in this chapter can be drawn from the following paragraphs.

- The main findings derived from analysis of the data presented in this chapter regarding the technical challenges facing a transactional e-government system by two case studies (DM and DNRD) elicited that:

  - There was agreement among interviewees of two case studies that the following challenges are very important: maintaining high levels of performance and service availability, ensuring the security of confidential data stored in government organisation databases and e-government sites from attack and misuse, and ensuring privacy of personal data provided by citizens as part of obtaining government services. The great importance of ensuring the security and privacy was justified because these challenges are related to customer trust issues and the reputation of the organisations.
  - There was disagreement among interviewees regarding the importance of the finance required to install a software system. Some interviewee's claim that this is an important challenge while others claim that it is not an important challenge. Furthermore, the finance required to provide more computers and vendor pressure to buy their solutions are considered not important

challenges by almost all interviewees. The interviewees who claimed that the finance required to install a software system is important, while the finance required to provide more computers is not an important challenge, justified their answer by saying that the cost of buying computers is very low in comparison with the high cost required to buy and install software.

- The main findings derived from analysis of the data presented in this chapter regarding the organisational challenges facing a transactional e-government system from two case studies (DM and DNRD) revealed that:

  - Changing the culture of employees (government processes should be organised for the convenience of the customers rather than the convenience of the department) is considered a very important challenge by almost all interviewees. This refers to the fact that changing the culture of employees is much more difficult than changing the system. The adoption of an e-government system depends mainly on the ability to change the culture of employees.
  - Finance required to re-engineer and change the internal business processes of the organisation is considered a not important challenge by almost all interviewees.

Based on the empirical data presented and analysed in this chapter, new technical and organisational challenges facing transactional e-government systems that were not included in the conceptual model proposed in Chapter 3, were explored in this chapter and will be considered in the revised conceptual model in Chapter 6.

To realise the aim of this dissertation, based on empirical data derived from both case studies presented and analysed in this chapter, the importance of technical and organisational challenges facing transactional e-governments, which will be included in the revised conceptual model (see Figure 6.1), will be identified and then categorised based on the level of importance in Chapter 6. Furthermore, the strategies used (suggested) for overcoming each technical and organisational challenge, as proposed in the conceptual model presented in Chapter 3 and those strategies presented

for technical and organisational challenges explored based on empirical data, were presented in this chapter based on the perceptions of the interviewees from each case study. These strategies (derived from two case studies) will be reported in Chapter 6 and linked to those proposed in Chapter 3.

Chapter 6:

Model for Technical and Organisational Challenges Facing Transactional E-government Systems

Summary

The research issues identified in Chapter 3 were explored in the previous chapter, which dealt with technical and organisational challenges facing a transactional e-government system. In doing so, empirical data collected from the two case studies were presented and analysed. There was an indication, from the results, of the need for modifications to the conceptual model proposed in Figure 3.4 based on the issues in practice and on empirical evidence. The empirical data presented and analysed in Chapter 5 are taken into account in this chapter to revise the conceptual model, and then identify the importance, categorisation, and presentation of the strategies for overcoming technical and organisational challenges facing a transactional e-government system. In doing so, the aim of this dissertation will be satisfied by providing researchers and decision-makers with a frame of reference for technical and organisational challenges facing such a system.

6.1 Introduction

The literature presented in Chapter 2 reveals that there is an absence of theoretical models for technical and organisational challenges facing a transactional e-government system. Moreover, there is a lack of studies that focus on identification of the importance, categorisation, and presentation of strategies for overcoming these technical and organisational challenges. The empirical evidence presented in Chapter 5 has addressed this. In doing so, this dissertation has investigated management concerns to contribute towards providing a better understanding of technical and organisational challenges facing a transactional e-government associated with implementation of an e-government system.

Chapter 5 provided empirical data used to assess the conceptual model presented in Chapter 3, and satisfy the aim of this dissertation. This chapter seeks mainly to revise the conceptual model for technical and organisational challenges facing a transactional e-government system, based on empirical data derived from the previous chapter. This will be achieved by exploration of and combination with the revised conceptual model, based on common characteristics of other technical and organisational challenges facing transactional e-government that were not included in the conceptual model proposed in Chapter 3. As a result, in this chapter, a novel conceptual model for technical and organisational challenges facing a transactional e-government system will be proposed. Such a model could benefit government organisations through using it as a tool for decision-making when implementing an e-government system and attempting to reach a transactional e-government system.

Additionally, to meet the aim of this dissertation, this chapter, based on empirical data, seeks to: (a) identify the importance of technical and organisational challenges facing a transactional e-government system, (which are included in the revised model); (b) categorise technical and organisational challenges facing transactional e-government systems, (which are included in the revised model) (see Figure 6.1), based on the level of importance, and (c) provide strategies used (suggested) to overcome technical and organisational challenges facing a transactional e-government system, which are included in the revised model.

6.2 Lessons Learned from Case Studies

This section aims to provide a synopsis of the main findings of Chapter 5, to enable others to relate their experiences to those presented. As a result, the change of the conceptual model proposed in Chapter 3 will consider adding technical and organisational challenges facing a transactional e-government system derived from empirical data presented in Chapter 5. The purpose of this dissertation is not to provide prescriptive guidelines to technical and organisational challenges facing a transactional e-government system, but rather to describe the perspectives of case studies that enable others to relate their experiences to those presented. Consequently, this dissertation provides a broader understanding of technical and organisational challenges facing a transactional e-government system.

The key issues regarding these technical and organisational challenges derived from the empirical data are summarised as follows:

- The conceptual model presented in Chapter 3 divided security challenges into: (a) ensuring the security of confidential data stored in government organisation databases and e-government sites from attack and misuse, and (b) ensuring privacy of personal data that is provided by citizens as part of obtaining government services. Based on the cases of DM and DNRD in Chapter 5, the challenge of *viruses and worms that have come from the connection with other departments or companies* is explored. *However, such a challenge was not included in the conceptual model presented in Chapter 3 and will be combined, based on common characteristics, with security challenges. So this addition is required to the revised model presented in this chapter to reflect this empirical finding.*
- The conceptual model proposed in Chapter 3 divided the challenges after installation of the software system into: (a) maintaining high levels of performance and service availability, and (b) trouble-shooting technical problems. However, based on both cases presented in Chapter 5, the challenge of *the evolution of the technology (there is always new technology)* is explored, and based on common characteristics, will be combined with the

challenges of after installation software systems. *This challenge is added to the proposed conceptual model.*

- As shown in the conceptual model proposed in Chapter 3, vendors' challenges were divided into: (a) vendors' pressure to buy their solutions; (b) false promises of vendors, and (c) exaggerated vendor prices. Based on the cases of DM and DNRD presented in Chapter 5, two challenges, based on common characteristics, that can be combined with vendor challenges are explored. The explored vendor challenges are: (a) *the availability of technical resources (skilled employees of vendors),* and (b) *after-sales support (from vendors*). *However, since such challenges were not included in the conceptual model presented in Chapter 3, additions are required to the revised model presented in this chapter to reflect these empirical findings.*
- Based on both cases presented in Chapter 5, *the speed of introducing (adopting) new legislation challenge was explored.* This challenge, based on common characteristics, will be combined with adopting new legislation as proposed in the conceptual model presented in Chapter 3. *However, as this challenge was not included in the earlier conceptual model, an addition is required to the revised model.*

Comprehensive literature review (see Chapter 2) revealed that there is a lack of studies that focus on technical and organisational challenges facing transactional e-government. However, based on empirical data presented in Chapter 5, a number of technical and organisational challenge(s) were explored (see Table: 6.1). Due to the importance of explored technical and organisational challenge(s) (see Section: 6.4), the additions to the conceptual model proposed in Chapter 3, as derived from the case studies are listed in Table 6.1 below. These additions in turn suggest changes to the conceptual model.

Table 6.1: Additional Technical and Organisational Challenge(s) Derived from Empirical Evidence

Additional technical and organisational challenge(s) facing transactional e-government systems	
Additional technical challenges	The evolution of the technology (there is always new technology).
	Availability of technical resources (skilled employees of vendors).
	After-sales support (from vendors).
	Viruses and worms that have come from connection with other departments or companies.
Additional organisational challenge	Speed of introducing (adopting) new legislation.

However, the identification of the importance, categorisation, and presentation of strategies for overcoming of the additional technical and organisational challenge(s) derived from empirical evidence will be presented in Sections 6.4, 6.5 and 6.6, respectively.

6.3 The Revised Conceptual Model for Technical and Organisational Challenges

After carrying out the analysis of the empirical data presented in Chapter 5, the process of the development of Figure 6.1 has become possible. Consequently, following the investigation of research issues identified in Chapter 3, a revised conceptual model is now developed (see Figure 6.1). In Figure 6.1, the new technical and organisational challenges (see Table: 6.1) facing a transactional e-government system derived from empirical evidence are shown in *italics* and included in un-highlighted text boxes.

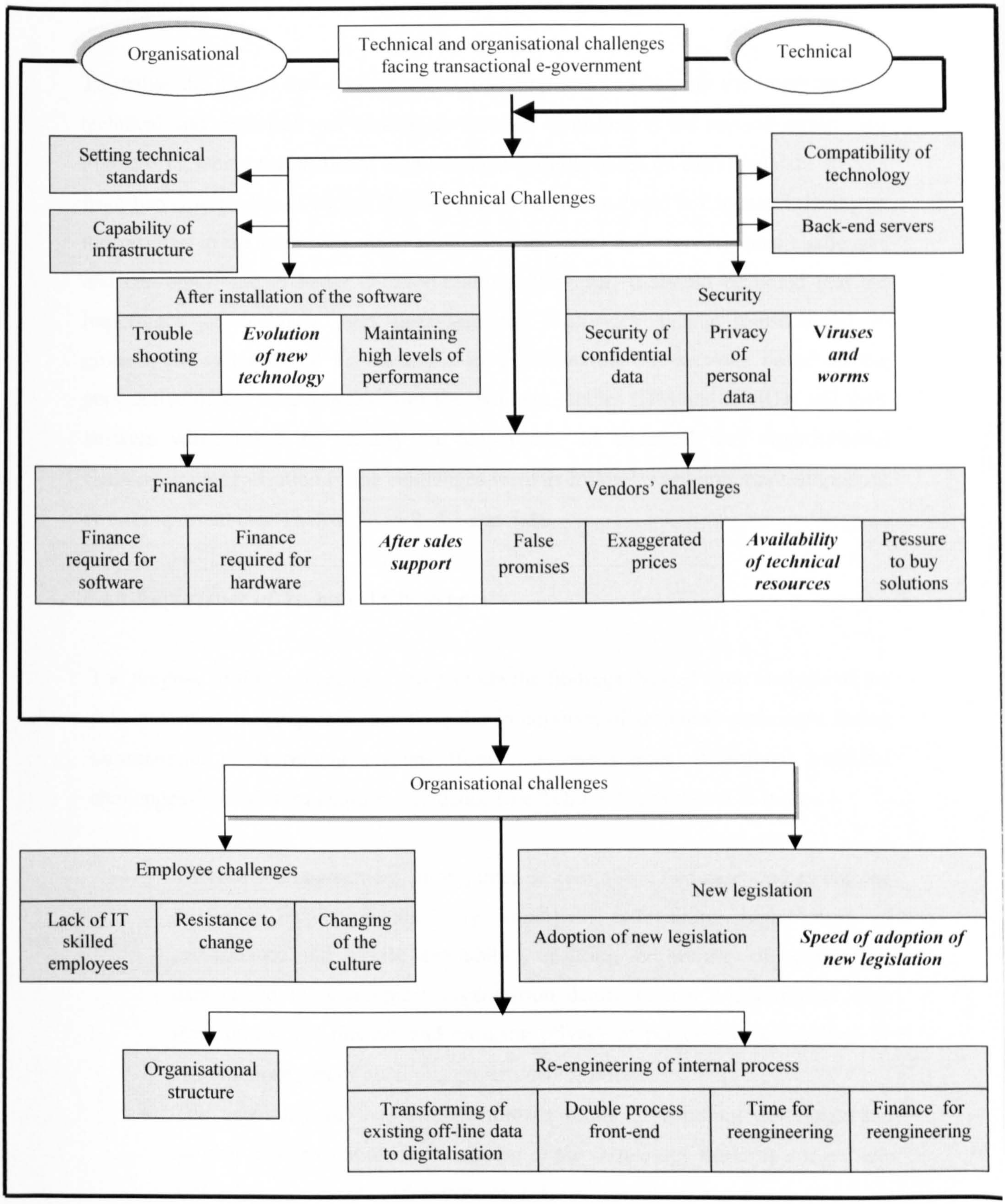

Figure 6.1: Revised Model for Technical and Organisational Challenges

6.4 Importance of Technical and Organisational Challenges

To realise the aim of this dissertation, this section seeks to identify the importance of technical and organisational challenges that are identified in the revised model (see Figure 6.1), facing transactional e-government systems based on empirical data derived from two case studies (DM and DNRD) presented and analysed in Chapter 5. Doing so has resulted in the improvement of analysis of technical and organisational challenges and can contribute to better decision-making. However, it should be noted that the importance of technical and organisational challenges facing transactional e-government systems will be discussed in the following sub-sections based on the perspective of the interviewees from the two case studies (DM and DNRD) and their answers when asked to identify the importance of technical and organisational challenges; categorisation of the challenges were as follows: very important, important or not important (see Tables: 5.1, 5.2, 5.3 and 5.4).

6.4.1 Importance of Technical Challenges

The purpose of this sub-section is to provide the findings derived from analysis of the data presented in Chapter 5 regarding the importance of technical challenges facing transactional e-government systems from two case studies. Additional technical challenges derived from empirical evidence (see Table 6.1) are shown in *italics*.

- There was an agreement among interviewees of the two case studies that the following challenges are very important: maintaining high levels of performance and service availability, ensuring the security of confidential data stored in government organisation databases and e-government sites from attack and misuse, and ensuring privacy of personal data provided by customers as part of obtaining government services.
- The capability of the infrastructure in terms of handling the range and number of transactions; *the evolution of the technology (there is always new technology); viruses and worms that have come from the connection with other departments or companies; after-sales support (from vendors;* and the back-end servers (communication failures between internal systems and the

external web-server) are considered by almost all interviewees as very important, except for a few who claim that these challenges are important. Only one interviewee (in both case studies) claims that after-sales support (from vendors) is not an important challenge.

- The perspectives of interviewees were divided into two groups regarding the challenges of trouble-shooting technical problems, setting technical standards for all e-services, compatibility of e-government technology available to the internal system, *the availability of technical resources (skilled employees of vendors),* and false promises of vendors. Some interviewees claim that these challenges are very important, while others claim they are important. Only one interviewee from the two case studies claims that the challenges of false promises of vendors, *the availability of technical resources (skilled employees of vendors),* and compatibility of e-government technology available to the internal system are not important. The programmer at DNRD was the only interviewee who claimed that the challenge of false promises of vendors was not important. This might refer to the position of the programmer who was involved in the technical rather than the money aspect. The unimportance of the challenge of *the availability of technical resources (skilled employees of vendors)* was justified by there being no need to buy the solutions and technology from the vendors who did not have qualified employees to implement the new technology. The Projects Manager was the only interviewee from DNRD and DM to claim that compatibility of e-government technology available to the internal system was not an important challenge because, at DNRD, they are studying how to use software intermediate (called e-book) that can deal with and make integration with different types of databases and applications easily.
- There was disagreement among interviewees regarding the importance of exaggerated vendor prices and finance required to install a software system. Some interviewees claimed that these were important challenges; others claimed that they were not important challenges. The unimportance of the challenge of exaggerated vendor prices was justified because in the final analysis it is the decision of the organisation, looking at different offers online, to choose the best based on their requirements. The fixed budget and

availability of money were the reasons that pushed some interviewees from the two case studies (DM and DNRD) to claim the unimportance of the challenge of finance required to install a software system.

- Due to the fixed budget and availability of money provided by upper management, finance required to provide more computers is considered not an important challenge by almost all interviewees. Vendor pressure to buy their solutions are considered not important challenges by almost all interviewees because, in the final analysis, it is the decision of the organisations to purchase the solutions based on their needs and requirements.

The comprehensive literature review in Chapter 2 (see Section 2.6) reveals that security and privacy are considered as important and the most common e-government challenges. Empirical data presented and analysed in Chapter 5 confirmed the importance of the challenges of ensuring the security of confidential data stored in government organisation databases and e-government sites from attack and misuse, and ensuring privacy of personal data provided by customers as part of obtaining government services. All interviewees of the two case studies agreed that ensuring security and privacy are very important technical challenges facing a transactional e-government system. Furthermore, lack of funding is considered the biggest challenge to e-government (see Chapter 2, Section 2.6). However, empirical data revealed that due to the availability of finance and the high level of support from the upper management, finance required to install a software system is considered between important and not important, and finance required to provide more computers is considered almost a not important technical challenge, facing a transactional e-government system.

6.4.2 Importance of Organisational Challenges

This sub-section aims to provide the findings derived from analysis of the data presented in Chapter 5 regarding the importance of organisational challenges facing transactional e-government systems in the two case studies. Additional organisational challenges derived from empirical evidence (see Table 6.1) are shown in *italics*.

- Changing the culture of employees (government processes should be organised for the convenience of the customers rather than the convenience of the department) is considered a very important challenge by almost all interviewees, except one, who claims that this challenge is important.
- The perspectives of interviewees were divided into two groups regarding the challenge of the lack of IT skilled employees, *the speed of introducing (adopting) new legislation*, resistance to change (from traditional to electronic ways of working) by the employees, and the transforming of existing off-line data to digitalisation. Some interviewees claim that these challenges are very important, while others claim they are important.
- The time required to re-engineer and change the internal business processes of the organisation, and change of the organisational structure, are considered important challenges by almost all interviewees; the time required to re-engineer and change the internal business processes of the organisation, in one case is considered very important and in the others is not important. For the change of the organisational structure, two claim this challenge is not important and one claims it is very important. The unimportance of the challenge of change of organisational structure is justified by the support of the higher levels of management and their belief in the benefits and importance of e-government.
- There are arguments among interviewees regarding the importance of challenges of adopting new legislation to deal with new issues such as electronic receipts and digital signatures and double process front-end (the interaction between government organisations and its customers needs to be offered in both a traditional manner and also through the Internet). Some interviewees claim that these are important challenges, while others claim that they are not important. The unimportance of adopting new legislation challenge was justified by: (a) the high level of support from the leadership of the Dubai Municipality and the Dubai government; (b) good planning from the start of the project, and (c) benefits from the legislation already adopted for e-commerce. The unimportance of the double process front-end challenge was justified by: (a) providing on-line services which reduces the pressure on

the employees who are dealing with counter services as the number of customers who are carrying out their work physically will be decreased, and (b) the employees can be divided into two groups, one to handle internet services, the other to handle counter services.

- Due to the availability of money and the fixed budget provided by upper management, the finance required to re-engineer and change the internal business processes of the organisation is considered not an important challenge by all interviewees – except a few who claimed that this challenge was important because the challenge lies in getting and distributing this money.

The comprehensive literature review in Chapter 2 (see Section 2.6) reveals that the challenge of the change of the culture can be considered the greatest e-government challenge because it involves people and their attitudes. The empirical data presented and analysed in Chapter 5 confirmed the great importance of the challenge of changing the culture of employees, which is considered a very important organisational challenge facing transactional e-government systems by almost all interviewees. The comprehensive literature review in Chapter 2 (see Section 2.6) also revealed that the shortage of skilled IT workers is considered an important and the most common e-government challenge. The empirical data presented and analysed in Chapter 5 confirmed the importance of the challenge posed by the lack of IT skilled employees. The perspectives of interviewees were divided into two groups regarding this challenge; some claim that this challenge is very important while the others claim that it is an important organisational challenge facing transactional e-government system. Chapter 2 (see Section 2.6) showed that lack of funding is considered the biggest challenge to e-government. However, the empirical data shows that the finance required to re-engineer and change the internal business processes of the organisation is almost a not important organisational challenge facing a transactional e-government system, because there was a high level of support from the leadership.

6.5 Categorisation of Technical and Organisational Challenges

The previous section showed the importance of technical and organisational challenges facing transactional e-government systems in two case studies, based on empirical data presented in Chapter 5. To satisfy the aim of this dissertation, the purpose of this section is to categorise those challenges from the perspectives of the interviewees of the two case studies (DM and DNRD), based on levels of importance. This categorisation could benefit decision-making in other government organisations attempting to reach a transactional e-government; it will allow them to pay more attention, focus on and give consideration to those challenges that are very important or important, and try to minimize or avoid them. The challenges have been categorised as 'very important' or 'important', enabling the researchers to analyse and understand the technical and organisational challenges facing transactional e-government systems; it can also benefit decision-makers by supporting the management when taking decisions to reach a transactional e-government system.

6.5.1 Categorisation of Technical Challenges

As a result of the above discussion (see sub-section 6.4.1) regarding the importance of technical challenges facing transactional e-government systems based on empirical data presented and analysed in Chapter 5, Table 6.2 shows the categorisation of these technical challenges based on levels of importance. Additional technical challenges derived from empirical evidence (see Table 6.1) are shown in *italics*.

Table 6.2: Categorisation of Technical Challenges

Technical challenges facing transactional e-government systems from two case studies (DM and DNRD)	Level of Importance of Challenges	Reference
Maintaining high levels of performance and service availability	**Very important**	**Based on the perspective of interviewees of two case studies (DM and DNRD)**
Ensuring the security of confidential data stored in government organisation databases and e-government sites from attack and misuse		
Ensuring privacy of personal data provided by customers as part of obtaining government services		
The capability of the infrastructure in terms of handling the range and number of transactions	**Almost very important**	
The evolution of the technology (there is always new technology)		
Viruses and worms have come from connection with other departments or companies		
After sales support (from vendors)		
The back–end servers (communication failures between internal systems and the external web–server)		
Trouble shooting technical problems	**Almost between very important and important**	
The availability of technical resources (skilled employees of vendors)		
Setting technical standards for all e-services		
False promises of vendors		
Compatibility of e-government technology available to the internal system		
Exaggerated vendor prices	**Between important and not important**	
Finance required to install a software system		
Finance required to provide more computers	**Almost not important**	
Vendor pressure to buy their solutions		

6.5.2 Categorisation of Organisational Challenges

As a result of the earlier discussion (see sub-section 6.4.2) regarding the importance of organisational challenges facing transactional e-government systems, Table 6.3 shows the categorisation of these organisational challenges based on levels of importance. Additional organisational challenges derived from empirical evidence (see Table 6.1) are shown in *italics.*

Table 6.3: Categorisation of Organisational Challenges

Organisational challenges facing transactional e-government systems from two case studies (DM and DNRD)	Level of Importance of Challenges	Reference
Changing the culture of employees (government processes should be organised for the convenience of the customers rather than the convenience of the department).	**Almost very important**	**Based on the perspectives of interviewees of two case studies (DM and DNRD)**
The lack of IT skilled employees	**Between very important and important**	
The speed of introducing (adopting) new legislation		
Resistance to change (from traditional to electronic ways of working) by the employees represents a challenge.		
The transforming of existing off-line data to digitalisation.		
Time required to reengineer and change the internal business processes of the organisation.	**Almost important**	
Change of organisational structure		
Double process front–end (the interaction between government organisations and its customers needs to be offered in both a traditional manner and also through the internet).	**Between important and not important**	
Adopting new legislation to deal with new issues such as electronic receipts and digital signatures.		
Finance required to reengineer and change the internal business processes of the organisation.	**Almost not important**	

6.6 Strategies for Overcoming Technical and Organisational Challenges

To realise the aim of this dissertation, the purpose of this section is to provide the strategies used/suggested for overcoming technical and organisational challenges, identified in the revised model (see Figure 6.1), facing a transactional e-government system from two case studies based on the empirical data presented in Chapter 5. 'Used' strategies refers to those already applied by the government organisations (DM and DNRD), while the 'suggested' strategies means those derived from the perspectives of interviewees based on their experiences. However, these strategies could help other government organisations attempting to reach a transactional e-government to overcome or avoid such challenges.

6.6.1 Strategies Used/Suggested for Overcoming Technical Challenges

The purpose of this sub-section is to present the strategies used/suggested for overcoming technical challenges facing a transactional e-government system in the two case studies, as shown in the following table (6.4). These strategies could assist other government organisations attempting to reach a transactional e-government to

overcome or avoid these challenges. However, those strategies not proposed in Chapter 3 (see Table 3.8), and derived from empirical data are shown in *italics.* Technical challenges identified as a result of empirical data and their solutions are also shown in *italics*.

Table 6.4:The Strategies Used/Suggested to Overcome the Technical Challenges

Strategies used/suggested to overcome technical challenges facing transactional e-government systems in two case studies (DM and DNRD)	
After installation software system	**Solutions to challenge of maintaining high levels of performance and service availability**
	▪ Training employees to deal with new software systems. ▪ Learning from mistakes. ▪ *Consulting specialist companies for particular problems.* ▪ *Applications should be run from two servers (if one server is shut down, the other will still be working).* ▪ *Specifying teamwork to monitor and make sure of availability of services.* ▪ *Continuous evaluation of performance of system.* ▪ *Proper planning, designing and implementation of infrastructure will lead to ensuring high level of performance and service availability.* ▪ *Continuous maintenance of infrastructure (hardware and software).* ▪ *Taking technical precautions to ensure high levels of performance and high levels of availability.*
	Solutions to challenge of trouble-shooting technical problems
	▪ Learning from mistakes. ▪ Training employees to deal with new software systems. ▪ *Minimizing and dealing with problems as soon as possible.* ▪ *Dealing with simple problems internally, complex problems might need consultancy help.* ▪ *Consulting specialist companies for particular problems - only for a short time because long contracts with consultancies are expensive.* ▪ *Specifying skilled specialist teams to deal with technical problems.* ▪ *Good testing leads to fewer technical problems; if testing is done properly, then problems will be minimized.* ▪ *Teamwork for testing and continuous assessment.* ▪ *Documentation of all technical problems and solutions used for each of them that will help when facing the same problem in the future.*
	Solutions to evolution of technology (there is always new technology)
	▪ *Following up new technology continuously.* ▪ *Stopping regularly every six months to evaluate performance of system.* ▪ *Adopting standards for using technology by all parties to e-government system.* ▪ *Building communities to evaluate new technology.* ▪ *Conducting periodic meetings to discuss issues & barriers.*
	Solutions to challenge of setting technical standards for all e-services
Technical standards	▪ Training employees to deal with new software systems. ▪ Learning from mistakes. ▪ *Consulting specialist companies - a good idea for building standards.* ▪ *Setting technical standards should include developing standards (coding, design, architecture and documentation standards).* ▪ *Proper planning, designing and implementation of the infrastructure.* ▪ *Ensuring chosen technical standard is easily used by customers.*
	Solutions to challenge of capabilities of infrastructure in terms of handling range and number of transactions

Table 6.4:The Strategies Used/Suggested to Overcome the Technical Challenges (continued)

Capability of infrastructure	▪ Expectations of how many transactions will be processed online, and provide extra margins of more than 20% to 30%. Some interviewees said the extra margin should be not less than 50%. ▪ *Continuous reviews of infrastructure and number of transactions it can handle.* ▪ *Provide flexible or expandable infrastructure by adding more servers that can provide better performances for extensive users.* ▪ *Good design of infrastructure (design should be flexible) followed by good planning and good monitoring.* ▪ *Use of particular switch or machine (Load balancer) that controls and distributes load among servers.* ▪ *Good monitoring to show what daily position is, i.e. how many transactions services were carried out).*
	Solutions to challenge of ensuring the security from attack and misuse of confidential data stored in the government organisation's databases and e-government sites
Security	▪ Specify official responsible for computer security. ▪ Assess systems regularly to make sure security precautions are being implemented. ▪ Backup information continually and store backup in separate location. ▪ Provide ongoing training to employees on computer security. ▪ *Ensuring data level security, which protects data from, unauthorised access, whether data residing in database (encryption) or travelling (through SSL and/or encryption).* ▪ *Ensuring application level security, which makes sure there are no holes in application that allow illegal access to certain data or other applications.* ▪ *Ensuring infrastructure level security which protects the whole infrastructure from hackers and intruders, by setting up, network authentication.* ▪ *Create security policy document approved by top level of management. Policy should be reviewed and upgraded continuously.* ▪ *Consult Specialist Company, especially at test stage of project, and to help create security policy document.* ▪ *Ensure physical security.* ▪ *Choose right infrastructure which is easy to maintain and ensures high levels of security* ▪ *Top management should understand importance and requirements of security issues.* ▪ *Involving only trustworthy employees on security issues.* ▪ *Use tools such as firewall to ensure security of data.* ▪ *Adopting regulations that ensure security of data.*
	Solutions to challenge of ensuring privacy of personal data provided by customers as part of obtaining government services
	▪ Limit access to personal identifiable information. ▪ Train government employees in importance of privacy. ▪ *Raise awareness of employees about importance of privacy of data.* ▪ *Limit information taken from customers to the level that is really required.* ▪ *Raise awareness of customers about importance of privacy.*
	Solutions to viruses and worms from connection with other departments or companies
	▪ *Use different layers of virus protection and use multiple technologies and products such as different antivirus packages and other technologies like AntiSpam solutions.* ▪ *Keep system patched with latest security updates.* ▪ *Regular upgrading and updating of system with the latest anti-virus software.* ▪ *Limit access to other departments and do not allow any unsecured connection with any devices.*

Table 6.4:The Strategies Used/Suggested to Overcome the Technical Challenges (continued)

	Solutions to challenge of finance required to install software system
Financial	▪ Buying technology in phases in order to spread cost over several years. ▪ *Leasing equipment and technology could be one of solution.*
	Solutions to challenge of finance required to provide more hardware
	▪ Specifying fixed budget to buy software systems and computers. ▪ Buying technology in phases in order to spread cost over several years.
	Solutions to challenge of back-end servers (communication failures between internal system and the external web-servers).
Back–end servers	▪ Installation of tools to monitor back-end server performance. *Head of Internet (Operation Unit) reported that the tool used in the Dubai Municipality for this purpose is Tivoli.* ▪ Use tools to monitor availability of network. *Head of Internet (Operation Unit) reported that the tool used in the Dubai Municipality for this purpose is Site Scope. Sr. Network & Security Consultant reported that the tool used in the (DNRD) for this purpose was CISCO.* ▪ *Provide reliable integration tool between web application and back-end system.* ▪ *Continuous evaluation of system.* ▪ *24 hours operation staff should be available.*
	Solutions to challenge of compatibility of e-government technology available to internal system
Compatibility	▪ Study technological solutions carefully to ensure high compatibility. ▪ Invest in strong integration solutions. ▪ *Try to identify solutions compatible with internal system.*
	Solutions to challenge of vendors' pressure to buy their solutions
Challenges of vendors	▪ *Limitation of vendors based on needs of organisation..*
	Solutions to challenge of false promises of vendors
	▪ *Include clear and strong conditions (penalties) within contract and follow implementation of these conditions.* ▪ *New software and hardware should be tested in organisation's environment before new technology is bought.* ▪ *Research through Internet to find good vendor and offer.* ▪ *Adopting of clear contract called SLA (Service Level Agreement) with strong penalties, and selecting famous companies.*
	Solution(s) to challenge of exaggerated vendor prices
	▪ *Deeply study all offers and choose the best, based on requirements of project.*
	Solutions to availability of technical resources (skilled employees of vendors)
	▪ *Looking at history of companies and choosing ones with experience and good reputations.* ▪ *Meeting of technical staff of vendors before project starts.* ▪ *Adoption of evaluation & assessment procedures for choosing vendors, and replacing them in initial stage as soon as discovering that they will not be capable of handling project.*
	Solutions to after sales-support (from vendors)
	▪ *Asking other organisations about the reputation of vendor, selecting vendors carefully, and studying vendors' history i.e. previous projects, other clients, integrity.* ▪ *Writing contracts and agreements extremely carefully.* ▪ *Including reference to after-sales support with penalties, in all contracts.*

6.6.2 Strategies Used /Suggested for Overcoming Organisational Challenges

The purpose of this sub-section is to present the strategies used/suggested for overcoming organisational challenges facing transactional e-government systems in the two case studies, as shown in the following table. These strategies could assist other government organisations attempting to reach a transactional e-government in overcoming or avoiding these challenges. However, those strategies not proposed in Chapter 3 (see Table 3.9) and derived as a result of empirical data are shown in *italics*. Organisational challenge identified as a result of empirical data and its solutions are also shown in *italics*.

Table 6.5: The Strategies Used/Suggested to Overcome the Organisational Challenges

Strategies used/suggested to overcome the organisational challenges facing transactional e-government systems in two case studies (DM and DNRD)	
Employees Challenges	**Solutions to challenge of lack of skilled employees**
	▪ Training employees. ▪ Encouraging employees by giving them prizes (money, certificates) to train to deal with new technology. ▪ Bringing (contracting) new skilled people *not only to train employees but also to deliver new technology and be a good example to existing employees.* ▪ *Consulting specialised company.* ▪ *Continuous upgrading of knowledge of employees about new technology.*
	Solutions to resistance to change (from traditional to electronic ways of working) by employees
	▪ Arranging workshops for employees to upgrade knowledge of e-government. ▪ Raising awareness of e-government by sending e-mails to employees describing importance and benefits of e-government to customers and employees. ▪ Assuring employees that e-government will not affect negatively the authority and jobs of employees. ▪ *Managing change early in project.* ▪ *Starting from top by convincing management of importance and benefits of e-government.*
	Solutions to challenge of changing culture of employees
	▪ Raising awareness of e-government by arranging presentations and sending e-mails to employees describing importance of e-government to customers and employees. ▪ Arranging workshops for employees to upgrade their knowledge of e-government. ▪ On-the-job training on using e-services. ▪ Training employees in customer service concepts. ▪ *Arranging workshops for both customers and employees.*
Challenges of re-engineering of internal processes	**Solutions to challenge of transforming existing off-line data to digitalisation**
	▪ *Identifying data that needs to be digitised from the beginning of project (early plan).* ▪ *Using technical solutions such as databases.* ▪ *Consulting specialist companies and benefiting from their experience.* ▪ *Studying size of this challenge.* ▪ *Identifying most important data to be digitised, and give them priority.*

Table 6.5: The Strategies Used/Suggested to Overcome the Organisational Challenges (continued)

Challenges of re-engineering of internal processes (continued)	**Solutions to challenge of double process front-end**
	▪ *Dividing employees into two groups: one to handle Internet services, the other to handle counter services, ensuring both groups can do both traditional and Internet work.*
	Solutions to challenge of time required to re-engineer and change internal processes
	▪ *Defining requirements and the needs of re-engineering.* ▪ *Reducing cycle of approval to minimum.* ▪ *Creating timetable for carrying out tasks.* ▪ *Dividing responsibilities among employees.* ▪ *Starting with most important tasks.*
	Solution(s) to challenge of finance required to re-engineer and change internal processes
	▪ *Support of leadership and specifying fixed budget.*
	Solutions (<u>in general</u>) for dealing with various challenges of reengineering of internal processes
	▪ Ensuring employees' awareness of importance of the reengineering of processes. ▪ Ensuring employees' awareness of benefits of the re-engineering of processes before moving them to e-government. ▪ Ensuring enough time provided for project team to work on reengineering processes. ▪ Involvement of all levels of employees in reengineering processes. ▪ *Including everyone affected by process of reengineering (manager, employees and customers (if possible)).* ▪ *Consulting specialist companies, especially in the first phase of project where e-government knowledge is very limited and resources low. (Head of e-government services in Dubai Municipality claims this solution is used for almost all organisational challenges).*
New legislation Challenges	**Solutions to challenge of adopting new legislation to deal with new issues such as electronic receipts and digital signatures**
	▪ Support of higher management inside organisation. ▪ Defining legislation that needs to be changed or introduced in order to facilitate reaching an organisational transactional e-government. ▪ *Benefits from e-commerce legislation.* ▪ *Benefits from experience of other organisations.*
	Solutions to challenge of speed of adopting new legislation to deal with new issues such as electronic receipts and digital signatures
	▪ *Support of leadership* ▪ *Good planning from start of project.* ▪ *Enhancing work processes.*
Challenge of changes of organisational structure	**Solutions to challenge of changes to organisational structure**
	▪ Convincing management of importance of structural changes and requirements. ▪ Identifying need for structural changes to organisation. ▪ Adopting new organisational department(s) to ensure success of e-government project. ▪ *Consulting specialist companies, especially in first phases of project.*

6.7 Conclusions

The case for identification of the importance of technical and organisational challenges facing a transactional e-government system, the categorisation of these challenges,

strategies used (suggested) to overcome or avoid these challenges, and the development of a model that is translated into frames of reference has been presented, analysed and argued.

The focus of this chapter was mainly to revise the conceptual model proposed in Chapter 3. Empirical data analysed and presented in Chapter 5 has been used and has led to the modified model presented in this chapter. Empirical evidence reveals that there are additional technical and organisational challenge(s) facing transactional e-governments that should be considered and added to the conceptual model proposed in Chapter 3. Technical challenges added are: (a) viruses and worms arising from connection with other departments or companies, (b) evolution of the technology (there is always new technology) after installation of software, (c) availability of technical resources (skilled employees of vendors), and (d) after sales-support (from vendors). The speed of introducing (adopting) new legislation has been considered and added to the organisational challenges included in the earlier conceptual model. The novelty of the conceptual model presented in Figure 6.1 focuses on the following:

- This model is one of the first attempts to explore and understand the technical and organisational challenges facing a transactional e-government system because the literature review presented in Chapter 2 revealed that there is an absence of theoretical models for these challenges.
- The model consists of a comprehensive set of technical and organisational challenges of e-government facing a transactional e-government system, and combines challenges identified in the conceptual model proposed in Chapter 3 (see Figure 3.4) with those based on empirical data explored, presented and analysed in Chapter 5.
- Decision-making can use the conceptual model as a tool to support government organisations when they are taking decisions to develop transactional e-government system. Additionally, the revised conceptual model can be used by researchers to understand and analyse technical and organisational challenges facing transactional e-government.

Finally, to realise the aim of this dissertation, (a) the importance of technical and organisational challenges facing a transactional e-government system included in the

revised model (see Figure 6.1) is identified based on the empirical data in order to improve the analysis of technical and organisational challenges and contribute to better decision-making; (b) technical and organisational challenges facing a transactional e-government system, identified in the revised model (see Figure 6.1), are categorised based on levels of importance to enable decision-makers in other government organisations attempting to reach a transactional e-government to pay more attention to, focus on and consider those challenges (technical and organisational) that are 'very important' or 'important', and try to minimise or avoid them. This allows researchers to analyse and understand the technical and organisational challenges facing transactional e-government systems as well as benefiting decision-makers by supporting the management when taking decisions to develop a transactional e-government system, and (c) the strategies used (suggested) for technical and organisational challenges (identified in the revised model) facing a transactional e-government system are presented. These strategies could be used in decision-making by other government organisations attempting to reach a transactional e-government system, enabling them to either avoid or overcome such challenges.

7

Chapter 7:

Conclusions and Further Research

Summary

This chapter seeks to: (a) present conclusions of the research reported in this dissertation, and (b) suggest areas for further work. It will initially give a summary of the thesis and offer conclusions derived from the literature review and the empirical research presented. Thereafter, the novelty claimed in this dissertation will be summarised. Finally, recommendations for further research in the area of technical and organisational challenges facing a transactional e-government system will be provided.

7.1 Research Overview and Findings

7.1.1 Research Overview

This dissertation began with an overview of the research problem in Chapter 1. It was identified in Chapters 2 and 3 that the transactional stage of e-government is one of the most important to the implementation of an e-government system. It represents the highest level of internal interaction between customers and governments. Government organisations might seek to reach the transactional stage of an e-government system for several reasons, such as the saving of time, effort and cost of delivery of services by increasing the efficiency of internal government processes, as well as making the delivery of external services quicker and enabling customers to implement a complete transaction electronically. There is an absence of theoretical models for technical and organisational challenges facing a transactional e-government system. Furthermore, there is a lack of studies that focus on identification of the importance, categorisation, and presentation of the strategies for overcoming of technical and organisational challenges facing transactional e-government systems. Chapter 1 then states the aim of this research, as being to:

> *Identify the importance, categorisation, and presentation of the strategies for overcoming, technical and organisational challenges facing a transactional e-government system. In doing so, resulting in the development of a frame of reference that leads to a model that can be used to enhance decision-making.*

Chapter 1 thereafter provides a general overview of the dissertation outline.

In an attempt to meet the aim of this dissertation, Chapter 2 (background theory) discussed the issues related to the e-government area to identify the domain of the research problem. It started by offering a brief history of the emergence of e-government that included the clarification of the relationship between e-government and e-governance, the difference between e-government and e-commerce, the effect of e-government, and the difference between internal and external objectives of e-government. This chapter then discussed the definition of e-government and the reasons that make it a debatable issue among researchers, where there is no specified

definition. As a result, a novel taxonomy for classification of the main characteristics of the definition of e-government is proposed. This taxonomy allows researchers to apprehend the definition of e-government and leads to improved IT sophistication. Motivations for e-government were also discussed and classified into change of traditional government methods for the delivery of services, technological, economic and social forces. Thereafter, the benefits, costs and risks of e-government were discussed. The benefits of e-government were classified into citizen benefits, government benefits and business benefits. Challenges of e-government were also discussed in Chapter 2. Discussion of benefits and challenges of e-government led to making a contribution in the area of e-government, where money, employees, accessibility/digital divide, single point of access/security, and efficient relationship/ gap between expectations and awareness issues were discussed so as to articulate the fact that, although an e-government system has benefits, it leads to new kinds of challenges. Finally, Chapter 2 makes a further contribution to the e-government area from the perspective of the different models of the stages of e-government that were analysed. Consequently, the relationship between the stages, type of online services, and benefits of e-government were explored. Higher levels of e-government maturity lead to higher benefit levels of e-government. This contribution leads to an extension of e-government knowledge, since there has been considerable debate regarding the models of the stages of an e-government system. Discussion of the challenges facing e-government and models of the stages of e-government revealed that there is an absence of theoretical models for different challenges (specifically technical and organisational) that are faced in reaching the transaction stage of an e-government system, as well as a lack of studies that focus on identification of the importance, categorisation and presentation of the strategies for overcoming technical and organisational challenges faced when reaching the transaction stage of an e-government system. Furthermore, the literature review presented in Chapter 2 revealed that: (a) the process of implementing an e-government system passes through different stages; within these the transaction stage of e-government systems can be considered as one of the most important stages of the implementation of any e-government because it leads to enabling the public to make complete transactions online, therefore government organisations might seek to reach this stage. And (b) there are very few studies which have focused on the transaction stage of e-government systems and provided a detailed description of the

issues related to this stage i.e. its location among different models of the stages of e-government, its importance and the need of government organisations to reach it, its scope of implementation and the criteria identifying government organisations reaching this stage.

Chapter 3 (focal theory) focused on the investigation of the research issues derived from Chapter 2. In doing so, Chapter 3 aimed to: (a) provide a clear framework for this dissertation, and (b) propose a conceptual model. Therefore, to meet the aim of this dissertation, Chapter 3 concentrated mainly on the transaction stage of e-government systems, because Chapter 2 elicited that there is a surprising lack of details regarding this issue. The issues of location and existence of the transaction stage among different models of the stages of e-government, its importance and the need for government organisations to reach it, its scope of implementation, and criteria identifying government organisations reaching this stage were discussed.

All the above issues provided a contribution to the e-government area by expansion of knowledge for researchers and decision-makers regarding the transaction stage of an e-government system. The most important contribution of this chapter is developing and suggesting the criteria involved in identifying the transaction stage. These criteria could be used by researchers and decision-makers to measure progress towards implementing an e-government system inside government organisations. The conceptual model was proposed in Chapter 3. This model contained a set of technical and organisational challenges facing a transactional e-government system. This satisfies the aim of this dissertation as reported in Chapter 1. As a result, the conceptual model was empirically examined in Chapter 5 and revised in Chapter 6 by exploration, and then combination with the revised conceptual model (based on common characteristics), of other technical and organisational challenges facing transactional e-governments that were not included in the conceptual model proposed in Chapter 3.

To deal with issues identified in Chapters 2 and 3, Chapter 4 (data theory) focused mainly on: (a) identifying and developing an appropriate research strategy, and (b) identifying an appropriate research method. Justification for the research method and strategy chosen is stated in this chapter.

Case studies of two government organisations were used to investigate the research issues identified in previous chapters, regarding technical and organisational challenges facing a transactional e-government system. As a result, Chapter 5 (data theory) presented and analysed the empirical evidence of the perspectives of the different case studies. In doing so, it described human and organisational perceptions during the implementation of an e-government project and in trying to reach a transactional e-government system. Empirical evidence from the two case studies, (DM and DNRD) confirmed the importance of a number of technical and organisational challenge(s) identified in Chapters 2 and 3. Furthermore, a number of additional technical and organisational challenge(s) that were not taken into account in the conceptual model proposed in Chapter 3 were considered, based on empirical data.

Empirical evidence derived from DM and DNRD led to making a number of modifications to the proposed conceptual model (see Figure 3.4) and strategies for overcoming technical and organisational challenges facing a transactional e-government system (see Tables 3.8 and 3.9). These findings were considered in Chapter 6 (novel contribution), and led to a revised conceptual model (see Figure 6.1) and revised strategies (see Tables 6.4 and 6.5). The importance of technical and organisational challenges facing transactional e-government systems, which were included in the revised model, were identified and then categorised based on levels of importance.

Identifying the importance, categorisation, and the strategies for overcoming, technical and organisational challenges facing a transactional e-government system can therefore be used as a frame of reference when government organisations attempt to reach a transactional e-government system. In doing so, the author has achieved the aim of this dissertation as identified in Sub-section 1.7.1.

7.1.2 Research Findings

The main literature review and novel contribution (based on empirical data) findings derived from the work presented in this thesis are summarised as follows:

- The literature review in the e-government area revealed that there is confusion regarding the technical and organisational challenges facing a transactional e-government system. Therefore, there is a need to propose a conceptual model for these technical and organisational challenges.
- The normative literature review elicited that there is an absence of theoretical models for the technical and organisational challenges facing transactional e-government systems. This might refer to e-government being a relatively new area, with many topics remaining under investigation.
- The author has attempted to address these voids in the literature by proposing a conceptual model that consists of technical and organisational challenges. The proposed model attempts to classify these challenges based on common characteristics. This model was examined and revised based on empirical data.
- The revised conceptual model can be used as a tool for decision-making to enhance government organisations and to enable researchers to understand and analyse technical and organisational challenges facing transactional e-government.
- The strategies used (suggested) for overcoming each technical and organisational challenge included in the revised model (see Figure 6.1) are provided to enable other government organisations attempting to reach a transactional e-government system to overcome or avoid such challenges.
- The importance of technical and organisational challenges facing transactional e-government systems, which were included in the revised model, were identified and categorised (see Chapter 6), in order to improve analysis through enhancement of decision-making in government organisations that are attempting to reach a transactional e-government.

7.2 Contributions and Research Novelty

The individual elements of the contribution provided by this work come from different components of this dissertation. From the contextual information presented in Chapters 1, 2 and 3, to the research methods stated in Chapter 4, through the design and conduct of case studies provided in Chapters 4 and 5, and finally, to the presentation and analysis of empirical data in Chapters 5 and 6. It can therefore, be said that the work offered in this thesis has made a novel contribution to the area of the e-government system, and has expanded the boundaries of knowledge, especially regarding technical and organisational challenges facing a transactional e-government system. However, this section aims to provide the main contributions and the novelty of this dissertation.

7.2.1 Novel Model for Technical and Organisational Challenges

Chapter 2 identified the fact that there is an absence of theoretical models for different challenges (specifically technical and organisational) that are faced when attempting to reach the transaction stage of an e-government system. In addressing this void in the literature, Chapter 3 proposes a conceptual model for these challenges facing a transactional e-government system. This model is investigated and analysed in Chapter 5. As a result, a revised conceptual model is presented in Chapter 6 (see Figure 6.1) based on the empirical evidence derived from the case studies. One of the most important contributions of this dissertation is the development of a comprehensive novel model for technical and organisational challenges facing a transactional e-government system.

The proposed (revised) conceptual model provides a contribution at two levels. Firstly, at the conceptual level, the model combines the challenges (that can be classified into technical and organisational) of e-governments identified separately in previous studies. The author extends these challenges, based on empirical data, where a number of technical challenges including: (a) viruses and worms arising from connection with other departments or companies, (b) evolution of the technology (there is always new technology) after the installation of software, (c) availability of technical resources

(skilled employees of vendors), and (d) after sales-support (from vendors), and an organisational challenge, i.e. the speed of introducing (adopting) new legislation, are incorporated into the conceptual model proposed in Chapter 3, resulting in development of a consistent model for technical and organisational challenges facing a transactional e-government system. Secondly, at the practical level, the concept of the proposed model can be used as a guide by decision-makers to support government organisations that seek to reach a transactional e-government system. Additionally, the revised conceptual model can be used by researchers to understand and analyse technical and organisational challenges facing a transactional e-government.

7.2.2 Novel 'Identification of the Importance/ Categorisation' of Technical and Organisational Challenges

The importance of each technical and organisational challenge included in the revised model was identified in Chapter 6, based on empirical data presented and analysed in Chapter 5. The identification of the importance of these challenges is novel because it can lead to improved analysis through enhancing the work of decision-makers in government organisations when taking decisions to reach a transactional e-government system, as well as assisting researchers to understand technical and organisational challenges facing such a system.

Furthermore, as a result of the empirical data presented and analysed in Chapter 5, Chapter 6 provided a categorisation of technical and organisational challenges facing a transactional e-government system, based on levels of importance. A novel aspect of this categorisation is that it could benefit decision-making by supporting the management in government organisations attempting to reach a transactional e-government by paying more attention to, focusing on, and giving consideration to those challenges which are very important or important, and trying to minimise or avoid them. Additionally, categorisation of technical and organisational challenges facing a transactional e-government system enables researchers to better analyse and understand the technical and organisational challenges facing transactional e-government systems.

7.2.3 Novel Strategies Used (Suggested) for Overcoming of Technical and Organisational Challenges

Another important contribution made in this thesis deals with providing the strategies used (suggested) for overcoming each technical and organisational challenge, contained in the revised model, facing a transactional e-government system. These strategies are novel and could assist decision-makers in other government organisations by supporting the management when taking decisions to reach a transactional e-government system to overcome or avoid such challenges; this could then leads to improved IT sophistication.

7.3 Research Limitations

Developing a model for technical and organisational challenges facing a transactional e-government system required a robust research methodology. Such a methodology could be employed for other researches, especially those with a similar focus.

The qualitative method chosen as more appropriate for this dissertation was justified in Chapter 4 (see Section 4.4). The reason for this is that such a method enables the generation of rich data, which is associated with human and organisational issues. However, in spite of the strengths of qualitative research methods, they do have inherent drawbacks (Irani *et al.* 1999), with a number being encountered during the reported process of research. In conducting this research, the author admitted several issues regarding the use of qualitative research methods, they are (a) the relative difficulty of analysing qualitative data; although this did not invalidate the data or conclusions reported, because multiple case studies were used to obtain data, (b) the collecting and analysis of data was time-consuming and demanding, (c) the inability of the author to interpret events from the subjects' point of view, without bias, is questioned; this drawback was addressed by using data triangulation in data gathering, (d) the relationship between theory and research could be considered unstructured and weak because qualitative research methods might be criticised for not instilling theoretical elements. However, this dissertation attempts to consider this drawback by developing a conceptual model and building a framework that identifies clearly the

boundaries of this dissertation. The author also considers that the lack of theory and structure can add richness to qualitative data gathering. Consequently, the author acknowledges the possibility of the use of a grounded theory for investigation of the technical and organisational challenges facing transactional e-government systems, and (e) because the sample of organisations is relatively limited, there is much concern regarding the extension of qualitative research to be generalised beyond the boundaries of the inquiry. However, the qualitative method does not offer the pretence of replication because controlling the research setting destroys the interaction of variables and, as a result, affects the underlying philosophy of interpretivism. The study was conducted with a structured methodology and guided by theoretical models and concepts, using a number of methods for gathering data. However, the methodology chosen in Chapter 4 was considered more appropriate to explore technical and organisational challenges facing transactional e-government system. Having now evaluated the research process, such concerns need not have been considered important, as a grounded theory approach may also have been suitable, and yet provided 'freedom' and scope for: (a) discovery and theory building, and (b) discovery, theory building and testing.

7.4 Recommendations for Further Work

- Technical and organisational challenges facing a transactional e-government system were provided in the revised model presented, as well as the importance of those challenges identified in Chapter 6. One of the recommendations is that further study might lead to exploration of more technical and organisational challenges facing a transactional e-government system.

- Another important research proposition is that further investigation regarding strategies for overcoming each technical and organisational challenge (offered in Chapter 6) might lead to exploring more strategies.

- The author of this thesis suggests transforming the revised conceptual model and strategies used (suggested) into a large-scale survey questionnaire rather than continuing with an interpretivist epistemology. This approach would not

have been possible previously because the model and the framework did not exist. A large-scale survey might lead to improving the revised model through: (a) exploration of many more technical and organisational challenges facing a transactional e-government system, (b) better verification and understanding of the importance and then categorisation of technical and organisational challenges facing a transactional e-government system, and (c) exploration of many more strategies against the technical and organisational challenges facing a transactional e-government system.

- The importance of and the strategies used (suggested) for overcoming the challenge of resistance to change (from traditional to electronic ways of doing their work) by employees are identified and presented based on empirical data in Chapters 5 and 6. Chapter 2 (see Section 2.6) reveals that there are a number of reasons for resistance to change (from traditional to electronic ways of doing their work) by employees. So another important research proposition is to identify to what extent these reasons affect government organisations and strategies used to deal with them when government organisations seek to reach a transactional e-government system.

- Chapters 2 and 3 suggest that challenges facing a transactional e-government system could be technical, social, organisational, political, and economic. This thesis focused only on technical and organisational challenges. A further important recommendation is to explore social, political, and economic challenges facing a transactional e-government system.

- An additional recommendation is to further study the area of the costs of e-government (see sub-section: 2.5.2), and to pay more attention to the challenge of infrastructure of e-government, when government organisations attempt to reach a transactional e-government system.

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Abbreviations

IS	Information Systems
IT	Information Technology
E-commerce	Electronic Commerce
E-government	Electronic Government
DM	Dubai Municipality
DNRD	Dubai-Naturalization & Residency Administration
G2C	Government to Citizens
G2B	Government to Businesses
G2E	Government to Employment
G2G	Government to Government
DPEPA	Division for Public Economics and Public Administration
IDC	International Data Corporation
GITR	Global Information Technology Report
UNPAN	The United Nations Online Network in Public Administration and Finance
ICT	Information Communication Technology
ASP	Active Server Page
SSL	Secured Sockets Layer
SLA	Service Level Agreement
LAN	Local Area Network
GAO	General Accounting Office
e-procurement	electronic procurement

G2BMKT	Government to Business in the Marketplace
G2IP	Government to individuals as a part of the political process
G2IS	Government Delivering Services to Individuals
OMB	Office of Management and Budget
IEE	Internet Efficiency and Effectiveness
PC	Personal Computer
e-service	electronic service
IBM	International Business Machines
EAI	Enterprise Application Integration
XML	Extensible Markup Language
HTML	*Hypertext Markup Language*
ASP	*Active Server Page*

APPENDIX A: Technical Tools

A

A1. Load balancers are a complex and under-documented pieces of hardware. They are an integral part of Web infrastructure. Load balancers are used to distribute traffic to the servers (Bourke, 2001).

A2. Tivoli is intelligent management software for the on-demand world (http://www-306.ibm.com/software/tivoli/). This product can be categorised into (http://www-306.ibm.com/software/tivoli/sw-bycategory/indexS.html):

- **Security** software that is used to protect confidentiality, integrity, privacy, and assurance of information systems.
- **Storage Management** software that is used to manages and assures the accessibility, availability, and performance of stored information.
- **Systems Management** software that is used to monitor, control and optimise computing resources.

A3. "Anti-spam refers to any software, hardware or process that is used to combat the proliferation of or to keep spam from entering a system" (http://www.webopedia.com/TERM/a/anti_spam.html). A "spam" e-mail can be defined as an unsolicited mailing, usually to many people (http://www.arachnoid.com/lutusp/antispam.html).

A4. A firewall can be defined as a system or group of systems that enforces an access control policy between two or more networks (http://www.interhack.net/pubs/fwfaq/). It is system designed to prevent unauthorized Internet users to or from a private network. Firewalls can be implemented in both hardware and software, or a combination of both. They are considered a first line of defence in protecting private information (http://www.webopedia.com/TERM/f/firewall.html). Firewalls can be used

to do one or more of the following things (http://www.freebsd.org/doc/en_US.ISO8859-1/books/handbook/firewalls.html):

- To protect and insulate the applications, services and machines of internal network from unwanted traffic coming in from the public Internet.
- To limit or disable access from hosts of the internal network to services of the public Internet.
- To support network address translation (NAT), which allows internal networks to use private IP addresses and share a single connection to the public Internet (either with a single IP address or by a shared pool of automatically assigned public addresses).

A5. SSL (Secured Sockets Layer) is a protocol that transmits communications over the Internet in an encrypted form. The role of SSL is to ensure that the information is sent, unchanged, only to the server intended to send it to (http://www.mydotweb.com/ssl.html). SSL works by using a private key to encrypt data that is transferred over the SSL connection. Both Netscape Navigator and Internet Explorer support SSL, and many Web sites use the protocol to get confidential user information, such as credit card numbers (http://www.webopedia.com/TERM/S/SSL.html).

A6. Cisco Systems is one of the leading manufacturers of network equipment. The primary business of Cisco is in internetworking products, such as routers, bridges, and switches (http://www.webopedia.com/TERM/C/Cisco_Systems.html).

A7. Site Scope is an agent-less monitoring solution that is used to ensure the availability and performance of distributed IT infrastructures — e.g., servers, operating systems, network devices, network services, applications, and application components. SiteScope enables system administrators to remotely monitor multiple servers from a central installation without the need for agents on the remotely monitored machines (Mercury, 2005).

A8. Back – end / front – end : the front-end is the part of a software system that deals with the user, while the back-end is the part that processes the input from the front-end.

The idea is that the front-end is responsible for collecting input from the user, which can be in a variety of forms, and processing it in such a way that it conforms to a specification that the back-end can use (Wikipedia, 2005).

A9. Web – server is, simply, a computer that delivers (serves up) Web pages (**http://www.webopedia.com/TERM/W/Web_server.html**). Web-browser (user) formed a connecting to a web server, requested a page and received it (http://computer.howstuffworks.com/web-server1.htm).

A10. e-book (may be for integration) is software intermediate tool that is used to make integration with different types of databases and applications easily.

A11. LAN (Local Area Network) is a computer network that spans a relatively small area (http://www.webopedia.com/TERM/l/local_area_network_LAN.html).

A12. e-Procurement is the term that refers to the use of electronic methods in every stage of the purchasing process from identification of requirement through to payment, and potentially to contract management (http://www.ogc.gov.uk/index.asp?id=2361).

A13. HTML (Hypertext Markup Language) is a markup language that is used to format text and information (Deitel, Deitel and Nieto, 2000). By using HTML users can create web pages that include text, graphics, and pointers to other web pages.

A14. XML (Extensible Markup Language) is a markup language and language for creating markup languages. It enables the creation of new markup languages to markup anything imaginable (Deitel, Deitel and Nieto, 2000).

A15. C: The C programming language is a popular and widely used programming language for creating computer programs (http://computer.howstuffworks.com/c.htm). It gives maximum control and efficiency to the programmer.

A16.C++ is a programming language that literally means "increased C", since it derives from the C language (http://www.cplusplus.com/info/faq.html). C++ improves on many of C's advantages and provides object-oriented-programming capabilities that

lead to great promise for increasing software productivity, quality and reusability (Deitel and Deitel, 2001).

A17. Java is a high-level programming language developed by Sun Microsystems. It is an object-oriented language similar to C++ (http://www.webopedia.com/TERM/J/Java.html). Java is designed for use in the distributed environment of the Internet (http://searchwebservices.techtarget.com/sDefinition/0,290660,sid26_gci212415,00.html).

A18. ASP (Active Server Page) "is an HTML page that includes one or more scripts (small embedded programs) that are processed on a Microsoft Web server before the page is sent to the user" (http://searchwin2000.techtarget.com/sDefinition/0,,sid1_gci213787,00.html). ASP.NET is the next generation of Microsoft's Active Server Page (ASP). Both ASP and ASP.NET enable a Web site builder to dynamically build Web pages by inserting queries to a relational database in the Web page (http://searchsqlserver.techtarget.com/sDefinition/0,290660,sid87_gci509342,00.htm).

A19. Portals: According to Teicher *et al.* (2002, p.389) "A portal is a point of entry which enables citizens to have access to a full range of services without any consciousness of movement between Internet sites and where those services may be tailored to the user's profile". Portals provide citizens with easy and single access to government services without the need to know which agency is responsible for them. An e-government portal is based on the concept of "intentions-based design" so the site is organised to meet the citizens needs rather than the structure of government. So, a true e-government portal is much better than a website (Howard, 2001). Morris (2002) argues that portals lead to a saving of the time spent by citizens, businesses and employees on access and searching for information and services. However, a portal requires comprehensive technology, project management skills and systems integration, as well as graphics design, interactive media and user interface construction abilities (Sharma and Gupta, 2002).

References of Appendix A

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APPENDIX B: Interview Agenda

B

This agenda of interview aims to identify the importance and presentation of the strategies used (suggested) for overcoming technical and organisational challenges facing the transactional e-government system.

So, this agenda of interview is divided into 3 parts and concentrates on the following issues:

- To obtain general organisational information.
- To identify the importance and presentation of the strategies used (suggested) for overcoming organisational challenges facing the transactional e-government system.
- To identify the importance and presentation of the strategies used (suggested) for overcoming, technical challenges facing the transactional e-government system.

Name:			
Position			
Organisation Name:			
Address:			
Telephone:		**Fax:**	
E-mail:			

Sections

Section A: General Organisational Information

Section B: Organisational Challenges

Section C: Technical Challenges

Section A: General Organisational Information

A.1 What are the businesses of your organisation?

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.....

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.....

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.....

A.2 Do the services and information provided by your organisation focus more on: citizens, businesses, public administration or all of these (citizens, businesses and public administration)?

Citizens	
Businesses	
Public administration	
All of the above (customers)	

A.3 How many people are employed in your organisation? [ ]

A.4 What kind of services/information does your organisation provide? Please select.

- Information services that enable customers to obtain information about your organisation.
- Communication services that give the opportunity of interaction with groups of people or individuals.

- Transaction services that include submitting data or getting products or services online.
- All above.

A.5 Criteria for reaching transactional e-government within government organisations:

Does your organisation:

- Enable customers to fill in and submit online different types of forms such as registration and payment ☐

- Provide a secure connection by enabling customers to complete their transaction with the required government organisation online, safely and with trust in the system. ☐

- Enable customers to perform online financial transactions (if applicable) such as payment of bills and fines. ☐

- Enable customers to create online accounts with their own usernames and passwords within government organisations. ☐

- Provide instant decisions, meaning that as soon as a customer has completed a transaction such as filling in a form or paying a bill online, the message will appear to confirm that the process has been executed successfully. ☐

Other:.....

A.6 What language is used for the software in your organisation? Please select and justify the answer.

Software language Used	**Justification(s) for Decision**
❑ ASP (Active Server Page)	
❑ Java	
❑ C++	
❑ C	
❑ Other:	

Section B: Organisational Challenges

(A) Employees Challenges

1. How is the lack of IT skilled employees an important challenge?

Very Important ☐ Important ☐ Not important ☐

1.1 If not important, Why? Please, select.

- ❑ Technology is already used in the organisation.
- ❑ Technology chosen is well known.
- ❑ Other:.....

1.2 If "very important or important", What are the used/suggested solution(s) for dealing with this challenge? Please, select.

- ❑ The training of employees.
- ❑ Encouragement of employees by giving them prizes (i.e. more money, certificates) to train to deal with new technology.
- ❑ Bringing (contracting) new skilled employees.
- ❑ Other: .....

2. To what extent did resistance to change (from traditional to electronic ways of doing their work) from the employees represent a challenge?

Very Important ☐ Important ☐ Not Important ☐

2.1. If not important, why? Please, select.

- ❑ Employees already aware of the importance of e-government.
- ❑ Employees already aware of the benefits of e-government.
- ❑ Other: .....

2.2 What are the used/suggested solution(s) for dealing with challenge of resistance? Please, select.

- ❑ Make workshops for employees to upgrade their knowledge on e-government.
- ❑ Raise the awareness of e-government by sending emails to employees describe the importance and the benefits of e-government to customers and employees.
- ❑ Assure that e-government will not affect negatively the authority and the job of employees.
- ❑ Other:.....

.....

3. How is changing the Culture of employees (government processes should be organised for the convenience of the customers rather than the convenience of the department) an important challenge?

Very Important ☐ Important ☐ Not Important ☐

3.1 If "very important or important", how did you deal about this challenge? Please, select.

- ❑ Raise the awareness of e-government by sending emails to employees describe the importance of e-government to customers and employees.
- ❑ Make workshops for employees to upgrade their knowledge on e-government.
- ❑ On job training on using the e-services.
- ❑ Training employees on customer service concepts.
- ❑ Other:.....

.....

(B) Challenges of Reengineering of the internal Processes

1. To what extent do the following statements about the reengineering of processes represented a challenge to your organisation.

	Not Important	Important	very important
a. The transforming of existing offline data to digitalisation	☐	☐	☐
b. Double process front–end (the interaction between government organisations and its customers needs to be offered in both a traditional manner and also through the internet)	☐	☐	☐
c. Time required to reengineer and change the internal processes	☐	☐	☐
d. Finance required to reengineer and change the internal processes	☐	☐	☐

e. Other challenges of re-engineering of processes: .....

2. If the answer to the statement **a, b, c** or **d** (mentioned in section 1 above) is "not important", Why?

3. If the answer to the statement **a, b, c** or **d** (mentioned in section 1 above) is "important or very important", what are the used/suggested solution(s)?

4. What are the used/suggested solution(s) **(in general)** for dealing with challenges of reengineering of the internal processes? Please, select.

- ❑ Ensuring employees' awareness of the importance of reengineering of processes.
- ❑ Ensuring employees' awareness of the benefits of reengineering of processes before moving them to e-government.
- ❑ Ensuring enough time provided to the project team for working on the reengineering processes.
- ❑ Involvement of all levels of employees in the reengineering processes.
- ❑ Other:

.....

.....

.....

(C) New Legislation Challenge

1. How much of a challenge (inside your organisation) is adopting new legislation to deal with new issues such as electronic receipts and digital signatures?

Very Important ☐ Important ☐ Not Important ☐

2. If "very important or important", what are the used/suggested solutions for dealing with this challenge?

Please, select.

- ❑ Support of the higher management inside the organisation.
- ❑ Defining the legislations that need to be changed or introduced in order to facilitate reaching an organisation transactional e-government.
- ❑ Other solution(s): .....

.....

(D) Changes of Organisational Structure Challenge

1. How is a change of organisational structure an important challenge?

Very Important ☐ Important ☐ Not Important ☐

2. If "very important' or 'important", what are the used/suggested solutions for dealing with this challenge? Please, select.

Convincing of management structural changes importance and requirements

- ❑ Identifying the needs for structural changes to the organisation.
- ❑ Adopting new organisational department(s) to ensure the success of e-government project.
- ❑ Other: .....

Other organisational challenges already faced by your government organisation in order to reach transactional e-government system:	
Other:	
Other:	
Other:	
Other:	

Section C: Technical Challenges

(A) After installation software system

To what extent do the following statements represent a challenge after installation of software that enables your organisation to reach transactional e-government? Please, select.

	Not Important		Important Very Important
1. Maintaining high level of performance and service availability	☐	☐	☐
2. Trouble shooting technical problems	☐	☐	☐

Other:.....

(B) Technical standards

To what extent do the following statement represent a challenge.

1. Setting technical standards for all e-services	☐	☐	☐

Other:.....

2. What are the used/suggested solution(s) to deal with the challenge(s) mentioned above in A and B? Please, select.

- ❑ Training of the staff for dealing with new software system.
- ❑ Learning from the mistakes.
- ❑ Other:

.....

.....

(C) The capability of the infrastructure

1. How is the capability of the infrastructure in terms of handling the range number of transactions an important challenge?

Very important ☐ Important ☐ Not important ☐

2. If "important or very important":

a. What are the used/suggested solution(s)? Please, select.

- ❑ Expectations of how many transactions will be processed online and provide extra margin of 20 – 30%.
- ❑ Other:

.....

.....

b. What are the capabilities of the infrastructure in terms of handling the range number of transactions? Please, select

- ❑ 0 – 1000 transactions a day.
- ❑ 1000 – 5000 transactions a day.
- ❑ 5000 – 10000 transactions a day.
- ❑ More than 10000 transactions a day.

C. If the answer to the question 1 above is not important, why? Please explain.

.....

.....

(D) Security

To what extent do the following statements represent a technical challenge to your organisation in order to reach transactional e-government?

	Not Important	Important	very Important
1. Ensuring the security of the confidential data stored in government organisation databases and e-government sites from attack and misuse	☐	☐	☐

1.a If the answer to the statement **a,** above is "important or very important", how did you deal about this challenge? Please, select:

- ❑ Specify an official responsible for computer security.
- ❑ Assess systems regularly to make sure security precautions are being implemented.
- ❑ Backup information continually and store backup in a separate location.
- ❑ Provide ongoing training to employees on computer security.
- ❑ Other solution(s):. .....

.....

2. Ensuring privacy of the personal data that is provided by customers as part of obtaining government services	☐	☐	☐

2.a If the answer to the statement **b,** above is "important or very important", how did you deal about this challenge? Please, select:

- ❑ Limit access to personally identifiable information.
- ❑ Train government employees on the importance of privacy.
- ❑ Other solution(s):. .....
- ❑ .....

.....

(E) Financial

1. To what extent do the following statements represent a technical challenge to your organisation in order to reach transactional e-government?

	Not Important	Important	very Important
a. Finance required installing software system	☐	☐	☐
b. Finance required providing more computers	☐	☐	☐

2. If the answer to the statement **a** or **b** above is "important or very important", what are the used/suggested solution(s)? Please, select.

- ❑ Specifying fix budget to buying software system and computers.
- ❑ Buying of technology in phases in order to spread the cost over several years.
- ❑ Other:.....

.....

3. If the answer to the statement **a** or **b** above is "not important", why?

(F) Back–end servers

1. How is the back – end servers (communication failures between internal system and external web – server) an important challenge?

Very Important ☐ Important ☐ Not Important ☐

2. If "very important or important", what are the used/suggested solutions for dealing with this challenge? Please, select.

- ❑ Installation some tools to monitor back – end server performance.
- ❑ Use tools to monitor the availability of network.
- ❑ Other solution(s):

.....

.....

(G) Compatibility

1. How much of a challenge is compatibility of e-government technology available with internal system?

Very Important ☐ Important ☐ Not Important ☐

2. If "very important or important", what are the suggested solutions for dealing with this challenge? Please, select.

- ❑ Study technology solutions carefully to ensure high compatibility.
- ❑ Invest in strong integration solutions.
- ❑ Other:

.....

.....

.....

(H) Challenges of vendors

1. To what extent do the following statements represent challenges related to vendors in buying the technology solutions such as software and computers? Please, select.

	Not Important	Important	Very Important
a. Vendors pressures for buying their solutions.	☐	☐	☐
b. False promises of vendor.	☐	☐	☐
c. Exaggerated vendor prices.	☐	☐	☐

2. If the answer to the statement **a, b** or **c** above is "important or very important", what are the used/suggested solution(s)?

3. If the answer to the statement **a, b** or **c** above is "not important", why?

Other:.....

.....

Other technical challenges already faced by your government organisation in order to reach transactional e-government system:	
Other:	
Other:	
Other:	
Other:	